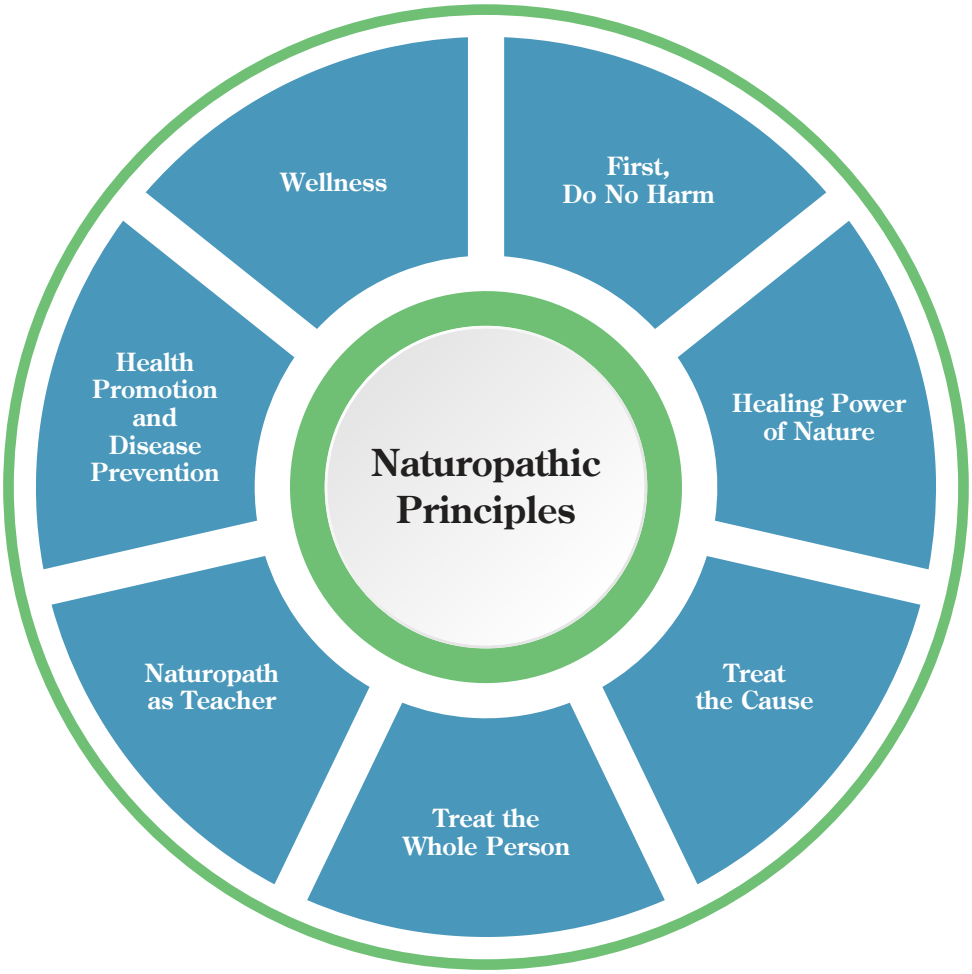
Naturopathy

Practice, Effectiveness, Economics & Safety



Edited by

Iva Lloyd · Amie Steel · Jon Wardle

WORLD NATUROPATHIC FEDERATION

Naturopathy

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Edited by:
Dr. Iva Lloyd, ND
Dr. Amie Steel, ND, PhD
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Iva Lloyd, ND
Amie Steel, ND PhD
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Executive Summary

Iva Lloyd, ND
Amie Steel, ND PhD
Jon Wardle, ND PhD

Health Technology Assessment - Naturopathy

This Executive Summary presents the findings of a Health Technology Assessment (HTA) on naturopathy initiated by the World Naturopathic Federation (WNF), the non-profit organization representing the global naturopathic profession and composed of national naturopathic organizations, naturopathic educational institutions and other naturopathic organizations spanning all World Health Organization (WHO) Regions. The protocol and methods for the HTA were drafted in line with the World Health Organization HTA guidelines, adapted to meet the specific requirements and nature of the naturopathic profession. The HTA report was developed to provide an evidence-based summary of naturopathic practices and outcomes of naturopathic care. The scope of the HTA was informed by research conducted by the international naturopathic community.

Foundational Basis of the Naturopathic Profession

Section 1 of this HTA outlines naturopathy as a distinct traditional and complementary system of medicine practiced around the world with strong historical and cultural roots in Europe. Naturopathy was formalized as a distinct system of medicine at the end of the 19th century in Germany and at the beginning of the 20th century in North America. Naturopathy quickly expanded to the Western Pacific, Asia, Latin America and the Caribbean, Africa and throughout the rest of Europe. The naturopathic profession encompasses both naturopathy and naturopathic medicine. Naturopaths and naturopathic doctors (NDs) around the globe share a common philosophical framework and a set of core therapeutic modalities and practices as foundation to naturopathic practice despite some educational differences, as well as jurisdiction-specific regulation and restrictions.

HIGHLIGHTS

- Naturopathy is a traditional system of medicine originating in Europe and it is part of Traditional and Complementary Medicine (T&CM) around the world.
- Naturopaths/naturopathic doctors treat patients throughout the span of their life. Naturopathic care focuses on prevention and chronic conditions, but also in the treatment of patients with acute conditions and those in palliative care.
- Naturopathic diagnoses categorize the symptoms, conditions and/or disease-state using biomedical terminology and diagnosis criteria along with traditional naturopathic diagnostic concepts.
- Naturopathy is defined by two core philosophies and seven principles and naturopathic practice that is guided by distinct naturopathic theories.
- Naturopathic practice is complex and multi-modal and incorporates core naturopathic therapies, modalities and practices including applied nutrition, clinical nutrition, herbal medicine, lifestyle modification, mind-body medicine counselling, naturopathic physical medicine, hydrotherapy, and other therapies based on jurisdictional regulations and naturopathic education.

Naturopathic Practice

Chapter 1 describes how naturopathic practice is characterized by specific assessment, diagnosis and treatment approaches used by naturopaths/naturopathic doctors. As a European traditional medicine system sharing several historical connections with Western medicine, naturopathic practice can successfully bridge traditional and biomedical approaches to practice. ***Naturopathic Assessment*** is person-centered with the goal of determining the factors contributing to a patient's state of health and their symptoms and conditions. It involves investigation into lifestyle, social, environmental, external, and genetic factors, and the impact of medical interventions. Naturopaths/naturopathic doctors employ a range of assessment tools including a thorough case history, standard conventional physical examinations and laboratory testing, along with traditional ***naturopathic assessment*** techniques such as tongue and pulse diagnosis. The three main goals of a ***naturopathic assessment*** are to:

1. determine the factors contributing to a patient's state of health, their symptoms and/or diseases;
2. collect the proper information to inform a naturopathic diagnosis and
3. assess the patient's vitality and state of wellbeing.

The three primary and interrelated purposes to a ***naturopathic diagnosis*** are to:

1. accurately categorize the symptoms, condition and/or disease-state using biomedical terminology and diagnostic criteria along with traditional naturopathic diagnostic concepts;
2. determine the underlying causes of the patient's symptoms, conditions, or disease-state; and
3. determine the patient's healing ability.

Naturopathic practice has always been therapeutically diverse in its approach to healing and incorporates various ***therapeutic modalities and practices*** applied based on the naturopathic philosophical and traditional framework. The therapeutic modalities and practices core to naturopathic care and which are included in over 80% of naturopathic educational programs are clinical and applied nutrition, herbal medicine, lifestyle counselling, hydrotherapy, and homeopathy. Based on jurisdictional regulation and the training of naturopaths/naturopathic doctors in some countries, other modalities such as yoga, naturopathic manipulation, acupuncture, intravenous therapies (IV), regenerative injection therapies and the prescribing of restricted products (e.g., bio-identical hormones, high dose vitamin D, compounds for IV therapy) form a significant part of the naturopathic scope of practice.

Naturopathic Philosophies and Principles

Chapter 2 provides an overview of the naturopathic philosophies of *vitalism* (an innate intelligence of living organisms) and *holism* (the body is a complex adaptive system that exists as a unified whole) that embrace every aspect of naturopathic care and are supported by seven naturopathic principles that guide naturopathic practice:

I. First, Do No Harm *(primum non nocere)*
II. Healing Power of Nature *(vis medicatrix naturae)*
III. Treat the Cause *(tolle causam)*
IV. Treat the Whole Person *(tolle totum)*
V. Doctor as Teacher *(docere)*
VI. Health Promotion and Disease Prevention
VII. Wellness and Wellbeing

Naturopathic Theories

Chapter 3 describes core theoretical and conceptual frameworks that inform naturopaths/naturopathic doctors clinical reasoning and decision making. The main theories included are:

- The ***Naturopathic Therapeutic Order*** which is a systematic approach to treatment that moves from minimally invasive to more forceful treatments as necessary.
- The ***Emunctory Theory*** which states toxic substances can be absorbed from the environment or produced by abnormal metabolic processes and must be effectively eliminated to achieve good health.
- The ***Theory of Complex Systems*** outlines that the body is a complex and self-sustaining dynamic and evolving system functioning within an environment of multiple nested systems which are interconnected, and naturopathic practice must reflect this complexity.

Naturopathic Professional Formation by WHO Region

Section 2 of this HTA explains that although there is some diversity in the educational standards and regulation of the naturopathic profession around the world, the profession is strongly united in the philosophies and principles that define naturopathic practice, as well as in the core therapeutic modalities and practices used by the profession.

HIGHLIGHTS

- The naturopathic profession includes more than 110,000 naturopaths/ naturopathic doctors (NDs) practicing in over 108 countries spanning all WHO Regions.
- 34 countries have some form of statutory regulation including regulation specific to the naturopathic profession (i.e., Naturopathy Act), and/or umbrella regulation under Allied Health or T&CM.
- 75% of countries where naturopathy/naturopathic medicine is practiced use the term naturopath and 41% use *naturopathic doctor* or *naturopathic physician*. Local variations such as *heilpraktiker, naturista, naturólogo* or *naturópata* reflect the language spoken in those countries.
- Over 130 naturopathic educational programs exist around the world and there are two main types of naturopathic educational programs the doctorate-level training programs at over 4,000 hours – which currently represents 52% of all programs – and the practitioner-level training programs at 2,500 hours.

Landscape of Naturopathy by WHO Region

Chapter 4 provides an overview by WHO Region starting with naturopathy as a discrete traditional system of medicine originating in Germany in the mid-1800s. It then spread to countries in the Americas, the Western Pacific Region, India, and throughout other European countries by the early 1900s. Currently, naturopathy/naturopathic medicine is practiced in 108 countries spanning all WHO Regions and it is estimated that there are over 110,000 naturopaths and/or naturopathic doctors globally. Naturopathy is currently practiced in all WHO Regions.

- ***Europe*** is the traditional home of naturopathy with over 30 countries in that Region with a naturopathic workforce of around 60,000 naturopaths.
- Naturopathy was introduced into the ***Region of Americas*** in the late 1800s and currently there are over 30 countries in that Region with a naturopathic workforce of over 25,000 naturopaths and naturopathic doctors. North America (Canada and the United States) is considered the home of modern naturopathy as this was where codification and education became most advanced. In North America naturopathic doctors are recognized as primary care practitioners in those States or Provinces with regulation. North American NDs have played a significant role in leading naturopathic research and the codifying of naturopathic information.
- The ***Western Pacific Region*** has had a naturopathic workforce since the early 1900s and there are currently 14 countries in that Region practicing naturopathy with a workforce of over 10,000 naturopaths/NDs. Naturopaths/NDs in the Western Pacific Region, especially in Australia, have been instrumental in furthering naturopathic research for the profession.
- Naturopathy was introduced into ***South-East Asia*** in the 1920s via India and currently there are at least five countries with a naturopathic workforce of over 10,000 naturopaths/NDs. In India, naturopathy is a recognized part of the Traditional System of Indian Medicine (referred to as AYUSH: Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa Rigpa and Homeopathy) with naturopathy and yoga being combined in naturopathic studies.
- Naturopathy was introduced to ***Africa*** in the mid-1900s and is now practiced in at least 13 countries in that Region with a workforce of about 5,000 naturopaths/NDs.
- Naturopathy has been introduced to the ***Eastern Mediterranean*** Region since the late 1990s and is currently practiced in at least eight countries in that Region.

Regulation of the Naturopathic Workforce

Chapter 5 outlines that there is a naturopathic workforce in 108 countries. While 35 countries enforce statutory regulation of the naturopathic profession another 17 have a formal process of voluntary certification. Other regulatory models used include co-regulation and negative licensing. Statutory regulation follows several legislative frameworks including regulation specific to the

naturopathic profession (i.e., Naturopathy Act), and/or umbrella regulation under Allied Health or T&CM.

Educational Standards for the Naturopathic Workforce

Chapter 6 outlines that there are 131 naturopathic educational institutions globally with 38% residing in the Region of South-East Asia, 27% in the European Region, 22% in the Region of the Americas, 9% in the Western Pacific Region, and 4% in the African Region. There are two main naturopathic educational programs doctorate-level training programs (over 4,000 hours) and practitioner-level training programs at 2,500 hours. Over 52% of the current naturopathic medical educational programs are 4,000 hours or longer and less than 9% are under 2,000 hours. *Benchmarks for Training in Naturopathy* were published in 2010 by the WHO.

Naturopathic education includes the full breadth of:

- naturopathic history, philosophies, principles, and theories.
- naturopathic medical knowledge includes basic and clinical sciences, laboratory and diagnostic testing, naturopathic assessment and diagnosis.
- naturopathic therapeutic modalities, practices, and treatments.
- supervised clinical practice.
- ethics and business practices; and
- research.

Surveys Conducted for the HTA

For five years, the WNF undertook essential foundational work to inform this HTA. An outline of the surveys conducted are as follows:

2015: The first international survey of the global naturopathic profession was conducted outlining characteristics of naturopathic practice in each country. Responses were received from 22 national naturopathic organizations which spanned all WHO Regions .

2016: A detailed international survey examining the characteristics of naturopathic education, regulation, and practice frameworks was initiated. The survey included responses from 65 naturopathic organizations (educational institutions, professional associations, regulatory bodies) from 29 countries. Data collection for this survey was completed in 2020.

2016: The international naturopathic educational institutions were surveyed. Thirty responses were received spanning 17 countries from five WHO Regions outlining what was taught in their naturopathic educational programs [4].

2016: A bibliometric analysis of research conducted by the naturopathic profession was undertaken from 2016 to 2018. The results of this international naturopathic research coalition project identified over 2200 naturopathic research papers which provided the basis for a substantial part of this HTA.

2019: An international practice survey was conducted to confirm the practices, health conditions and treatment modalities used by naturopaths/naturopathic doctors. This survey was sent to members from fourteen full WNF members (national naturopathic organizations) with an established history of naturopathic practice and included feedback from 859 naturopathic patient visits.

2019: An international survey was conducted to identify the degree that naturopathic educational institutions provide free or low-cost naturopathic care to the underprivileged, low income or specialized groups through naturopathic community clinics.

2019: A detailed analysis of program content provided by naturopathic educational institutions around the world was initiated and completed in 2021. The analysis identified 131 naturopathic educational programs located across five WHO Regions.

2020: An international survey of naturopaths/naturopathic doctors was conducted to identify the degree that naturopathic clinicians engage with and educate the public through various community education and health promotion activities. The survey was translated into five languages and over 800 responses were received from naturopaths/naturopathic doctors spanning all WHO Regions.

2020: A detailed knowledge mobilization survey was translated into five languages and shared internationally, resulting in over 500 responses from naturopaths/naturopathic doctors from around the globe. This survey examined naturopathic clinicians' approach to sharing and using knowledge and information related to naturopathic practice.

Practice and Implementation of Naturopathy in Health Care Systems

Section 3 of this HTA outlines that there is extensive evidence describing clinical outcomes associated with naturopathic therapeutic modalities and practices, and a broad evidence base examining many other aspects of naturopathic practice providing a guide to how it might fit into the global healthcare system. Policymakers and other stakeholders seeking to understand how best to optimize the health workforce and integrate naturopaths/naturopathic doctors into their policies, programs, and services for community benefit must consider this evidence within the context of contemporary naturopathic practice.

HIGHLIGHTS

- Naturopathic care is cost-effective, particularly for longer-term and chronic conditions and for persons with higher disease burden.
- Direct risks associated with naturopathic care are infrequent compared to most health professions, usually minor in nature and of types not dissimilar from other professions with similar primary care roles.
- The over 100 naturopathic community clinics around the globe serve an essential role in providing naturopathic care to the underprivileged, marginalized, low income, and underserved populations.
- Naturopaths/NDs are actively engaged in various forms of community education and health promotion activities and are well suited to play a more formal role in public health initiatives aimed at increasing health literacy.
- Naturopaths/NDs practice knowledge mobilization, employing multiple forms and sources of knowledge and mobilizing knowledge to – as well as from – others.

Safety and Risk of Naturopathic Practice

Chapter 7 outlines that the main types of risk associated with naturopathic practice are similar to those from any other health profession that employs a broad scope of practice and results primarily from the tools of trade that naturopaths/NDs use and the primary-care context within which they work. While risks associated with naturopathic practice are relatively rare, they are potentially significant enough that regulatory initiatives aimed at minimizing them should be encouraged. Lower risks associated with naturopathic practice are highly dependent on appropriate levels of education and safe standards of practice, and mechanisms should be enacted to ensure these standards are met. Most risks associated with naturopathic practice are either not unique to naturopathic practice (e.g., adverse events from therapeutic tools such as botanical or intravenous treatments) or are associated with rogue practitioners rather than representative of naturopathic practice (e.g., fraudulent behaviours). The typology of risks of naturopathic practice is what could be expected of any health profession with a substantive primary health care role and are substantively less than other practitioner groups performing similar roles.

Economics of Naturopathic Care

Chapter 8 outlines that globally, naturopathic care is primarily covered by third party insurers or out-of-pocket costs borne by consumers, rather than by government-funded programs, which may reduce the accessibility of naturopathic care.

- Some countries incorporate government-funded naturopathic care either for specific populations (e.g., veteran care) or circumstances (e.g., worker's compensation).
- Economic evaluations of naturopathic interventions that have been conducted have reliably shown naturopathic care to be cost-effective, particularly for longer-term and chronic outcomes, and for persons with higher disease burden.
- Studies also suggest societal economic benefits from naturopathic care, such as improved presenteeism and reduced absenteeism, and lower overall insurance costs per person.
- Integration of complementary therapies in multidisciplinary settings has also shown the ability to reduce costs of care while delivering equal or better clinical outcomes in general inpatient populations, oncology patients and pain patients, and such findings are suggestive of a potentially beneficial role

for naturopaths/naturopathic doctors in integrative multidisciplinary settings.

International Survey of Naturopathic Patients and Practices

Chapter 9 highlights the results from an original research paper titled, *"Overview of international naturopathic practice and patient characteristics: results from a cross-sectional study in 14 countries"* highlights that naturopaths/NDs treat a wide range of conditions with over 70% of patients presenting with chronic conditions. Naturopaths/NDs also treat patients with acute conditions and focus on preventive and palliative care. A typical naturopathic visit will generally involve the prescription, recommendation or use of an average of four different naturopathic treatments, therapies, or practices. Naturopaths/NDs treat a wide range of health conditions both as primary care practitioners and in collaboration with other healthcare providers.

International Prevalence of Consultations with a Naturopath/Naturopathic Doctor

Chapter 10 outlines that although the naturopathic workforce has a significant presence globally, there are limited data on the prevalence of naturopathic consultations. The 12-month prevalence of consultations with a naturopath/naturopathic doctor ranged from 1% of the general population in the USA to 6% in European and Western Pacific Regions, though there are significant differences between and within Regions, which may be driven by a range of policy, legislative and social factors.

Access and Equity in Naturopathic Care

Chapter 11 highlights that the original research paper *Naturopathic community clinics: international cross-sectional survey* indicates that there are over 100 Naturopathic Community Clinics (NCCs) globally that offer free or low-cost naturopathic care to under-served populations. NCCs have been offered through various naturopathic educational institutions for over three decades.

- NCCs reach underserved, vulnerable, and marginalized populations such as low-income families, immigrants, refugees, people experiencing homelessness, indigenous peoples, people with HIV/AIDs and those dealing with addictions or drug use as well as individuals from diverse genders including transgender and non-binary.
- NCCs provide naturopathic care that is like that delivered in general naturopathic practice treating both chronic and acute conditions. Gastrointestinal, mental health, endocrine and musculoskeletal conditions are the most common presenting concerns of individuals visiting NCCs.

Community Education and Health Promotion Activities of Naturopaths/Naturopathic Doctors

Chapter 12 highlights the results of the original research paper, *"Community education and health promotion activities of naturopaths/naturopathic doctors: results of an international cross-sectional survey"* highlights that naturopaths/NDs use a variety of educational tools, often at no cost to patients and consumers, to improve health literacy and encourage self-care. The tools used focus on ways to change health behaviours, to provide self-care guidelines, to manage health concerns and to prevent future health issues. Commonly employed tools include information sheets and handouts, social and professional network communications and information talks for members of the community. Research indicates that individuals who visit with a naturopath/ND may be more motivated to engage in positive health behaviours. This combination of patient-centered education and motivation of patient group may mean the community education activities undertaken by naturopathic practitioner have a marked impact in their patient population.

Mobilization of Knowledge and Information in Naturopathic Clinical Practice

Chapter 13 highlights the original research paper titled, *"Naturopaths' mobilisation of knowledge and information in clinical practice: an international cross-sectional survey"*, indicates that naturopaths/NDs are able to effectively draw knowledge from a diverse range of information sources to inform their clinical decision-making. While published research evidence is the prominent source of information informing clinical practice, naturopaths/NDs also draw on traditional knowledge, clinical experience and patient expertise regarding their own health condition. Naturopaths/NDs actively share their knowledge with patients and the wider community, suggesting they may act as knowledge brokers.

Naturopathic Research

Section 4 of this HTA outlines that there is an extensive body of research examining naturopathic practices and therapies, though several considerations need to ensure research appropriately reflects naturopathic practice. The naturopathic community has been active in researching health topics beyond naturopathic medicine and T&CM.

HIGHLIGHTS

- Pragmatic clinical research methods apply a complex, person-centred approach to clinical trial design that may help determine fidelity to naturopathic practice.
- The international naturopathic research community has demonstrated sustained commitment to codifying and synthesizing existing knowledge, generating new knowledge, and disseminating this knowledge to the wider clinical and research community.
- Naturopaths/NDs have published over 2000 peer-reviewed articles since 1987 with notable increases in the last 20 years.
- The naturopathic profession requires adequate infrastructure to further support research and research capacity building, consumer and practitioner engagement, and integration into health systems.
- It is important that naturopathy is recognized as a total system of traditional medicine when designing and conducting research investigating naturopathic treatments, therapies, and practices.

Researching Naturopathy as a Traditional System of Medicine

Chapter 14 outlines that research requires a balance between internal validity and external validity. Achieving this can be challenging in T&CM professions, such as naturopathy, due to its whole practice nature. Research with a limited focus on external validity has been identified by naturopaths/NDs as having limited applicability to clinical practice. The naturopathic profession has a long tradition of generating new knowledge and naturopaths/NDs have been described as early adopters of various forms of research, and as improving evidence-based approaches to practice while maintaining a strong connection to their naturopathic philosophies and principles.

Challenges and Advancements for Naturopathic Clinical Research

Chapter 15 outlines that researching naturopathy/naturopathic medicine – as well as primary care, public health, and other T&CM practices – has historically presented several challenges due to the limitations of the randomized-controlled trial design when evaluating complex interventions underpinned by philosophies and principles beyond the biomedical paradigm.

- Naturopathic researchers have embraced widely accepted innovations in research design and methodology aimed at investigating person-centred interventions with multiple therapeutic elements.
- The pragmatic clinical research design allows for the inclusion of multi-modal interventions, real-world settings and flexibility in treatment delivery matching the approach taken in real-world naturopathic care.

Research Dissemination by the Global Naturopathic Research Community

Chapter 16 highlights an original research paper titled, *"Knowledge dissemination by the naturopathic profession: a bibliometric analysis of naturopath-authored, peer-reviewed publications"* indicates that the international naturopathic research community has been actively publishing peer-reviewed research literature for over 30 years and has demonstrated sustained commitment to codifying existing knowledge, generating new knowledge and disseminating this knowledge to the naturopathic and wider allied-health clinical and research communities. Naturopathic research is conducted in most of the educational institutions that have a naturopathic program, especially those in the United States of America, Canada, Australia, Germany, India, and New Zealand.

Effectiveness of Naturopathic Clinical Practice

Section 5 of this HTA outlines that naturopaths/naturopathic doctors treat diverse physical and psychological health concerns throughout the full range of a patient's life. Most naturopathic visits focus on chronic diseases, but naturopathic clinicians also treat acute conditions and support patients in palliative care and those seeking advice for preventive medicine. Naturopathic researchers have published 235 original clinical research articles investigating a wide range of health interventions and sampling diverse health populations. Overall, 81.1% of the studies on the effectiveness of naturopathic clinical practice identified a positive response to at least one primary or secondary outcome measure.

HIGHLIGHTS

- Naturopathic researchers have conducted original clinical research involving 81 different illness populations.
- 81.1% of the studies investigating the effectiveness of naturopathic clinical practice, therapies or treatments identified a positive response to at least one primary or secondary outcome measure.
- The risk of non-communicable diseases (NCDs) is strongly associated with modifiable risk factors – lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, dietary choices, and environmental exposures – all which are addressed as part of naturopathic care.
- Naturopaths/NDs have been instrumental in the development of integrative oncology, nutritional psychiatry as well as modern biomedical concepts such as the role of the microbiome on health.
- Although this section included 235 clinical research articles, due to the variety of complex interventions used by naturopaths/NDs further research is required on the effectiveness of naturopathic care.

Cancer and Cancer-related Conditions

Chapter 17 outlines that individuals seek naturopathic care for a range of cancers, as well as for recovery from cancer or palliative care. Naturopathic researchers have conducted 53 clinical studies investigating interventions for populations with cancer and cancer-related conditions, with 93.5% reporting a positive outcome. These are supported by over 100 observational studies and more than 60 reviews or meta-analysis. Conditions represented include breast, colorectal, prostate, and cervical, and other cancers.

Cardiovascular Conditions

Chapter 18 outlines that naturopaths/NDs can have a significant role in the prevention and management of cardiovascular and other NCDs. Naturopathic researchers have conducted 12 clinical studies investigating interventions for populations with cardiovascular conditions, with 72.7% reporting a positive outcome. These are supported by over 20 observational studies and more than 20 reviews or meta-analysis. Cardiovascular conditions represented include hypertension, cardiovascular disease, post-cardiac surgery, and other cardiovascular conditions.

Complex Immune Conditions

Chapter 19 outlines that the naturopathic approach views the management of conditions through a lens of complexity, addressing multiple causative factors and physiological systems concurrently. Naturopathic researchers have conducted 14 clinical studies investigating interventions for populations with complex immune condition. Complex Immune conditions represented include HIV and AIDS, multiple sclerosis and chronic fatigue syndrome.

Endocrine Conditions

Chapter 20 outlines that naturopaths/NDs are well-placed to help in the treatment and prevention of endocrine conditions and other NCDs due to their specific training and focus on lifestyle counselling and treatment of the various risk factors. Naturopathic researchers have conducted 23 clinical studies investigating interventions for populations with cardiovascular conditions, with 90.9% reporting a positive outcome. These are supported by 15 observational studies and 17 reviews or meta-analysis. Endocrine conditions represented include type II diabetes mellitus, metabolic syndrome, and other endocrine conditions.

Gastrointestinal Conditions

Chapter 21 outlines that gastrointestinal conditions are among the top reason patients seek naturopathic care. Naturopaths/NDs place a high importance on gastrointestinal health and recognize that it is linked to many other conditions. Naturopathic researchers have conducted 17 clinical studies investigating interventions for populations with gastrointestinal conditions, with 82.4% reporting a positive outcome. These are supported by 13 observational studies and 39 reviews or meta-analysis. Gastrointestinal conditions represented include irritable bowel syndrome, functional gastrointestinal disorders, inflammatory bowel disease, coeliac disease, hepatobiliary and pancreatic conditions, and other gastrointestinal conditions.

Mental Health Conditions

Chapter 22 outlines that naturopathy's broad-spectrum approach to health and disease and the principle *Treat the Whole Person* means that naturopaths/NDs acknowledge the significance of a person's mental status when treating any condition. Naturopathic researchers have conducted 24 clinical studies investigating interventions for populations with mental health conditions, with 64.7% reporting a positive outcome. These are supported by over 50 observational studies and more than 80 reviews or meta-analysis. Mental health conditions represented include depression, anxiety, and other mental health conditions.

Musculoskeletal Conditions

Chapter 23 outlines that naturopaths/NDs use a broad treatment approach with musculoskeletal conditions, which are one of the most common reasons patients seek naturopathic care. Naturopathic researchers have conducted 30 clinical studies investigating interventions for populations with musculoskeletal conditions, with 89.3% reporting a positive outcome. These are supported by over 50 observational studies and more than 50 reviews or meta-analysis. Musculoskeletal conditions represented include chronic neck pain, low back pain, osteoarthritis, fibromyalgia and other musculoskeletal conditions.

Neurological Conditions

Chapter 24 outlines that naturopaths/NDs employ a diverse treatment approach in the treatment of neurological conditions. Naturopathic researchers have conducted 21 clinical research papers investigating interventions for populations with neurological conditions, with 66.7% reporting a positive outcome. These are supported by over 40 observational studies and more than 25 reviews or meta-analysis. Neurological conditions represented include migraine and chronic headaches, Parkinson's Disease, and other neurological conditions.

Skin Conditions

Chapter 25 outlines that naturopaths/NDs place great importance on skin conditions as naturopathic theory views the skin as the largest detoxification organ of the body and as a representation of internal health. Naturopathic researchers have conducted 8 clinical studies investigating interventions for populations with skin conditions, with 62.5% reporting a positive outcome. Skin conditions represented include acne vulgaris, psoriasis, vitiligo vulgaris and other skin conditions.

Women's Health Conditions

Chapter 26 outlines that naturopaths/NDs commit significant focus to women's health conditions and over 70% of patients seeking naturopathic care are female. Naturopathic researchers have conducted 11 clinical studies investigating interventions for women's health conditions. These are supported by over 40 observational studies and more than 30 reviews or meta-analysis. Women's health conditions represented include menopausal symptoms, menstrual disorders, and other women's health conditions.

Other Conditions

Chapter 27 outlines that in addition to the conditions listed above, there are a range of other conditions treated by naturopaths/NDs. Naturopathic researchers have conducted 14 clinical studies investigating interventions for these other conditions, with 85.7% reporting a positive outcome. The conditions represented include overweight or obesity, respiratory conditions, and genitourinary conditions.

Other Research Publications Related to Health Conditions

Chapter 28 outlines that naturopathic researchers have also published over 1400 peer-reviewed journal articles related to health conditions and roughly half of these are reviews and meta-analyses (n=357; 24.5%) or observational studies (n=363; 24.9%). These types of articles present an important contribution in the healthcare field to the understanding of health, illness, and its management.

Research on Naturopathic Therapeutics and Practices

Section 6 of this HTA outlines that naturopathic practice is known for its complexity and flexibility with a range of treatments, therapies, and practices. There is strong consensus on seven core naturopathic modalities used in practice: applied nutrition and diet modifications, clinical nutrition and the use of natural health products, herbal medicines, lifestyle counselling, hydrotherapy, homeopathic remedies, and various physical modalities such as yoga, naturopathic manipulation, and muscle release techniques. Naturopathic research on naturopathic therapeutic modalities and practices highlights how such treatments are employed – singularly and in combination – by naturopaths/NDs both in naturopathic clinical interventions and at times in collaboration with other healthcare settings. There are over 300 original clinical studies that focus on clinical outcomes associated with naturopathic treatment modalities and practices. These studies investigate treatments for over 140 conditions. These clinical studies commonly feature pragmatic elements such as multi-modal interventions, flexibility in administration, and real-world settings. Overall, 77.6% of these studies each identified a positive response to at least one primary or secondary outcome measure.

HIGHLIGHTS

- There is strong consensus on the core naturopathic modalities used in practice with a typical naturopathic visit generally involving the prescription, recommendation or use of an average of four different naturopathic therapeutic modalities or practices.
- Naturopathic care is known for its diverse and flexible therapeutic approach to healthcare. It includes the prescription of internal and topical substances; counselling with respect to diet, lifestyle, and mind-body medicine; naturopathic physical medicine and other therapies.
- The use of a complex intervention approach to care allows naturopaths/NDs to utilize the synergistic properties of various treatments and to treat the psychological, functional, and structural aspects of each patient.
- The naturopathic community have been leaders in examining the impact of integrating multiple T&CM treatment approaches in conventional care settings.
- The naturopathic multi-modal, complex intervention approach warrants further investigation.

Complex Interventions

Chapter 29 outlines that a holistic, patient-centered, multi-modal treatment approach is central to naturopathic care. Naturopathic researchers have conducted 25 clinical studies investigating complex interventions. These are supported by over 70 observational studies and 19 reviews or meta-analysis.

Applied Nutrition

Chapter 30 outlines that applied nutrition has an essential and foundational role in naturopathic care and includes diet therapy (therapeutic diets, fasting and individualized diet modification), therapeutic application of specific foods and behavioural and lifestyle counselling related to eating behaviours. Naturopathic researchers have conducted 31 clinical studies investigating applied nutrition interventions, with 88% reporting a positive outcome. These are supported by over 20 observational studies and more than 30 reviews or meta-analysis.

Clinical Nutrition

Chapter 31 outlines that clinical nutrition is one of the therapeutic modalities most used by naturopaths/NDs. Clinical nutrition includes vitamins and minerals, nutrients that have physiological effects such as amino acids and other amino-based compounds, food-based constituents, and other compounds that are important to foundational human biochemistry and physiology. Naturopathic researchers have conducted 59 clinical research papers investigating clinical nutrition interventions, with 62.5% reporting a positive outcome. These are supported by over 50 observational studies and more than 90 reviews or meta-analysis.

Herbal Medicine

Chapter 32 outlines that more than half of naturopathic visits result in some form of herbal prescription. Naturopaths/NDs are trained to use a wide range of herbs from mild herbs to extremely powerful herbs that arguably are the basis of modern pharmacological

medicine. Naturopathic researchers have conducted 48 clinical research papers investigating herbal medicine interventions, with 71.7% reporting a positive outcome. These are supported by over 70 observational studies and 19 reviews or meta-analysis.

Lifestyle Modifications

Chapter 33 outlines that naturopaths/NDs were among the first health professionals to formally acknowledge lifestyle modifications as an important element of care. The importance of lifestyle counselling in naturopathic practice continues and is considered one of the core therapeutic elements in naturopathic practice. Naturopathic researchers have conducted three clinical studies investigating lifestyle modification interventions, with 100% reporting a positive outcome.

Mind-body Medicine Counselling

Chapter 34 outlines that mind-body medicine (MBM) Counseling is prescribed and practiced by naturopaths/NDs with patients of all ages presenting with functional disorders (e.g., gastrointestinal, endocrine, neurological or cardiovascular conditions), structural disorders (e.g., musculoskeletal conditions, chronic pain), psychological conditions (anxiety, depression, ADHD), and as part of preventive and palliative care. Naturopathic researchers have conducted nine clinical studies investigating mind-body medicine counseling interventions, with 88.9% reporting a positive outcome.

Naturopathic Physical Medicine

Chapter 35 outlines that addressing or correcting structural integrity is considered an essential stage of the Naturopathic Therapeutic Order as naturopaths/NDs recognize that there is a correlation between an individual's alignment and structure, the functioning of internal organs and a person's psychological state. Naturopathic researchers have conducted nine clinical studies investigating physical medicine interventions, with 66.7% reporting a positive outcome. These are supported by 20 observational studies and seven reviews or meta-analysis.

Hydrotherapy

Chapter 36 outlines that hydrotherapy – the application of water for therapeutic purposes – has been used for thousands of years and has been part of naturopathic care since its inception. Naturopathic researchers have conducted 17 clinical studies investigating hydrotherapy interventions, with 84.2% reporting a positive outcome.

Acupuncture

Chapter 37 outlines that Acupuncture is included in the curriculum of naturopathic educational programs and within the scope of naturopathic care in some countries such as Canada, the USA, South Africa, India, Germany, Switzerland, and Brazil. Naturopathic practice may include needling, electroacupuncture, auricular acupuncture, acupressure, cupping and moxibustion. Naturopathic researchers have conducted 32 clinical studies investigating acupuncture interventions, with 84.8% reporting a positive outcome. These are supported by ten observational studies and 15 reviews or meta-analysis.

Yoga

Chapter 38 outlines that yoga plays a significant role in naturopathic care, especially in India. In India, yoga and naturopathy are integrated in naturopathic educational programs and practice. Naturopaths/NDs use a variety of yogic practices, such as *asanas*, *pranayama*, and meditation, to achieve demonstrable improvements in patient health and wellbeing. Naturopathic researchers have conducted 58 clinical studies investigating yoga interventions, with 86.3% reporting a positive outcome. These are supported by over 20 observational studies and more than 50 reviews or meta-analysis.

Optimizing Pharmaceutical-based Interventions

Chapter 39 outlines that it is important that naturopaths/NDs are well-informed on drug-herb and nutrient interactions, and the comparison of pharmaceutical and naturopathic-based interventions. In some jurisdictions, primarily within North America, NDs have prescribing rights as part of their defined scope of practice. Naturopathic researchers have conducted eight clinical studies investigating ways to optimize pharmaceutical-based interventions.

Other Research Publications Regarding Naturopathic Therapies and Practices

Chapter 40 outlines that naturopathic researchers have conducted extensive clinical research, yet they only represent one quarter of the 1203 published peer-reviewed journal articles examining the broad range of therapies commonly used in naturopathic practice. A substantial proportion of observational studies including research using survey, interview or focus group methods (n=195; 16.2%), and reviews and meta-analyses (n=297; 24.6%) have been published by naturopathic researchers.

Discussion

Section 7 contains the Discussion (Chapter 41) and it highlights the key questions identified by extensive consultation with stakeholders as important for policy and practice decision-making at systems and organizational levels for naturopathic practice. It also summarizes the effectiveness and efficacy of naturopathy and naturopathic medicine and the policy relevance and implementation of the findings presented in the HTA.

About the World Naturopathic Federation

In 2014 the WNF, developed by the global naturopathic community, was incorporated in Canada. As of 2021, the WNF represents 78 naturopathic organizations, 35 national naturopathic organizations as full members, 10 associate members, 25 educational members and eight specialized naturopathic organizations. Between 2015 and 2021 the WNF has actively worked to codify and consolidate the current information and research available on the naturopathic profession. In that time, the WNF produced 19 publications and seven policy statements.

WNF Mission

- Supporting the growth and diversity of naturopathy / naturopathic medicine worldwide.
- Supporting the appropriate regulation and recognition of naturopathy / naturopathic medicine.
- Promoting accreditation and the highest educational standards in each WHO Region.
- Encouraging naturopathic research.
- Establishing and maintaining a database of naturopathic organizations, regulation, accreditation, conferences, and research activities.
- Working with world agencies (World Health Organization, United Nations, UNESCO) and national governments and supra-national agencies to promote the naturopathic profession.

WNF Current Membership Countries

African Region
- Democratic Republic of the Congo
- Ghana
- Nigeria
- South Africa
- Zambia

The Americas
- Brazil
- Canada
- Chile
- Ecuador
- El Salvador
- Guatemala
- Mexico
- Peru
- Puerto Rico
- Uruguay
- United States of America

Eastern Mediterranean Region
- Cyprus
- Saudi Arabia

European Region
- Belgium
- Czech Republic
- France
- Greece
- Ireland
- Italy
- Norway
- Portugal
- Russia
- Slovenia
- Spain
- Switzerland
- United Kingdom

South-East Asian Region
- India
- Nepal

Western Pacific Region
- Australia
- Hong Kong
- Japan
- New Zealand
- Singapore

Aim, Objectives and Methods

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This Health Technology Assessment (HTA) report on naturopathy was developed to provide an evidence-based summary of naturopathic practice and the safety, economics and effectiveness of naturopathic care. The scope of the HTA was informed by research conducted by the international naturopathic community over the last thirty years.

Aim

The aim of this HTA is to provide the data and research necessary to inform evidence-based decisions regarding the inclusion of the naturopathic workforce in contemporary health care systems, which reflects their ability to reduce the burden of global illnesses such as non-communicable diseases. It is our intention that this HTA will be used to support the global implementation of appropriate and robust regulation of the naturopathic profession and to increase access to training for naturopaths/naturopathic doctors that is commensurate with their role in delivering primary care health services.

Objectives

The objectives of this HTA are to describe:

1. The international landscape of the naturopathic profession
   - How widespread is the practice of naturopathy/naturopathic medicine globally?
   - What is the foundational basis of naturopathic practice?
   - What are the educational standards underpinning naturopathic practice?
   - What regulation is in place for the naturopathic profession?
2. The safety and risks associated with naturopathic care
   - What adverse effects or complications can occur or have been observed so far associated with naturopathic practice?
   - What safety precautions are required in naturopathic practice?
3. The economics of naturopathy/naturopathic medicine
   - What are the economic considerations when evaluating naturopathic care?
   - What is the cost-effectiveness of naturopathic care?
   - What are the economic factors influencing naturopathic practice and research?
4. The implementation and practice of naturopathy/naturopathic medicine in real-world settings and health systems
   - How widespread is the use of naturopathy/naturopathic medicine by the general population?
   - What is the access and equity of naturopathic health services?
   - What role do naturopaths/naturopathic doctors play in health promotion and community education?
5. The naturopathic profession's contribution to knowledge generation
   - What types and quantities of scientific publications have been produced by naturopathic researchers?
   - What is the scope, breadth and quality of naturopathic research?
6. The research evidence-base for naturopathic practice
   - What conditions are commonly treated by naturopaths/naturopathic doctors?
   - What are the volume and outcomes of clinical studies examining the efficacy and effectiveness of naturopathic therapeutics, practices and treatments?
   - How are naturopathic treatments and practices studied in clinical research?

Context

For five years, the WNF undertook essential foundational work to inform this HTA. During that time, the WNF conducted seven international surveys involving naturopathic organizations, naturopathic educational programs, naturopaths and naturopathic doctors to ensure an appropriate and impartial representation of the breadth and complexity of naturopathic practice globally (see Figure i). An outline of the surveys conducted are as follows:

2015: The first international survey of the global naturopathic profession was conducted outlining characteristics of naturopathic practice in each country. Responses were received from 22 national naturopathic organizations which spanned all World Health Organization (WHO) Regions [1].

2016: A detailed international survey examining the characteristics of naturopathic education, regulation, and practice frameworks was initiated. The survey included responses from 65 naturopathic organizations (educational institutions, professional associations, regulatory bodies) from 29 countries. Data collection for this survey was completed in 2020 [2, 3].

2016: The international naturopathic educational institutions were surveyed. Thirty responses were received spanning 17 countries from five WHO Regions outlining what was taught in their naturopathic educational programs [4].

2016: A bibliometric analysis of research conducted by the naturopathic profession was undertaken from 2016 to 2018. The results of this international naturopathic research coalition project identified over 2200 naturopathic research papers which provided the basis for a substantial part of this HTA [5].

2019: An international practice survey was conducted to confirm the practices, health conditions and treatment modalities used by naturopaths/naturopathic doctors. This survey was sent to members from fourteen full WNF members (national naturopathic organizations) with an established history of naturopathic practice and included feedback from 859 naturopathic patient visits [6, 7].

2019: An international survey was conducted to identify the degree that naturopathic educational institutions provide free or low-cost naturopathic care to the underprivileged, low income or specialized groups through naturopathic community clinics [8].

2019: A detailed analysis of program content provided by naturopathic educational institutions around the world was initiated and completed in 2021. The analysis identified 131 naturopathic educational programs located across five WHO Regions [9].

2020: An international survey of naturopaths/naturopathic doctors was conducted to identify the degree that naturopathic clinicians engage with and educate the public through various community education and health promotion activities. The survey was translated into five languages and over 800 responses were received from naturopaths/naturopathic doctors spanning all WHO Regions [10].

2020: A detailed knowledge mobilization survey was translated into five languages and shared internationally, resulting in over 500 responses from naturopaths/naturopathic doctors from around the globe. This survey examined naturopathic clinicians' approach to sharing and using knowledge and information related to naturopathic practice [11].

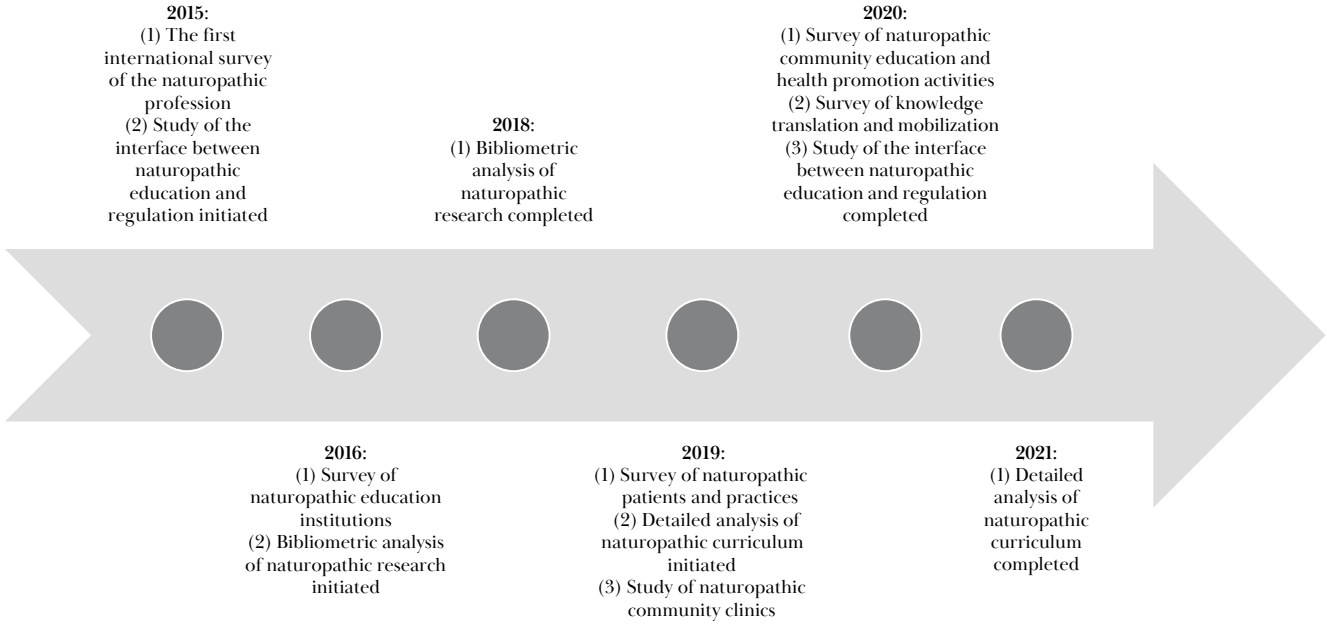

Figure i: Timeline of international research undertaken by the WNF in preparation for the Health Technology Assessment

Declaration of Astana

In 2018, the global health community came together for a Global Conference on Primary Health Care to review the 1978 Alma-Ata Declaration in the context of the WHO Sustainable Development Goals. Both Dr Iva Lloyd, ND and Professor Jon Wardle were invited to contribute to this event as representatives of the WNF, the outcome of which was the Declaration of Astana [12]. With the aim of achieving universal health coverage and meeting the WHO Sustainable Development Goals, the Declaration represents a commitment from Heads of State and Government, ministers and representatives of States and Governments to promote a Health for All policies approach, build sustainable primary health care, empower individuals and communities, and align stakeholder support to national policies, strategies and plans. The success of primary health care has been determined to be driven by knowledge and capacity building, human resources for health, technology, and financing. This Declaration is a pivotal document to guide the focus and activities of all areas of primary health care, including the naturopathic profession, especially as many of the recommendations (e.g., focus on prevention, person-centered care, teaching self-responsibility and healthy lifestyle) are congruent with naturopathic care. This HTA should be considered within the context of the Declaration of Astana's important global vision for primary care.

Full details of the Declaration of Astana can be accessed here: https://www.who.int/docs/default-source/primary-health/declaration/gcphc-declaration.pdf.

Resourcing

The HTA was primarily funded by the Naturopaths and Herbalists Association of Australia (NHAA), a full member of the WNF and by the WNF itself.

Materials and Methods

The scope of the HTA was outlined in 2017, approved by the World Naturopathic Federation Research Committee and involved a five-year in-depth analysis of the global naturopathic profession as foundational work for this HTA.

Protocol

The protocol for this HTA was structured in accordance with WHO HTA guidelines [13] and informed by previously published HTAs [14-16] with consideration of the specific context and features of the naturopathic profession and its practice.

Definition of the term "naturopathy" for the HTA report

For the purpose of this HTA report, naturopathy is defined as a system of healthcare with a deep history of traditional philosophies and practices and with medically trained practitioners who utilize a breadth of natural treatment modalities and practices in the provision of person-centered healthcare [17]. The term naturopathy includes both naturopathy and naturopathic medicine.

The foundational basis of naturopathic care includes the philosophies of "vitalism" and "holism" and the guiding principles of naturopathic practice include:

- The Healing Power of Nature *(vis medicatrix naturae)*
- Treat the Whole Person *(tolle totum)*
- Treat the Cause *(tolle causam)*
- First, Do No Harm *(primum non nocere)*
- Naturopathic Doctor as Teacher *(docere)*
- Health Promotion and Disease Prevention
- Wellness

Naturopathic practice is known for its multifaceted approach to treatment. The therapeutic modalities practiced by naturopaths and naturopathic doctors vary to some degree. A strength of naturopathy/naturopathic medicine is that it is an integrated system; as such, each jurisdiction incorporates modalities based on regional traditional health care practices and on the level of education and regulation in the Region. Other modalities integrated into naturopathic practice include acupuncture, and therapies associated with additional education such as intravenous therapies, prescribing rights for pharmaceuticals, regenerative injection therapies and minor surgery (See Chapter 1 *Naturopathic Practice* for more information).

Literature Search and Choice of Literature

The literature informing this HTA was drawn from the extensive bibliometric analysis of naturopathic research [5] expanded upon in Chapter 16. The full list of citations identified through the bibliometric study was divided into topic areas based on the coding allocated to each manuscript during the bibliometric analysis.

The results of the bibliometric analysis were separated into two sections for the HTA. The first – *Section 5: Effectiveness of Naturopathic Clinical Practice* – presents a summary of the evidence describing the conditions supported by naturopathic research including cancer, cardiovascular conditions, complex immune conditions, endocrine conditions, gastrointestinal conditions, mental health conditions, musculoskeletal conditions, neurological conditions, women's health, skin conditions, among

others. The second – *Section 6: Research in Naturopathic Therapeutics and Practices* – presents the clinical outcomes associated with naturopathic treatment modalities and practice including complex naturopathic interventions, applied nutrition, clinical nutrition, herbal medicine, lifestyle and exercise, bodywork, mind-body medicine and counselling, hydrotherapy, acupuncture, yoga, and pharmaceuticals. The topic areas for each chapter were selected by the editorial team based on the number of articles available, and the frequency with which the treatment(s) was used, or the condition was reported as treated by naturopathic practitioners.

In total 51 authors from ten countries in six WHO Regions contributed to the literature review and the writing of chapters for this HTA. Authors selected for each chapter were primarily naturopathic researchers, or research-active naturopaths/naturopathic doctors and, in many instances, were affiliated with naturopathic educational institutions. Authorship of all chapters was led by a naturopathic researcher, however authors from other fields were invited to contribute specialist knowledge or skills where the editorial team deemed it of value to the overall rigor of the report. The authors assigned to a chapter were provided with the full list of citations relevant to their topic, following which they filtered the citations to exclude any manuscripts not reporting original clinical research. Manuscripts were retained if they reported the results from clinical research. This was defined as any retrospective or prospective study designs examining clinical outcomes following an intervention including case reports, clinical audits, and clinical trials. Authors were also invited to undertake pearling and citation-checking to verify if any additional relevant articles produced by naturopathic researchers met the criteria for inclusion.

Analysis of observational studies was also undertaken to summarize the survey research, qualitative studies, and other non-clinical research conducted by naturopathic researchers. Manuscripts meeting this criterion were identified through the bibliometric analysis based on two groupings: (1) health condition; (2) therapy or treatment. Descriptive statistics for each group were analyzed and reported. For the health conditions group, the two most prevalent health conditions examined in the included manuscripts were identified, and the manuscripts were thematically categorized according to their content. The same process was applied to the two most prevalent therapies or treatments covered in the therapy or treatment group. Review and meta-analyses published by naturopathic researchers were similarly examined in accordance with this method.

Data extraction and presentation of results

Data were extracted from all relevant articles for each topic and summarized into tables. Authors for each chapter then provided a written summary of the overall characteristics of the included articles. The written summaries presented in *Section 5: Effectiveness of Naturopathic Clinical Practice* focused on the clinical outcomes of the naturopathic interventions studied. For the topics included in *Section 6: Research in Naturopathic Therapeutics and Practices*, the summaries focused on the specific details about the variations in the types of treatments used within the category, their application, and the conditions they were used to treat.

Due to the substantial number of included studies, full details of all studies could not be presented in the written text and, as such, an overview of selected studies was presented with an overview of relevant papers included in the tables for each chapter within the corresponding section.

Review

A staged peer-review process was employed for each topic. The first stage of review was conducted by at least two members of the editorial team who provided feedback to the authors for quality and compliance with methodology and format requirements of the project. Once completed, members of the WNF Research Committee undertook a second stage of review which was checked by the editorial team and then provided to the authors for further edits and refinements, with a focus on consistency and accuracy of content. A final review was then conducted by the editorial team to check for consistency and accuracy of content. All final versions were approved by authors and editors prior to publication.

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Glossary of Key Naturopathic Terms

The following are key naturopathic terms used in this report. Please note that Appendix III provides a detailed list of the abbreviations used throughout this report.

Constitution: Constitution is the aggregate composition and energetics of an individual person's spiritual, psychological, functional, and structural characteristics and includes the way in which such characteristics are composed and how they are interrelated. A person's constitution is impacted by various factors, including an individual's genetics, the accumulation of an individual's life experiences, and their environment.

Doctor as Teacher: The naturopathic principle, Doctor as Teacher *(docere)* emphasizes the importance of education, personal responsibility, and development of an individual's knowledge and understanding of their health, symptoms and conditions, as well as the safe and effective use of behavioural, lifestyle and natural medicines to improve health and well-being.

Emunctorology: The processes and organs of detoxification and elimination in the body. The emunctory theory states that proper elimination of toxins assists homeostasis and optimal health.

First, do no harm: To do no harm, a naturopath / naturopathic doctor establishes the most gentle and non-invasive treatment strategy and advice to achieve the desired outcome for each individual patient. First, do no harm is one the naturopathic principles.

Healing Power of Nature: The term Healing Power of Nature *(vis medicatrix naturae)* is one of the naturopathic principles and it denotes that all living organisms have an inherent self-organizing, ordered healing ability along with the innate ability to grow, develop, reproduce, and progress through defined stages of life.

Health Promotion: The process of enabling individuals to increase control over, and to improve their health. It recognizes the importance of addressing a number of determinants of health – including lifestyle, social relationships, environment, external, medical interventions, genetic and gestational factors – with the aim of not only reducing and treating disease but optimizing an individual's health and well-being. *Health Promotion* is a principle that guides naturopathic practice.

Holism: The body is a complex adaptive system that exists as a unified whole. *Holism* is one of the naturopathic philosophies.

Nature cure: The use of natural elements to treat disease and to promote health.

Naturopath: A healthcare practitioner practicing according to the traditional philosophies and practices of naturopathy and having completed training commensurate with the level of naturopathic education required in their country.

Naturopathic Clinical Assessment: The naturopathic clinical assessment is a patient-centred process with the goal of determining the factors that contribute to an individual patient's state of health and/or disease as well as their vitality to determine how their symptoms, condition and disease-state are presenting on the multidimensional levels of the individual and their social interactions. A naturopathic clinical assessment may include standard conventional assessment techniques and specialized naturopathic assessment practices.

Naturopathic Diagnosis: The summation and interpretation of the findings from the naturopathic clinical assessment using biomedical terminology and naturopathic concepts.

Naturopathic Doctor (ND): A healthcare practitioner practicing according to the traditional philosophies and practices of naturopathy and having completed training commensurate with doctorate-level naturopathic education.

Naturopathic Medicine: A system of healthcare with a deep history of traditional philosophies and practices and with medically trained practitioners who utilize a breadth of natural treatment modalities and practices in the provision of person-centered healthcare.

Naturopathic Researcher: A naturopath or naturopathic doctor who engages in research.

Naturopathic Treatment: An individualized clinical practice which is diverse and multi-modal focused on dietary and lifestyle changes as well as the use of modalities and practices such as clinical nutrition, applied nutrition, herbal medicine, lifestyle counselling, hydrotherapy, homeopathy, and physical modalities such as acupuncture and exercise therapy. The use of invasive treatments including intravenous therapy and mesotherapy depend on educational standards and jurisdictional regulations.

Naturopathy: A system of healthcare with a deep history of traditional philosophies and practices and with medically trained practitioners who utilize a breadth of natural treatment modalities and practices in the provision of person-centered healthcare. The term naturopathy includes both naturopathy and naturopathic medicine.

Prevention: The practice of reducing the contributing factors to symptoms, conditions and diseases and their progression as well as supporting the natural healing ability of the body. Naturopathic clinical practice emphasizes the importance of addressing all factors that impact

health and educating patients on how to live a life that supports their constitution and unique susceptibilities throughout all phases of life, ensuring optimal wellness and the prevention of disease.

Therapeutic Order: A hierarchical philosophy for therapeutic intervention. It guides naturopathic practice and its application by respecting the natural healing process and vitality of an individual. The basis of the naturopathic therapeutic order is that the body possesses an intrinsic nature to heal itself using the least possible force.

Treat the Cause: The naturopathic principle based on choosing a treatment regimen that addresses contributing factors for each symptom, condition, or disease. The cause of most symptoms, conditions or diseases can be traced back to lifestyle, social, environmental, external, genetic, or other factors as well as the status of vitality.

Treat the Whole Person: A naturopathic principle that recognizes the spiritual, psychological, functional, and structural aspects and vitality of an individual as being part of an inseparable whole. Individuals are also interconnected and interdependent with family, community, and environment.

Vitalism: An inherent capacity to live, grow, develop, and heal. *Vitalism* is one of the naturopathic philosophies.

Wellness and Wellbeing: Interrelated concepts about an individual's state of health. ***Wellness*** reflects more of the objective aspect, whereas ***Wellbeing*** reflects an individual's subjective perception of their state of Wellness.

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Section 1: Foundational Basis of the Naturopathic Profession

Iva Lloyd, ND

HIGHLIGHTS

- Naturopathic practice uses a distinct assessment, diagnosis and treatment approach to healthcare.
- Naturopathy is defined by two philosophies and seven principles and naturopathic care is guided by distinct naturopathic theories.
- Naturopathic care is individualized to each patient and uses a range of therapeutic modalities and practices.
- Naturopaths/naturopathic doctors treat patients throughout the span of their life. Naturopathic care focuses on prevention and chronic conditions, but also in the treatment of acute conditions and patients in palliative care.

Naturopathy is a distinct traditional and complementary system of medicine practiced around the world with strong historical and cultural roots in Europe. Naturopathic practice was strongly influenced by traditional nature cure practices which date back prior to the 18th century and which are based on the observation of how plants and animals survive and interact with their environment. Nature cure practices use natural elements to treat disease and to promote health. These nature cure elements include hydrotherapy, herbal medicine and nutrition and they have had a strong influence on the naturopathic profession as it formalized as a distinct system of medicine at the end of the 19th century in Germany and at the beginning of the 20th century in North America. Naturopathy quickly expanded to the Western Pacific, Asia, Latin America and the Caribbean and throughout the rest of Europe.

The naturopathic profession encompasses both naturopathy and naturopathic medicine. The global naturopathic workforce has unanimously identified a common philosophical and traditional knowledge framework and a set of core therapeutic modalities and practices as being the foundation to naturopathic practice despite some educational differences, as well as jurisdiction-specific regulation and restrictions. This chapter introduces key concepts that underpin naturopathic practice.

Naturopathic Practice (Chapter 1) provides an overview of naturopathic practice with a focus on the assessment, diagnosis and treatment approach used by naturopaths/naturopathic doctors. ***Naturopathic clinical assessment*** is person-centered with the goal of determining the factors contributing to a patient's state of health and their symptoms and conditions. It involves investigation into lifestyle, social, environmental, external and genetic factors, and the impact of medical interventions. Naturopaths/naturopathic doctors employ a range of assessment tools including a thorough case history, standard conventional physical examinations and laboratory testing along with traditional naturopathic assessment techniques such as tongue and pulse diagnosis. The three main goals of a naturopathic assessment are to (1) determine the factors contributing to a patient's state of health, their symptoms and/or diseases; (2) collect the proper information to inform a naturopathic diagnosis and (3) assess the patient's vitality and state of wellbeing.

A ***naturopathic diagnosis*** is the summation and interpretation of the findings from the naturopathic clinical assessment. The three primary and interrelated purposes of a naturopathic diagnosis are to (1) accurately categorize the symptoms, condition and/or disease-state using biomedical terminology and diagnostic criteria along with traditional naturopathic diagnostic concepts; (2) determine the underlying causes of the patient's symptoms, conditions, or disease-state; and (3) determine the patient's vitality and healing ability.

Naturopathic practice has always been therapeutically diverse in its approach to healing with the core therapeutic ***modalities and practices*** including:

- Applied nutrition
- Clinical nutrition
- Herbal medicine
- Lifestyle modification
- Mind-Body Medicine counselling
- Naturopathic physical medicine
- Hydrotherapy
- Acupuncture
- Yoga

Other therapies, such as Intravenous Therapies, regenerative therapies and other therapeutics may also be used by naturopaths/naturopathic doctors based on jurisdictional regulations and educational training.

Naturopathic Philosophies and Principles (Chapter 2) outlines the philosophical basis that informs naturopathic practice. The naturopathic philosophies – *vitalism* (that there is an innate intelligence of living organisms) and *holism* (that the body is a complex adaptive system that exists as a unified whole) – encompass every aspect of naturopathic care. The seven naturopathic principles also guide naturopathic practice:

I. First, Do No Harm *(primum non nocere)*
II. Healing Power of Nature *(vis medicatrix naturae)*
III. Treat the Cause *(tolle causam)*
IV. Treat the Whole Person *(tolle totum)*
V. Doctor as Teacher *(docere)*
VI. Health Promotion and Disease Prevention
VII. Wellness and Wellbeing

Naturopathic Theories (Chapter 3) outlines key theoretical and conceptual frameworks that inform the clinical reasoning and decision making of naturopaths/naturopathic doctors. The main theories included are:

- The *Naturopathic Therapeutic Order* which is a systematic approach to treatment that moves from minimally invasive to more forceful treatments as necessary.
- The *Emunctory Theory* which outlines that toxic substances can be absorbed from the environment or produced by abnormal metabolic processes and must be effectively eliminated to achieve good health.
- The *Theory of Complex Systems* which outlines that the body is a complex and self-sustaining dynamic and evolving system functioning within an environment of multiple nested systems which are interconnected, and treatment must reflect this.

1 Naturopathic Practice

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HIGHLIGHTS

- Naturopathic assessment is a person-centered process that focuses on assessing a patient's health status, on identifying factors contributing to patient symptoms and/or diseases and on assessing a patient's vitality and wellbeing.
- Naturopathic diagnosis draws upon biomedical and traditional profession-specific diagnostic methods to understand a patient's health status and to determine the underlying causes, as well as a patient's vitality and sense of wellbeing.
- The naturopathic workforce employs a range of treatment modalities in their individualized and multi-modal integrative approach to patient care.
- It is common for naturopaths/NDs to perform or prescribe four or more different treatments during a naturopathic visit.
- The most common therapeutic modalities used internationally by naturopaths/NDs are *lifestyle modification*, *applied nutrition*, *clinical nutrition*, and *herbal medicine*.

Naturopathy/naturopathic medicine is a distinct healthcare system with a defined approach specific to naturopathic assessment, diagnosis, and treatment. There is a high degree of consistency in the foundational basis of naturopathic practice, but there are educational and regulatory variances in each country that result in differences in the breadth of assessments performed by naturopaths/naturopathic doctors, their ability to provide patients with a naturopathic diagnosis, and in the therapeutic modalities and practices used by naturopaths/naturopathic doctors (NDs).

Naturopathic Assessment

The naturopathic clinical assessment is a person-centred process focused on determining how a patient's symptoms, condition and disease-state are presenting on the multidimensional levels of the individual and their social interactions. There are three distinct goals to a naturopathic assessment [1, 2].

1. Determining the factors contributing to a patient's state of health, their symptoms and/or diseases.
2. Collecting the proper information to inform a naturopathic diagnosis.
3. Assessing the patient's vitality and state of wellbeing.

When treating the whole person, a naturopathic assessment incorporates the comprehensive range of factors encompassed by the Treat the Cause *(tolle causam)* principle. These include addressing lifestyle factors (e.g. nutritional status, hydration, posture, sleep, breathing, hygiene, movement); family history and genetic factors; social interactions (e.g. family dynamics, community and school or work factors, mental and emotional status); environmental factors (e.g. exposure to environmental pollutants, pathogens, and time spent outside); external influences (e.g. accidents and injuries, life events, hobbies, exposure to electromagnetic frequency devices and toxins in household and personal products); and medical treatments (e.g. medications and supplements, history of surgeries and medical treatments) [1, 2].

Naturopathic assessments are commonly longer than visits with biomedical practitioners and emphasise a holistic patient-centered approach that considers the patient's perspective and their experience of their health condition [3]. Naturopaths/naturopathic doctors employ methods of assessment and diagnosis drawn directly from naturopathic training, other traditional and complementary systems of healthcare, and biomedicine. The training and scope of practice, and the specific regulation in each jurisdiction influences the specific assessment tools employed and a naturopaths/naturopathic doctor's ability to diagnose. Generally speaking, a naturopathic assessment includes [1]:

- Detailed personal and health history.
- Assessment of a patient's diet and nutritional status,

level of exercise and other lifestyle factors.
- Assessment of a patient's mental and emotional status and sense of wellbeing.
- Assessment of the emunctory pathways.
- Information related to environmental exposures and unique environmental conditions associated with where the person lives and has lived.
- History of previous accidents, injuries, external influences, medical procedures, prescription medications and surgeries and the potential for contraindications when using naturopathic treatments.
- Diagnostic techniques may include tongue, iris, and pulse diagnosis as well as other diagnostic methods consistent with the training and scope of practice in each Region.[1]
- A physical examination using traditional and biomedical diagnostic methods.[2]
- Laboratory testing.[3]
- Referral to another allied healthcare professional or specialist for aspects of the assessment may occur, depending on the scope of practice in each jurisdiction and the specific needs of each patient.

Naturopathic Diagnosis

A naturopathic diagnosis is the summation and interpretation of the findings from the naturopathic clinical assessment. Naturopaths/naturopathic doctors combine evidence-based biomedical approaches to diagnostics with traditional profession-specific diagnostic methods. There are three primary and interrelated purposes to a naturopathic diagnosis [1]:

1. To accurately categorize the symptoms, condition and/or disease-state using traditional naturopathic diagnostic concepts along with biomedical terminology and diagnostic criteria.
2. To determine the underlying causes of the patient's symptoms, conditions, or disease-state.
3. To determine the patient's vitality and healing ability.

Naturopathic practice recognizes that health and disease are a continuum, and in the absence of a clearly defined conventional diagnosis, a naturopathic diagnosis may classify a patient's symptoms based on the characteristic pattern of their symptoms and the causal factors.

It is important to note that in some jurisdictions, naturopaths/naturopathic doctors' use of the terms *diagnosis* and *diseases* are restricted and, hence, the naturopathic diagnosis in these Regions focuses more on the assessment of health status, characteristic (or constitutional) patterns and the causes of diseases.

Therapeutic Modalities and Practices

Naturopathic care is an integrative clinical practice tailored to each individual patient based on the unique factors identified in the naturopathic assessment and classified in the naturopathic diagnosis. Naturopathic practice has always been known for its range of practices and treatment modalities [1]. Naturopaths/naturopathic doctors recognize that an integrated approach to healing and disease management provides the best foundation for optimal health and that focusing on changes that patients can integrate into their life, including a greater sense of wellbeing and self-care, are important aspects of naturopathic care [1]. It is common for naturopaths/naturopathic doctors to perform or prescribe four or more different treatments during a naturopathic visit [4].

A 2021 international survey across all WHO Regions investigated the practice characteristics and behaviours of naturopaths/naturopathic doctors [3]. The study found naturopaths/naturopathic doctors 'always' or 'most of the time' reported prescribing or recommending lifestyle modifications, dietary changes, nutritional supplements and herbal medicines. Counselling and psychotherapy, and manual therapies were also reported by more than one quarter of naturopaths/naturopathic doctors. Most naturopaths/naturopathic doctors report discussing a range of topics with their patients including diet and nutrition, stress management, sleep, physical activity and fitness, pharmaceuticals and other medications, substance use, counselling and mental health, relationships and support, and environmental health and toxins. The full list of practice behaviours is presented in Table 1.1. These survey findings align with other research conducted by the WNF [1, 4, 5].

A strength of the naturopathic integrated approach to healthcare is its ability to incorporate practices and therapeutic modalities based on regional traditional healthcare practices, on the level of education and regulation in each jurisdiction and based on the unique characteristics of each patient. In Regions that include higher naturopathic educational training and a supportive regulatory environment, naturopathic practice may include

[1] Naturopathic practitioners in Europe are commonly trained in iris analysis ('iridology'). Naturopaths in many WHO Regions include tongue and pulse diagnosis as part of their naturopathic training.

[2] In some jurisdictions such as North America, naturopathic doctors are trained as primary care practitioners and their scope of practice includes gynecological and pelvic exams, along with standard physical exams.

[3] Laboratory testing can include standard blood and urine tests, hair mineral analysis, detailed testing of stool, saliva, and other secretions. Some naturopathic doctors are also trained to interpret radiological reports and scans as part of their assessment.

Table 1.1: Frequency naturopaths/naturopathic doctors report engaging in practice behaviours 'always' or 'most of the time' (n=478)

Practice behaviour	Always/Most of the time
Prescription/recommendation	*N (%)*
Lifestyle modification	437 (91.4%)
Dietary changes	429 (89.8%)
Nutritional supplements	308 (64.4%)
Herbal medicines	287 (60.0%)
Counselling and psychotherapy	132 (27.7%)
Manual therapies	127 (26.5%)
Acupuncture	78 (16.3%)
Hydrotherapy	72 (15.1%)
Other traditional medicine systems	69 (14.5%)
Homeopathy	67 (14.1%)
Injection/intravenous therapies	28 (5.9%)
Discussion topic	
Stress management	432 (90.8%)
Diet and nutrition	429 (90.1%)
Sleep	422 (88.6%)
Physical activity and fitness	422 (88.6%)
Pharmaceuticals and other medication	302 (63.6%)
Counselling and mental health	302 (63.4%)
Relationships and support	286 (60.2%)
Substance use	272 (57.2%)
Environmental health and toxins	234 (49.2%)

therapies such as prescribing rights for pharmaceuticals, bio-identical hormone prescribing, intravenous therapies, regenerative injective therapies, and minor surgery.

In addition to the clinical value of specific naturopathic treatments, patients may also benefit non-specific healing effects associated with the quality and nature of the naturopathic consultation [6]. More details about the naturopathic philosophies and principles are described in Chapter 2. Section 6 also presents a summary of clinical research investigating outcomes of specific naturopathic therapies and practices, including clinical trials that control for non-specific healing effects. The therapeutic modalities and practices further explored in Section 6 are outlined below.

Applied nutrition involves the modification of dietary patterns and food choices with the goal of optimizing nutritional status in the treatment and/or prevention of disease. Naturopathic applied nutritional interventions include diet therapy (therapeutic diets, fasting and individualized diet modification), therapeutic application of specific foods and behavioural and lifestyle counselling related to eating behaviours [7]. Naturopathic practice incorporates the scientific and empirical knowledge of food and nutrition, it recognizes the value of whole foods beyond their individual constituents, as well as the traditional knowledge of food as a form of medicine and the importance of considering the constitution and uniqueness of every patient, the thoughts, and emotions that they have around food and where they live.

Clinical nutrition is the use of therapeutic products (e.g., tablets, powders and liquids) of vitamins, minerals and food-based extracts with health-promoting, disease-preventing or medicinal properties for targeted clinical outcomes [8]. Naturopaths/naturopathic doctors may employ clinical nutrition interventions to address identified nutritional insufficiencies, or to initiate biochemical or physiological changes in response to the patient's specific health conditions or complaints [9]. Clinical nutrition can be applied by increasing levels of a wide range of vitamins and minerals (e.g., multivitamins); the application of specialized formulas developed for explicit health purposes and effects; or the use of single nutrients targeting specific patient needs. Naturopaths/naturopathic doctors may recommend or prescribe commercially-produced nutritional products, or extemporaneous dispense compounded nutritional ingredients formulated specifically for the individual patient [9, 10].

Herbal medicine ranges from herbs as food, the prescription of single herbs (either in whole form or various extracts or the use of unaltered constituents from

these sources) and compounded formulations with more than one herbal remedy. Herbs may be prescribed as pre-formulated proprietary products (i.e., commercially produced formulas), or dispensed extemporaneously (i.e., compounded onsite for the specific needs of the individual patient). Herbs can be prescribed internally as part of diet, as teas, tinctures, essential oils, or tablets/capsules, and can also be used topically in creams, oils and in poultices and compresses. Also referred to as *botanical medicine, phytotherapy or phytomedicine.*

Lifestyle modification consists of the application of environmental, psychological, and behavioural principles to enhance wellbeing. These principles may be applied through exercise prescription and postural awareness; the modification of diet; advocation for minimized exposure to tobacco smoking, alcohol, and other illicit substances; and guidelines for the regulation of the sleep-wake cycle through addressing work-rest balance and recreation [11]. Significant considerations of note also include activity scheduling, which encourages meaningful social engagement [12]. Environmental factors are also significant considerations and may be targeted by advocating for reduced exposure to air, water, and noise pollution, and encouraging time spent in nature.

Mind-Body Medicine (MBM) Counselling comprises a variety of practices designed to enhance the mind's positive impact on the body and vice versa, including behavioural, psychological, social, artistic, and spiritual approaches [13, 14]. The practice of MBM is based on the understanding that the mind influences the physical body and conversely the physical influences the state of the mind. MBM practices include yoga, tai chi, or meditation, which have been part of traditional medicine for several hundred to thousand years and more recent practices such as mindfulness stress reduction (MBSR).

Naturopathic physical medicine includes various forms of hands-on therapies ranging from muscle release and massage techniques, physical manipulation, and other bodywork techniques. Some naturopaths/naturopathic doctors provide naturopathic physical medicine as part of their practice directly with patients while others work with various bodywork practitioners to provide patients with a holistic and an integrated approach to healthcare.

Hydrotherapy is the application of water for therapeutic purposes. Hydrotherapy can be used externally, which includes compresses, baths (balneotherapy or thalassotherapy) and sprays; and internally, which includes inhalations and colon hydrotherapy [15]. It is a completely drugless therapy that supports the body's healing processes primarily through the manipulation of blood circulation through thermic and mechanical means. Some therapies also use water as a medium for transfer of minerals, herbal remedies or other therapeutic agents. The treatment effect of hydrotherapy is based on the specific application of either cold or hot water or the alternating of cold and hot water compresses and is designed to generally be sedative in acute disease and stimulative in chronic [16].

Acupuncture is practiced in several different ways including needling, electroacupuncture, auricular acupuncture, acupressure, cupping and/or moxibustion. Needle acupuncture includes the insertion of needles along meridian channels on the body based on Traditional Chinese Medicine (TCM) philosophy. Auricular acupuncture is a technique whereby points in the ear are needled or where acupuncture 'seeds' or tiny needles are applied to specific points on the ear. Acupressure uses the same philosophical basis as acupuncture, but instead of needles, pressure is applied to acupuncture points. Acupressure allows practitioners with regulatory restrictions, to still practice a form of acupuncture. Cupping traditionally uses continuous suction, but modern devices also allow for pulsating suction or the sliding of cups along the skin. Other techniques that fall under TCM include moxibustion which is the burning of herbs near or on the body, *Tui na,* a therapeutic type of TCM massage, and *Gua sha* therapy, a healing method which involves scraping the skin. A stimulation pad or device is another modern means of using the principles of acupuncture for pain relief that may be safely applied at home.

Yoga is a philosophically based practice and a blend of physical and mental disciplines. Traditionally Yoga incorporates physical *asanas* (postures) and practices, but also *pranayama* (breathing exercises), *nidra* (chanting), *kriyas* (cleansing activities), and *dhyana* (meditation), as well as other meditation, spirituality, and dietary and lifestyle modifications that support harmony and balance within the whole person. The term Yoga refers to both the entire process of these practices and the goal or end-point philosophically [17].

Summary

Naturopaths/naturopathic doctors treat patients across their lifespan, including those with acute and chronic conditions and those seeking preventive and/or palliative healthcare. Naturopathic practice is person-centered with a detailed focus on the assessment process and on identifying the causes of disease as part of a naturopathic diagnosis. Naturopathic practice is defined by a cohesive philosophical and principles-based foundation and naturopathic care employs a range of therapies and practices to meet individual treatment goals. Common therapeutic modalities and practices employed by naturopaths and naturopathic doctors include applied nutrition, clinical nutrition, herbal medicines, lifestyle counselling, hydrotherapy, naturopathic physical medicine, and other therapies and practices depending on jurisdictional regulations and naturopathic medical training.

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2 Naturopathic Philosophies and Principles

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HIGHLIGHTS

- The naturopathic philosophies of *vitalism* (an innate intelligence of living organisms) and *holism* (the body is a complex adaptive system that exists as a unified whole) are core to naturopathic practice.
- There are seven naturopathic principles that guide every aspect of naturopathic care:
  I. First, Do No Harm *(primum non nocere)*
  II. Healing Power of Nature *(vis medicatrix naturae)*
  III. Treat the Cause *(tolle causam)*
  IV. Treat the Whole Person *(tolle totum)*
  V. Doctor as Teacher *(docere)*
  VI. Health Promotion and Disease Prevention
  VII. Wellness and Wellbeing

The naturopathic profession shares historical and cultural roots with early Western medicine, and it has become particularly adept at integration and translation within biomedical settings, whilst remaining true to its traditional philosophies and principles. It is the integration of naturopathic philosophies and principles within a biomedical understanding of health and disease that defines the naturopathic profession. Applying natural therapeutic modalities and practices through the lens of naturopathic principles, philosophies and theories, rather than prescribing natural remedies using a biomedical approach, is what differentiates naturopathy/naturopathic medicine from other systems of medicines.

Naturopathic Philosophies

Vitalism and *holism* are the core naturopathic philosophies that guide every aspect of naturopathic care [1-3].

Vitalism

Vitalism is based on the concept that living organisms are fundamentally different from non-living entities in that the origin and phenomena of life involves a force or energy distinct from and in addition to the physical or chemical elements of life [4]. The application of *vitalism* within naturopathy/naturopathic medicine is based on the understanding that the body has an innate ability to heal, and that life, health and disease follow certain laws and principles that are logical and innate [1, 5]. Vitalism postulates that there is a self-organizing principle within all life and recognizes that life is ordered and intelligent [1, 6]. The innate intelligence of the human body animates every individual and refers to forces that not only include but go beyond the physical or chemical self in governing life, health, and healing. Naturopathic practice aims to facilitate and augment this process by identifying and removing the obstacles to health and recovery, and by supporting the creation of healthy internal and external environments [6].

Holism

The philosophy of *holism* underpins naturopathic practice and recognizes that to achieve health the whole person must be treated. *Holistic/holism* means 'all', 'entire' or 'total'. It is grounded in the realization that the whole is greater than the sum of the parts [1, 5, 7] and that the body is a complex adaptive system that exists as a unified whole and must be dealt with as an integrated model in

order to be fully understood [8].

The holistic approach of naturopathic practice recognizes that the spiritual, psychological, functional, and structural aspects of a person are interdependent. When treating an individual, the holistic approach treats intrapersonal and interpersonal dynamics, as well as the interaction of each person with their environment, external influences, and social interactions [1, 7, 9, 10]. A naturopathic practitioner views the human body holistically, recognizing that changes in one part of the body will result in corresponding changes in another part. For example naturopaths/naturopathic doctors understand a disruption of the gut microbiome can negatively affect mood and memory, or that joint pain and digestive function is impacted by emotions and stress [1]. An example of applying *holism* to clinical practice is when naturopaths/naturopathic doctors are providing first-line or auxiliary care for high blood pressure they would concurrently assess and proactively address any causal factors that may be contributing to the patients hypertension such as diet, sedentary lifestyle, extreme exercise, stress, environmental pollutants, etc. [1, 11].

Naturopathic Principles

Naturopathic practice is characterised by the consistent application of seven fundamental distinct yet inter-related principles which complement the naturopathic philosophies of *vitalism* and *holism.*

The naturopathic principles are [1]:

I. First, Do No Harm *(primum non nocere)*
II. Healing Power of Nature *(vis medicatrix naturae)*
III. Treat the Cause *(tolle causam)*
IV. Treat the Whole Person *(tolle totum)*
V. Doctor as Teacher *(docere)*
VI. Health Promotion and Disease Prevention
VII. Wellness and Wellbeing

Various philosophies and theories have been long-standing parts of naturopathic practice since its inception. While the naturopathic principles have been fundamental to naturopathic practice throughout this time, their formal codification was initiated in 1989 by a professional formation initiative led by naturopathic doctors in North America [1]. The codifying of these principles were based on historical traditional knowledge, writings of earlier naturopaths and naturopathic philosophers, and a review of contemporary naturopathic concepts [7]. A 2015 survey of the global naturopathic profession indicated that there was global consensus on the naturopathic principles as they pertain to naturopathic practice [12] (see Figure 2.1). A seventh principle, "wellness and wellbeing" was later added to this definition and is included in the teachings of several naturopathic programs around the world [13].

First, Do No Harm *(primum non nocere)*

First, Do No Harm, or *primum non nocere*, is a fundamental concept accepted across different health professions that can be dated back to the *Corpus Hippocraticum* [1].

Naturopathic practitioners approach this principle following three precepts for avoiding harm [1, 14]:

1. By utilizing practices, therapeutics and treatments which minimize the risk of harmful effects and applying the least possible force or intervention necessary to assess, diagnose and/or to treat illness and restore optimal health.
2. In acute situations and when the body is overwhelmed, short-term suppression of symptoms may be required. However, whenever safe to do so, the suppression of symptoms is avoided as this is understood to interfere with the healing process.
3. Respecting and working with the *vis medicatrix naturae* in all facets of naturopathic assessment, diagnosis, and treatment.

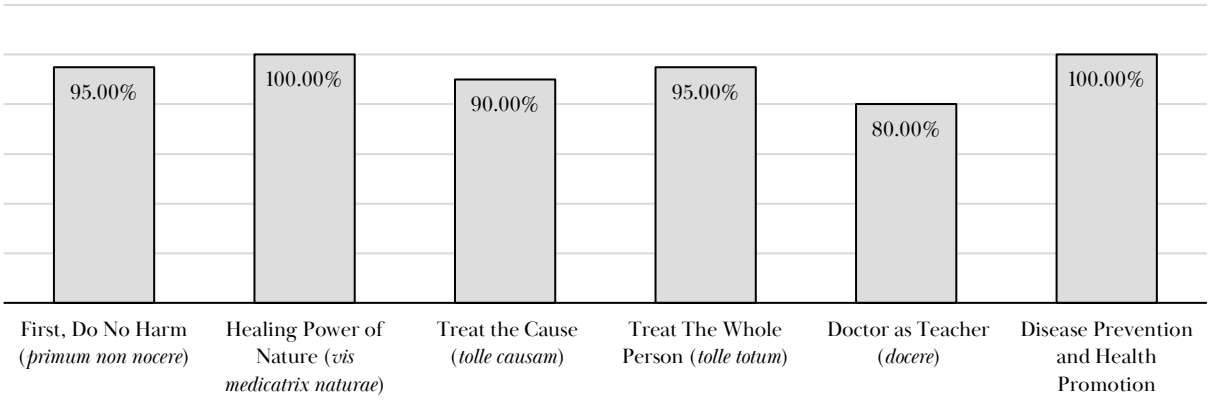

Figure 2.1: Global consensus of naturopathic principles reported by naturopathic professional associations [12]

The principle of *First, Do No Harm* also requires naturopaths/naturopathic doctors to teach patients about the necessary insights and awareness of their lifestyle choices, their environment, their social relationships, and that all aspects of their life are interrelated and have the potential to affect their health and/or to contribute to either health or disease. This principle also includes educating patients about their disease and its associated risks/potential harm [1, 14].

Healing Power of Nature *(vis medicatrix naturae)*

It is the naturopath's/naturopathic doctor's role to support, facilitate and augment the *Healing Power of Nature (vis medicatrix naturae)* by identifying the obstacles that need to be removed to support health and recovery, by supporting and educating a patient towards the creation of a healthy lifestyle and healthy internal and external environments and by working with patients to ensure that their mind is supporting wellness and wellbeing [1, 15]. When the root causes of symptoms and the obstacles to cure are identified and addressed, the body is able to initiate its innate healing process. With lifestyle changes and the use of natural therapies such as herbal medicines, optimal nutrition, adequate hydration, exercise and bodywork, the vis medicatrix naturae, the healing power of the body, is supported [5].

The *vis medicatrix naturae* explains the intrinsic and innate healing processes within every individual. Naturopathic practice is based on the recognition that, when provided with the building blocks to health, the human body possesses a natural ability to resist most diseases, and an inherent mechanisms of recovery and self-regulation [16]. Henry Lindlahr (1862-1924), a renowned proponent of natural therapeutics and a hydrotherapist from Germany, stated that the *vis medicatrix naturae* "endeavours to repair, to heal and to restore obstructions and to establish normal conditions, so that the healer within can do his work to the best advantage" [15].

There are numerous examples of the *vis medicatrix naturae* in human health including:

- When a finger is cut the wound starts to heal due to the innate inflammatory cascade which releases chemicals that stop the bleeding and initiates tissue repair.
- Fever is a natural response to an infection; where the benefits of experiencing the febrile state generally outweigh the deleterious effects [17].
- Vomiting or diarrhea is the body's way of responding to food poisoning.
- Fractures, when aligned, often heal on their own.
- Following major surgeries or treatments such as chemotherapy or radiation, the body initiates healing processes.

Treat the Cause *(tolle causam)*

Identifying and treating the root cause of disease, and factors aggravating the condition is an essential aspect of naturopathic assessment and Treat the Cause *(tolle causam)* is a principle that stresses the importance of this approach. It is based on the realization that health and disease are logical – they happen for a reason [1]. It recognises that illness is due to one or more causes and that these causes may originate from various aspects of a person's life. Underlying causes of illness and disease must be identified and addressed before complete recovery and healing can occur or before optimal wellness is achieved [15].

As part of their complex multidimensional approach to healthcare, a naturopath or naturopathic doctors explores a range of factors that can impact health and disease including [1, 7, 9, 10]:

- Genetic and developmental factors such as prenatal exposures, intrauterine influences and/or birth traumas.
- Lifestyle behaviours such as nutritional intake and eating regimen, hydration, posture, rest and relaxation, sleep patterns and/or exercise and movement.
- Social interactions include family, school, work, or community dynamics; relationships with others; communication skills including self-talk; and/or ability and freedom to cope with and respond to social conflict and change and economic factors.
- Environmental elements include the quality of air, water, and soil; exposure to environmental chemicals, heavy metals, and other pollutants; pathogens such as viruses, bacteria, mould, or fungi and/or inquiring about the time spent in nature and exposure to sunlight.
- External influences range from accidents and injuries, significant life events, chemicals in personal care products and/or household or gardening products, devices transmitting electromagnetic frequencies, poor ergonomics and/or hobbies and the impact of flying.
- Medical interventions include historical and current use of medical and cosmetic prescription medicines, surgeries and/or other medical treatments.

Naturopathic treatment involves teaching patients that a return to a simpler health-promoting lifestyle can often be the best medicine and an important part of achieving optimal health. To treat the causes of symptoms, it is important to understand not only the genetics, physiology and pathology of symptoms and diseases, but also to identify the emotional impact that they have on each person and how a person thinks about their health and disease [1]. The aim of a naturopathic assessment

is to determine, where possible, the specific trigger, situation, relationship, external influences, environmental factors and/or behaviour that initiated the disruption from health and that needs to be addressed [1, 14].

The body naturally attempts to compensate whenever the internal physiology is out of balance and/or at the onset of disease. This compensation shows up as symptoms and as a disruption in various functions in the body. Naturopaths/naturopathic doctors recognize that the body is complex and logical and they view symptoms as expressions of the body's natural attempt to heal which can provide a road map to the root causes and guide treatment decisions [1].

Naturopaths/naturopathic doctors apply the principle *tolle causam*, or Treat the Cause, by considering the factors apart from medical care that can be influenced by social policies and shape health in powerful ways [17]. This approach overlaps with the well-recognised concept of 'social determinants of health' – defined by the World Health Organization as "the conditions in which people are born, grow, live, work and age...and the fundamental drivers of these conditions" [18, 19].

Treat the Whole Person *(tolle totum)*

The naturopathic approach to healthcare is "person-centered" [20] and, through the Treat the Whole Person *(tolle totum)* principle, applies a holistic model of care that recognizes the whole is greater than the sum of the parts. Naturopathy/naturopathic medicine recognizes the harmonious functioning of all aspects of the individual is essential to optimal health, and that the multifactorial nature of health and disease requires an individualized comprehensive approach to assessment, diagnosis and treatment [1, 15].

Naturopathic consultations generally involve an extended assessment and treatment time [12]. The longer visits allow for a greater depth of understanding of the patient's health issues, the way in which those issues have affected the patient on all levels and the causative factors that have led to the current level of health or disease. The nature of naturopathic consultations requires substantial thought and analysis on the part of the naturopath/naturopathic doctor to understand the role of causal factors and their impact upon the patient's conditions and presenting symptoms [21].

When treating the whole person, a naturopathic assessment incorporates the comprehensive range of factors outlined in the Treat the Cause *(tolle causam)* principle. Naturopathic practice recognizes that the integration of all parts of a person internally and externally contribute to achieving and maintaining health [1]. The naturopathic focus on such innate integration is becoming increasingly recognised in research and biomedicine as witnessed by concepts such as biopsychosocial, psychoneuroimmunology, psychoneuroendocrinology, and the gut-brain connection, to name a few [22, 23]. These multi-system constructs are reinforcing the interconnectedness within each person and are more suited to a scientific world view that embraces complexity and the emergent nature of complex systems.

Doctor as Teacher *(docere)*

A principal objective of naturopathic patient education is to empower patients, increase health literacy and encourage patients to become more accountable and capable of maintaining their own health [1, 15]. *Docere*, or "doctor", comes from the Latin word "to teach". The role of a naturopath/naturopathic doctor includes educating their patients and the community about factors that affect health and disease so that they are informed about the impact of their choices. They devise a health program for their patients that provides a roadmap from their current health status, instructing their patients on what needs to be addressed in order to maintain or recover health and to achieve optimal wellbeing.

Since inception, the naturopathic encounter has been person-centered and individually focused. Over the last two decades, other health professions and policy-makers have embraced the patient-centered model that has evolved into the now more contemporary concept of person-centered care [24]. The shift from patient-centered to person-centered care arose to include the entirety of an individual's needs beyond just the clinical and medical. Naturopathic practice is, and has always been, in complete accord with a person-centered approach. Rooted in the philosophy of holism, the naturopathic focus is on the individual, the cause(s) of their symptoms and conditions, how the symptom(s) affect other aspects of health and their relationship to their symptoms and conditions. The *docere* principle requires that naturopaths/naturopathic doctors help the patient to understand these issues for themselves, and in doing so, become more empowered to look after their own health. This patient experience of empowerment is a known feature of naturopathic care [20].

Teaching takes time; hence most naturopathic visits allow sufficient time for the naturopath/naturopathic doctor to educate each patient on how to implement and maintain the behavioural changes needed to achieve wellness [1, 21]. Many patients wish to understand the reason they are sick, what they can do to improve their situation and what they need to change for future health [25]. This awareness, motivation and understanding determines long-term health and is predicated on the knowledge level of the naturopath/naturopathic doctor.

Health Promotion and Disease Prevention

The prevention of disease and the attainment of optimal health are primary objectives of naturopathic practice [1]. Working with individuals and communities to maintain health and optimize wellness through all stages of the life cycle is a core concept in naturopathic care. Naturopathic holistic healthcare and preventive care involves simultaneously applying the naturopathic principles, identifying and addressing the cause(s) of symptoms and diseases, developing an integrated treatment plan that applies the healing power of nature, educating a patient about the changes that are recommended to achieve full health while encouraging patients to engage actively in their journey back to health and wellbeing. Naturopathy/naturopathic medicine aligns with the health promotion and disease prevention framework by promoting a healthy lifestyle, assessing risk factors, determining susceptibility to disease, and applying appropriate therapeutic interventions.

Community education is a key activity of the global naturopathic profession with naturopaths/naturopathic doctors utilizing a wide range of patient education tools for changing health behaviours, implementing self-care guidelines, and providing lifestyle recommendations for managing specific diseases [26]. Supporting a patient to develop a healthy lifestyle may include recommendations such as; proper individualized nutrition; adequate exercise and movement; rest, relaxation and stress management; living a moderately paced lifestyle; developing healthy social connections; becoming present to the beauty and complexity of life; avoiding environmental pollutants when possible; and maintaining proper digestion function and elimination [5].

Naturopaths/naturopathic doctors treat patients throughout all life stages of life for both acute and chronic conditions as well as for those seeking preventive and/or palliative care [3]. Naturopathic assessment includes inquiring about environmental exposures and external influences that might be affecting a patient's health, determining the impact of social relationships and community on health, genetic and hereditary factors, and the impact of current and previous medical interventions [1]. Lifestyle behaviours are paramount to disease prevention and health promotion and in preventing minor illnesses from developing into more serious or chronic degenerative diseases [14]. As such, lifestyle behaviours are examined by naturopaths/naturopathic doctors as causative or aggravating factors; as well as being considered as an essential part of the naturopathic treatment intervention.

Wellness and Wellbeing

Naturopaths/naturopathic doctors focus on supporting their patients to achieve wellness rather than simply just avoiding or addressing illness. They work with their patients to help each individual experience wellbeing. *Wellness* is often associated with the establishment and maintenance of optimum health and balance, whereas *wellbeing* is based on each person's perspective of their life and is a state inherent and obtainable by everyone, regardless of symptoms or disease(s). The idea of wellbeing is reflected in the World Health Organization's definition of health, that states that health is a state of complete physical, mental and social wellbeing, not merely the absence of disease or infirmity [27, 28]. This is reflected in contemporary international health policy which is increasingly oriented towards achieving a wellness-oriented, rather than illness-oriented, health system [29].

It is not just physical health, but also psychological and spiritual health that creates the state of total wellbeing [1]. The criterion for *wellbeing* varies by individual and may include physical vitality; a strong connection to family and friends; a sense of pride in contributing to one's communities; and the quality of relationships and social connection, financial security and/or passion and love for what one does each day. As part of naturopathic practice, naturopaths/naturopathic doctors inquire as to how a patient defines *wellbeing* for themselves so that they can support their attainment of it. It is the patient's unique concept of *wellbeing* that is the most important as naturopathic care asserts that, when wellbeing is recognized and experienced by an individual, they will heal more quickly than they would if the disease was treated alone in the absence of a more holistic approach [1].

Summary

Naturopathic practice encompasses two core philosophies (*vitalism* and *holism*) and seven principles including First, Do No Harm (*primum non nocere*), Healing Power of Nature (*vis medicatrix naturae*), Treat the Cause (*tolle causam*), Treat the Whole Person (*tolle totum*), Doctor as Teacher (*docere*), Health Promotion and Disease Prevention and Wellness and Wellbeing. The naturopathic profession is defined by its philosophies and principles which guide all aspect of naturopathic assessment, diagnosis, and treatment. In this way, the naturopathic profession shares characteristics with other complementary medicine professions and is philosophically-oriented to deliver person-centred care [30]. Naturopaths/naturopathic doctors draw on their holistic and vitalistic philosophies to actively and deliberately employ nonspecific factors such as their therapeutic relationship with the patient, empathy and patient empowerment [31]. This approach is just as important to the overall value and benefit of naturopathic care in the community as their use of specific treatments and therapies.

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3 Naturopathic Theories

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HIGHLIGHTS

- Naturopathic theories guide naturopathic practice and provide an understanding of the clinical reasoning and decision making used in naturopathic care.
- *Naturopathic Therapeutic Order* provides a graduated guide to applying naturopathic practices, therapies, and services.
- *Emunctory Theory* outlines the need to and process of eliminating toxins to achieve health.
- *Theory of Complex Systems* acknowledges the human body as a complex adaptive system and provides a framework for understanding the interconnectedness of human health.

The practice of naturopathy/naturopathic medicine has always been and continues to be structured around philosophies, principles, and theories. As the naturopathic profession has developed, theories have been amalgamated, codified, and expanded to incorporate scientific advancements that explain the theories further.

Naturopathic Theories

According to the 2016 WNF global survey of naturopathic educational institutions, several naturopathic theories were reported as being common to the practice of naturopathy/naturopathic medicine globally (see Figure 3.1) [1].

Many of the naturopathic theories that have been taught in naturopathic educational programs have been incorporated into the naturopathic philosophies and principles outlined in Chapter 2. Some theories such as the Naturopathic Therapeutic Order, Emunctory Theory and Theory of Complex Systems are distinct and are highlighted below.

Naturopathic Therapeutic Order

The naturopathic therapeutic order expands the process of healing of the *vis medicatrix naturae* by emphasizing that the causal factors of disease and the determinants of health are the primary basis for the maintenance and restoration of vitality and healing [2]. Guidelines from early naturopathic theories were codified in 1997 in the United States with support from the naturopathic colleges in North America and Australia [3] into the Naturopathic Therapeutic Order to provide a guide outlining the order in which naturopathic practices, therapies and treatments are best applied to provide the greatest benefit with the least potential for risk or harm to the patient. This theory explains a natural hierarchy of therapeutic intervention, based on observations of the natural healing processes, and is based on the understanding that the body possesses an intrinsic nature to heal itself using the least possible force.

Naturopaths/naturopathic doctors appreciate and incorporate a range of treatments across the therapeutic spectrum. Whilst naturopathic practice focuses on the effective prioritization of non-invasive or non-pharmacological interventions, naturopathic philosophy also recognizes that more forceful treatments, whether provided by a naturopath/naturopathic doctor or another health professional, will be required in some circumstances.

According to the naturopathic therapeutic order [2, 4], treatment recommendations, especially for chronic conditions, are best undertaken through the following graduated steps, some of which may require referral to another healthcare professional.

1. **Establish the conditions for health** by promoting a healthy lifestyle and removing obstacles to health and healing.
2. **Stimulate the *vis medicatrix naturae* and self-healing processes** by applying naturopathic therapies and practices such as nutrition, hydrotherapy, homeopathy and acupuncture, or other

gentle naturopathic modalities as offered in each jurisdiction.

3. **Support and balance physiologic and bioenergetic systems** by strengthening weakened and calming overstimulated systems, tissues, and organs with the use of herbal medicines, nutraceuticals and other naturopathic therapies and practices.
4. **Address or correct structural integrity** by using naturopathic manipulation, postural correction, exercise therapy and other forms of bodywork or manual physical therapies.
5. **Address pathology using specific natural substances or modalities** by employing natural substances to treat, restore and regenerate the body, as needed.
6. **Address pathology using pharmaceutic or synthetic medicines** to halt the progression of the disease, when needed. In many jurisdictions this step requires referral to an allied health professional.
7. **Suppress or surgically remove pathology** by referring and supporting invasive modalities, surgery, radiation, chemotherapy, prescription medications, etc., as needed.

Naturopathic practitioners use supportive therapies described in levels 1 to 5 to concurrently decrease side effects and support recovery when more invasive treatments are required [3].

Emunctory Theory

Toxic substances can be absorbed from the environment or produced by normal and/or abnormal metabolism. The theory of emunctories outlines that to maintain or achieve health, toxic substances that are stored in the body must be eliminated. The idea that toxins within the body are a cause of illness was reinforced by the work of Christoph Wilhelm Hufeland [5], Samuel Thomson [6], Johann Schroth [7], Vincent Priessnitz [8], Louis Kuhne [9], John Henry Tilden [10] and other significant naturopathic practitioners [11].

Emunctory Theory expands upon the naturopathic principle *tolle causam* and facilitates the *vis medicatrix naturae* [4]. It states that proper elimination of toxins is essential to overall health, especially for chronic disease. Elimination of toxins assists vitality and innate healing and its corollary – the lack of elimination blocks vitality and healing. The Emunctory Theory recognizes that the body has several pathways to support the elimination of toxins. The primary emunctory pathways include the lungs (breath), kidneys (urine), bowels (stool), skin (sweat), reproductive organs (menstrual flow and ejaculation) and larynx (voice) [4]. Secondary emunctory pathways include other ways that the body excretes toxins such as nasal discharge, eye discharge, skin eruptions, etc. [4].

In recent years, modern naturopathic doctors have integrated knowledge from traditional emunctory theory and modern research to form a new discipline, called Emunctorology [12]. Emunctorology is a synthesis of traditional naturopathic practice and modern science and provides a multisystem construct allowing for the following: [4, 12].

- The integrated study of the organs of elimination (the emunctories).
- The understanding of genetic susceptibility to emunctory dysfunctions.
- The functional relationships and the role they play in maintaining normal physiology (homeostasis) through the elimination of waste material and toxic substances.
- The pathophysiology that occurs if the emunctories

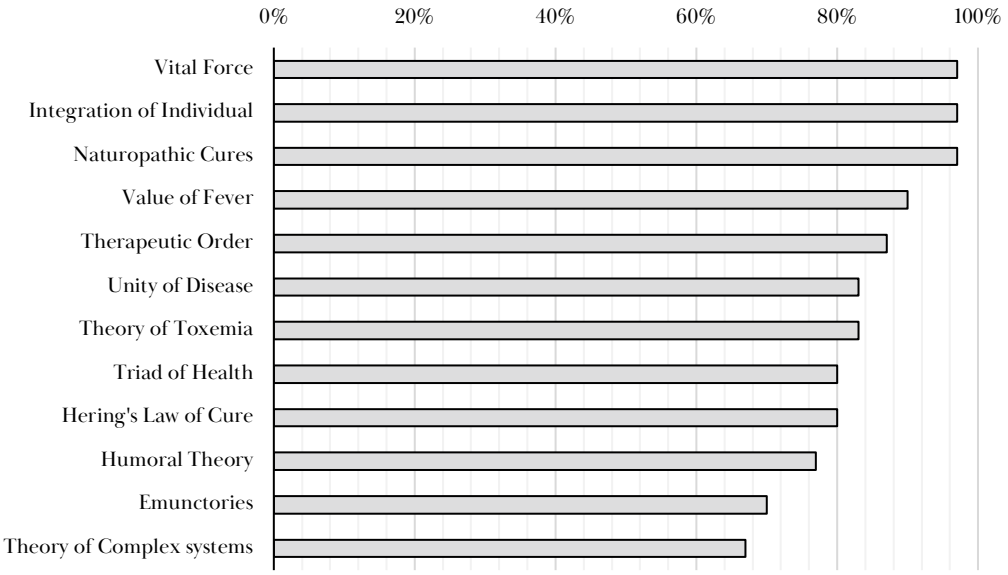

Figure 3.1: Proportion of naturopathic philosophies and theories taught by naturopathic educational programs

function sub-optimally or are diseased.
- The clinical strategies used in naturopathic practice to treat, nourish, tonify, stimulate and/or sedate the emunctories in the maintenance of good health.

In part, naturopathic assessment involves determining the functioning of the emunctory pathways. A clean, healthy diet and adequate water are essential, but treatment also aims to activate and normalize the functioning of all emunctory pathways. There are several naturopathic practices and therapeutic modalities that can be employed to assist with emunctory function including the application of nutritional foods, proper hydration, herbal medicine, hydrotherapy, tissue salts, cupping, increasing sweating, movement exercises and/or lymphatic drainage [4].

Theory of Complex Systems

The human body is a complex adaptive system. It is also a self-sustaining system functioning within an environment of multiple nested systems, which are dynamic, evolving, and characterized by emergence, interactive causation, and elaborate interconnectedness between internal and external factors [13]. Naturopathy/naturopathic medicine has always embraced the understanding that a person is an integrated whole that interacts and reacts to their surroundings. Although the importance of embracing complexity in a formalized and systematic way, such as through systems thinking and complexity theory, is being increasingly acknowledged [14], healthcare professions such as naturopathy/naturopathic medicine that are philosophically holistic and complex in nature have always conceptualized health and healing in a manner consistent with this paradigm [15]. Naturopathy/naturopathic medicine views a person's individual health needs as a configuration of interacting, interdependent parts connected through a web of relationships that form a whole greater than the sum of its parts, and in doing so is often able to target several areas of treatment simultaneously. In practice, the theory of complex systems is mirrored in the naturopathic approach to health and disease in the following ways:

- Embracing *holism* (a naturopathic philosophy) versus reductionism.
- Recognizing that the relationships between all aspects of an individual and between an individual and their environment are more important than the isolated parts (naturopathic principle *Treat the Whole Person*).
- Viewing individuals as complex rather than complicated and recognizing that individuals display different properties such as *emergent* and *non-linear* patterns rather than linear cause-and-effect mechanisms (naturopathic principle treat the cause).

Through their philosophical and principles-based approach to person-centered care, naturopaths and naturopathic doctors readily embrace concepts of complex systems theory in practice. Their multi-system approach to assessment, diagnosis and treatment highlights the importance of considering multiple organs and bodily systems in all aspects of healthcare [16].

Summary

Naturopathic practice is supported by theories such as the Naturopathic Therapeutic Order, the Emunctory Theory, and the Theory of Complex systems. Together the naturopathic philosophies, principles and theories guide naturopathic care and describe a theoretical basis to health and disease.

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Section 2: Naturopathic Professional Formation by WHO Region

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HIGHLIGHTS

- Naturopathy originated in Germany in the late 1800s as a European traditional system of medicine and it is part of T&CM throughout all other regions of the world.
- The naturopathic profession includes a workforce of more than 110,000 practicing in over 108 countries spanning all WHO Regions.
- 34 countries have occupational licensing or statutory registration for their naturopathic workforce.
- Over 130 naturopathic educational programs exist around the world. There are two main naturopathic educational programs with over 50% being doctorate-level training programs (over 4,000 hours) and the practitioner-level training programs including 2,500+ hours.

The naturopathic profession is defined as a traditional system of medicine in Europe and as part of traditional and complementary medicine in all other WHO Regions. The formation of a distinct professional identity within the global healthcare environment depends on interrelated factors including the level and standardization and accreditation of educational programs and the regulatory status and recognition from governments achieved by the profession in different countries and Regions.

Standards within healthcare are highest and the most consistent in countries with educational standards and when practice has a defined regulatory framework. Professional formation requires establishment of professional membership organizations and is impacted by the body of evidence available to support its practice and by the involvement of the profession in supporting healthcare initiatives.

This section provides context to the level of professional formation achieved by the naturopathic profession globally. Although there is diversity in the educational standards and regulation of the naturopathic profession around the world, the profession is strongly united in the philosophies and principles that define naturopathic practice (see Chapter 2), in the core therapeutic modalities and practices used by the profession (see Chapter 1) and in the theories that guide naturopathic care (see Chapter 3). This section provides the background to understanding the complexity of the naturopathic profession and its essential role in global healthcare.

Landscape of Naturopathy by WHO Region (Chapter 4) provides an overview of the contemporary and historic landscape of naturopathy/naturopathic medicine by WHO Region.

- Naturopathy began in *Europe* in the 1800s where it is the traditional home of naturopathy with over 30 countries with a naturopathic workforce that includes around 60,000 naturopaths.
- Naturopathy was introduced into the *Region of Americas* in the late 1800s and currently there are over 30 countries with a naturopathic workforce that includes over 25,000 naturopaths and naturopathic doctors (NDs). North America (Canada and the United States) is considered the home of modern naturopathy. In North America naturopathic doctors are generally considered primary care practitioners in those States/Districts or Provinces/Territories with regulation. Also, North American NDs have played an essential role in the codifying of naturopathic information and in engaging in naturopathic research.
- The *Western Pacific* region has had a naturopathic workforce since the early 1900s and there are currently 14 countries practicing naturopathy with a workforce of over 10,000 naturopaths/NDs. Naturopaths/NDs in the Western Pacific region, especially in Australia, have been instrumental in furthering naturopathic research for the profession.
- Naturopathy was introduced into *South-East Asia* in the 1920s via India and currently there are at least five countries with a naturopathic workforce of over 10,000 naturopaths/NDs. In India, naturopathy is part of the Traditional System of Indian Medicine referred to as AYUSH (Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa-Rigpa and Homeopathy).

- Naturopathy was introduced to *Africa* in the mid-1900s and is now practiced in at least 13 countries with a workforce of about 5,000 naturopaths/NDs.
- Naturopathy has been introduced to the *Eastern Mediterranean* region since the late 1990s and is currently practiced in at least eight countries.

Regulation of the Naturopathic Workforce (Chapter 5) highlights the status of naturopathic regulation, licensure, and registration globally. Regulation involving the naturopathic workforce follows several legislative frameworks including voluntary certification, co-regulation, negative licensing and occupational licensing or statutory registration also referred to occupational licensing. Notable points:

- Voluntary certification regimes are found in 21 Member States across three WHO Regions including the European Region, the Americas and the Western Pacific Region.
- Co-regulation is found in four Member States across three WHO Regions – Australia, Brazil, Norway and the United Kingdom.
- Negative licensing is found in only one Member State, in the Western Pacific Region (Australia).
- Statutory registration or occupational licensing is found in 34 Member States, representing all WHO Regions.

Naturopathic Education (Chapter 6) provides an overview of the status of naturopathic education globally with a focus on the history of naturopathic education by WHO Region; as well as, outlining the framework of naturopathic educational programs and the future of naturopathic education globally. There are 131 naturopathic educational institutions globally with 38% residing in the region of South-East Asia, 27% in the European region, 22% in the region of the Americas, 9% in the Western Pacific region, and 4% in the African region. There are two main naturopathic educational programs – doctorate-level training programs (over 4,000 hours) and practitioner-level training programs at 2,500 hours. Over 52% of the current naturopathic medical educational programs are 4,000 hours or longer and less than 9% are under 2,000 hours. In 2010 the WHO published *Benchmarks for Training in Naturopathy.*

The full breadth of naturopathic knowledge covered within naturopathic educational programs includes:

- naturopathic history, philosophies, principles, and theories;
- naturopathic medical knowledge, including basic sciences, clinical sciences, laboratory and diagnostic testing, naturopathic assessment, and naturopathic diagnosis;
- naturopathic therapeutic modalities, practices, and treatments;
- supervised clinical practice;
- ethics and business practices; and
- research.

The naturopathic profession is primed to be a significant contributor in global healthcare.

4 Landscape of Naturopathy by WHO Region

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HIGHLIGHTS

- Naturopathy originated as a distinct healing tradition in Germany in the late 1800s.
- Naturopathy is a European traditional system of medicine and is defined as a traditional and complementary system of medicine throughout all other WHO Regions.
- The naturopathic profession has existed as a distinct profession for over 120 years.
- The naturopathic profession includes more than 110,000 naturopaths/ naturopathic doctors practicing in over 108 countries spanning all WHO Regions.

Naturopathic practice has a rich history dating back to the early philosophies on health and healing. This history contributed to the formal definition and codification of naturopathy as a distinct profession in the late 1800s [1]. The term *Naturheilkunde* (later translated into naturopathy) was first defined in the early 19th century by Lorenz Gleich, a German physician [2, 3], and was officially used in 1896 in the United States to define the naturopathic profession [1]. The historic development of the naturopathic profession predates many other recognized 'Western' traditional medical systems (for example, chiropractic or osteopathy), and the total number of naturopathic practitioners and/or countries practicing naturopathy/naturopathic medicine outnumber those in these other professions [4].

In the last 40 years there has been tremendous growth and expansion in the number of naturopathic educational programs partly due to the increased consumer demand for healthcare that focuses on prevention and offers a broader range of natural treatment options. The naturopathic workforce includes more than 110,000 naturopaths/ naturopathic doctors practicing in over 108 countries spanning all WHO Regions [5] (see Table 4.1).

This chapter overviews the development of naturopathy/naturopathic medicine by WHO Region, starting with the European Region as it is the traditional home of naturopathy and then followed by the WHO Regions based on when naturopathy/naturopathic medicine was introduced in that Region.

European Region

Naturopathy is considered a traditional system of medicine in Europe [1] and Germany is recognized as the traditional home to naturopathy where it is still used by the majority of the population [3]. As of 2021, there are at least 30 countries in Europe (see Table 4.1) where naturopathy is practiced and it is estimated that there are over 60,000 naturopaths/naturopathic doctors in this Region [3]. There is variability in naturopathic regulation, educational standards and practice in Europe, yet efforts are underway in many European countries – such as, Belgium, France, Slovenia, Spain, and the United Kingdom – to standardize education and acquire regulation [6]. Naturopathic practitioners in Europe primarily use the titles of naturopath, *Heilpraktiker, naturópata* or *naturólogo* depending on the language of the country [7].

- **Regulation:** As of 2021, the naturopathic workforce is regulated in ten countries in Europe – Albania, Cyprus, Germany, Iceland, Liechtenstein, Norway, Portugal, Romania, Switzerland, and United Kingdom (expanded upon in Chapter 5).
- **Education:** There are 36 naturopathic educational programs that meet the WNF criteria offered across eleven European countries (expanded upon in Chapter 6).

Significant contributors to naturopathic development in Europe include Father Sebastian Kneipp, a 19th century hydrotherapist from Germany [8] who was a strong promotor of nature cure concepts. Students of

Table 4.1: Listing of countries (by WHO World Region) with a naturopathic workforce

WHO Region	Countries with a naturopathic workforce
African Region	Angola, Botswana, Democratic Republic of the Congo, Ghana, Kenya, Mauritius, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe
Region of the Americas	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, British Virgin Islands, Canada, Chile, Colombia, Costa Rica, Cuba, Dominica Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Saint Lucia, Saint Martin, Trinidad and Tobago, United States of America, Uruguay, Venezuela, Virgin Islands
Eastern Mediterranean Region	Bahrain, Egypt, Iran, Kuwait, Morocco, Qatar, Saudi Arabia, United Arab Emirates
European Region	Albania, Austria, Belgium, Bosnia and Herzegovina, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Liechtenstein, Luxembourg, Netherlands, Norway, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom
South-East Asian Region	India, Indonesia, Nepal, Sri Lanka, Thailand
Western Pacific Region	Australia, Cambodia, China, Cooks Island, Fiji, Hong Kong, Japan, Malaysia, New Zealand, Philippines, Republic of Korea, Samoa, Singapore, Vanuatu, Viet Nam

Kneipp were instrumental in the propagation of naturopathy around the world, including Louis Kuhne who taught people from India, Pastor Felke who promoted nature cure concepts to the public, and Henry Lindlahr and Benedict Lust who brought Kneipp's nature cure concept from Germany to North America [3].

Traditional naturopathic practices comprise a significant aspect of naturopathic treatments in Europe with clinical nutrition and applied nutrition being taught in all of the European schools, along with herbal medicine, hydrotherapy and various naturopathic physical modalities taught in 85% of the schools in this Region [6]. Other naturopathic modalities commonly used in Europe include tissue salts, flower essences, humoral therapy and Hildegard Medicine [6]. In European countries with regulation of the naturopathic workforce, modalities and practices such as regenerative and intravenous therapies may be part of naturopathic practice.

The advancement of naturopathy as a recognized healthcare profession in Europe has been hindered by numerous external factors such as the diversity in languages and educational standards as well as legislative and regulatory issues; for example, the tendency of some countries to focus on the regulation of naturopathic practices versus the regulation of naturopathy as a profession.

Region of the Americas

Naturopathy/naturopathic medicine is practiced in almost all countries in the Region of the Americas. Due to the historic and professional formation differences in the development of the naturopathic profession in North America and Latin America and the Caribbean (see Table 4.1) these areas have been expanded upon separately below.

North America

North America (Canada and the United States) is considered home to modern naturopathy/naturopathic medicine as this is where early professionalization and integration efforts were most advanced. Naturopathy was introduced in the United States in 1896 via Benedict Lust who had studied with Sebastian Kneipp in Germany [9]. Naturopathy/naturopathic medicine is practiced in both Canada and the United States, where naturopaths/naturopathic doctors are generally referred to as naturopathic doctors or naturopathic physicians and are largely regulated as primary care practitioners [9]. Today there are over 15,000 naturopaths and/or naturopathic doctors in North America.

- **Regulation**: As of 2021, there are five provinces in Canada with occupational licensing (British Columbia, Alberta, Saskatchewan, Manitoba, and Ontario) and one with title protection (Nova Scotia) and there are 22 states, the District of Columbia, and the United States territory of the Virgin Islands that regulation of the naturopathic workforce (expanded upon in Chapter 5).
- **Education:** There are nine naturopathic educational programs that meet the WNF criteria offered in North America (expanded upon in Chapter 6).

The naturopathic profession in North America has reached a high level of professional formation with established naturopathic educational programs, professional associations, regulatory boards, specialized naturopathic associations, and research facilities. Naturopathic doctors from this Region are robust contributors to naturopathic research and to codifying naturopathic knowledge. The traditional naturopathic principles that are recognized globally by the profession were codified in the United

States and approved by both national naturopathic organizations in North America in 1989 [1]. Naturopathic doctors in the United States are also credited with the codifying of two theories recognized by the global naturopathic profession: namely, the *Naturopathic Therapeutic Order* and the *Emunctory Theory* [1].

The National University of Natural Medicine (originally called National College of Naturopathic Medicine) was established in 1956, followed two decades later by the naturopathic medical educational program at Bastyr University (originally called John Bastyr College of Naturopathic Medicine) and the Canadian College of Naturopathic Medicine (originally called the Ontario College of Naturopathic Medicine) [9]. The majority of active North American naturopathic programs have been established for over 40 years and in 2000 two new naturopathic programs were established [10]. All naturopathic educational programs recognized in Canada and the United States are over 4000 hours in length and are accredited by the Council on Naturopathic Medical Education [11].

Although North America demonstrates significant strength in educational standards and regulatory efforts, the primary challenge in this area is that not all states and provinces have occupational licensing, and some states, such as Tennessee, South Carolina, Alabama, and Iowa restrict naturopathic practice. Also, despite the high educational standards recognized in this Region, there are non-accredited or self-accredited programs – primarily located in unlicensed states and provinces that are not recognized by the national naturopathic organizations representing the naturopathic profession. Graduates from these programs and naturopaths practicing in non-regulated jurisdictions often actively thwart the regulatory efforts of the two professional national naturopathic organizations in North America – the American Association of Naturopathic Physicians [12] and the Canadian Association of Naturopathic Doctors [13] – and their affiliated state and provincial naturopathic organizations.

Latin America and the Caribbean

Latin America is characterised by pluralistic and multicultural societies which have actively embraced traditions from other countries as well as local indigenous traditions. The respect that the naturopathic profession has for indigenous practices and its ability to integrate native herbs and practices has aided the growth of naturopathy/naturopathic medicine in this Region. Naturopathy has been practiced in Latin America since the late 1800s, with extensive growth in the last two decades. Currently there are approximately 5,000 naturopaths/naturopathic doctors across over 30 countries in Latin America where naturopathy/naturopathic medicine is practiced.

- **Regulation**: As of 2021, the naturopathic workforce is regulated in eight countries in Latin America and the Caribbean – Brazil, Chile, Colombia, Cuba, Ecuador, Peru, Puerto Rico, and Saint Lucia (expanded upon in Chapter 5).
- **Education**: There are 19 naturopathic educational programs that meet the WNF criteria offered across eight countries in Latin America and the Caribbean (expanded upon in Chapter 6).

A significant contributor to the early introduction of naturopathy in this Region is Father Tadeo de Visent who is credited with introducing naturopathy to Chile. He then shared his knowledge with Manuel Lezaeta Acharán in 1916 [5] who then mentored his son, Rafael Lezaeta to carry on the tradition. In 1958, Juan Estéve Dulin established the first school of Naturopathy in Chile. Puerto Rico offers the only CNME-accredited naturopathic medical program in this Region at the Universidad Ana G. Méndez Recinto Gurabo [14]. The first four-and-half year university degree program in naturopathic medicine accredited by the ministry of education was developed at Universidade do Sul de Santa Catarina in Brazil in 1998, followed by other naturopathic programs that opened in universities after 2000 [15]. In the last twenty years there has been tremendous growth in naturopathic educational programs in this Region [10].

Although naturopathy has been practiced in this Region for over 100 years, it has only been in the last few decades that there has been any regulation of the naturopathic workforce in this Region. Countries such as Puerto Rico and Chile have addressed this by introducing two levels of regulation which reflect the differences in educational standards between naturopaths and naturopathic doctors. This dual-regulatory framework also provides for the grandfathering of naturopathic practitioners with a long-history of practice. With the tremendous expansion of the naturopathic profession in Latin America and the Caribbean over the last two decades, the professional development of naturopathy / naturopathic medicine in this Region will be strongly influenced by the introduction of educational standards and the regulatory frameworks that are enacted.

Western Pacific Region

Naturopathy was introduced into the Western Pacific Region around 1900 and is currently practiced in at least fifteen (15) countries in this Region (see Table 4.1) [1]. It is estimated that there are over 10,000 naturopaths/naturopathic doctors in the Western Pacific with the majority residing in Australia and New Zealand [16].

- **Regulation**: As of 2021, some form of regulation of the naturopathic workforce exists in four countries in the Western Pacific – Australia, Cooks Island, Malaysia, and Samoa (expanded upon in Chapter 5).
- **Education**: There are 12 naturopathic medical

educational programs that meet the WNF criteria in the Western Pacific (expanded upon in Chapter 6).

The first university naturopathic program was offered by Southern Cross University in 1996, with two additional universities offering programs by 2000. However, absence of regulation resulted in the closure of these university programs by 2015. In 2020, Australia's oldest existing naturopathic college Southern School of Natural Therapies (SSNT) – which was established in 1961 in Melbourne – amalgamated with Torrens University, reintroducing naturopathic education to the university sector. The first naturopathic program offered in New Zealand, the South Pacific College of Natural Medicine (originally the South Pacific College of Natural Therapeutics) was established in 1967 in Auckland [17] and is still in operation. Naturopaths/naturopathic doctors from Australia and New Zealand have contributed greatly to the body of naturopathic research, especially in the last two decades [18]. Even in the absence of formal research support networks or university departments, naturopaths have consistently been the most successful T&CM profession in securing Australian government research funding in that country [18]

Although there are currently no government-recognized educational standards in the Western Pacific for naturopathic education, there is a high degree of consistency in naturopathic education and practice within this Region. This is due in part to the work of the Australian Register of Naturopaths and Herbalists (ARONAH) which is a voluntary and independent regulatory body that maintains minimum standards for naturopathic education delivered through the Tertiary Education Quality and Standards Agency in Australia [ARONAH][19]. Similar efforts to enforce minimum standards through ARONAH are also underway in New Zealand.

Seeking statutory regulation has been the primary challenge in the Western Pacific Region, especially in Australia, for decades. Australian naturopathic organizations have been actively pursuing statutory registration for over 100 years [20, 21], most recently via lobbying [22, 23] for the inclusion of naturopathy in the National Registration and Accreditation Scheme [24]. Although every review of the regulatory requirements for naturopathic practice in Australia since 2000 has recommended statutory regulation, the naturopathic profession is the only health workforce to be formally assessed that is not currently included in Australia's national registration scheme [25]. This absence of statutory registration has resulted in variability in practice, training, and education in the naturopathic profession in that country [26]. A similar situation is found in other countries in the Region, which express similarly high levels of support for regulation [27]. Australia was and continues to be active in self-governance [19].

South-East Asia Region

Naturopathy/naturopathic medicine is practiced in five countries in the Region of South-East Asia (see Table 4.1) with India introducing naturopathy in the 1920s and having the strongest representation in this Region. It is estimated that there are over 12,000 naturopaths / naturopathic doctors in South-East Asia [16]. Regulation in this Region exists in two countries: India and Nepal.

- **Regulation**: As of 2021, regulation of the naturopathic workforce exists in two countries in the South-East Asian Region – India and Nepal (expanded upon in Chapter 5).
- **Education:** There are over 50 naturopathic medical educational programs that meet the WNF criteria in the South-East Asian Region with 48 located in India (expanded upon in Chapter 6).

Naturopathy was first introduced to India in the 1920's through Dronamraju Venkatachalapathi Sharma who trained with naturopaths in Germany including Dr. Kuhne. Mahatma Gandhi was the patron of the National Institute in Pune and revived naturopathy in India in the 1940s, authoring multiple naturopathic texts and inspiring the opening of the Gandhi Naturopathic Medical College in 1970 [28, 29]. In India naturopathic practice is commonly incorporated in a hospital setting [7]. There has been tremendous growth and recognition of naturopathy/naturopathic medicine in India in the last few decades and India is one of the few countries where some States include naturopathic care under its government healthcare plans. At least two naturopathic educational programs have been established in Nepal and Thailand has also been progressing naturopathic professionalization, with the development of a university program in naturopathy at Surin Rajabhat University [30].

Naturopathy and Yoga are combined in education and practice in India and in other parts of South-East Asia. The naturopathic educational programs in India fall under the Central Council for Research in Yoga & Naturopathy (CCRYN) and include naturopathic programs that are over 4,000 hours and graduates earn the title Bachelor of Naturopathy and Yogic Studies (BNYS) [31].

Due to the support the Ministry of AYUSH and the Government of India, there has been tremendous growth in the naturopathic profession in India and surrounding countries. This growth has been accompanied by defined educational standards and a regulatory framework [32, 33].

African Region

In Africa indigenous or traditional medicine performs a significant role in health care, with some African countries having up to 70% of their population depending primarily on traditional medicine [34]. The practice of naturopathy was introduced in South Africa in the mid-1900s and it is now practiced in at least 13 countries throughout Africa (see Table 4.1) [35]. The origins of naturopathy in the various African countries are as diverse as the many individual countries that comprise the Region, with the naturopathic framework being introduced primarily through diasporic communities receiving naturopathic training outside their countries of origin [7], but also due to an increasing desire to bridge traditional medicine and biomedicine via trained primary health care professionals with expertise in both areas. The practice of naturopathy can serve as a bridge with indigenous practices from this Region due to naturopathy's focus on herbal medicine, nutrition and lifestyle [35, 36]. Africa is the Region which is observing the most rapid growth of professional naturopathic formation globally. As of 2020, there are about 5,000 naturopaths/naturopathic doctors in this Region.

- **Regulation:** As of 2021, regulation of the naturopathic workforce exists in ten countries in Africa – Botswana, Democratic Republic of the Congo, Ghana, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Uganda, and Zimbabwe (expanded upon in Chapter 5).
- **Education:** There are over 5 naturopathic medical educational programs that meet the WNF criteria in the African Region (expanded upon in Chapter 6).

The first degree-granting naturopathic school in Africa was established in the University of Western Cape in South Africa in 2002 [10] and in the past twenty years, due to strategies driven by the WHO regional office and key African heads of state, this Region has seen an increase in the use of traditional medicines, including naturopathy, as well as an increase in the promotion of professional training, research and policy formation [37].

Eastern Mediterranean

Eastern Mediterranean has a rich history of indigenous health practices. Over the last two decades naturopathy has been introduced to at least eight countries in this Region (see Table 4.1). The WHO Global Report on Traditional and Complementary Medicine identified naturopathic practice communities in Iran, Pakistan, Saudi Arabia and Syria [38] [REF].

- **Regulation**: As of 2021, regulation of the naturopathic workforce exists in two countries in the Eastern Mediterranean Region – United Arab Emirates (UAE) and Saudi Arabia (expanded upon in Chapter 5).
- **Education:** Currently the WNF is not aware of any naturopathic educational programs offered in the Eastern Mediterranean Region.

Of all the WHO Regions, the introduction of naturopathy/naturopathic medicine is newest in the Eastern Mediterranean Region and lacks some of the professional infrastructure present in other Regions. Although some jurisdictions have implemented regulation for naturopathic practice, the naturopathic profession in these countries continues to rely on overseas professional training, However, recent surveys of the public in this Region suggest that naturopathy is one of the most popular T&CM professions [39]. With such a strong focus on T&CM in this Region we expect that the naturopathic profession will continue to grow.

Summary

Naturopathy/naturopathic medicine is practiced in all WHO Regions. Europe is considered the traditional home to naturopathy and North America is consider the home to modern naturopathy or naturopathic medicine. The respect that the naturopathic profession has for indigenous practices and its ability to integrate native herbs and traditional practices has aided the growth of naturopathy/naturopathic medicine around the world. There are over 110,000 naturopaths/naturopathic doctors around the world practicing in over 108 countries that are united in their philosophical person-centred approach to healthcare.

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5 Regulation of the Naturopathic Workforce

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HIGHLIGHTS

- Occupational regulation is an important tool used by governments to assure the quality of the health workforce, to manage risk, and to protect the public.
- 34 countries with a naturopathic workforce have some form of statute-based occupational regulation.
- An additional 21 countries have voluntary certification operated by one or more naturopathy professional associations.
- While naturopathy is practiced widely in many countries and is a relatively low risk profession, it is not risk free. To address the risks, occupational licensing or statutory registration is the WNF's preferred model for regulation of the profession.
- Without enforceable minimum qualification and probity standards for entry to the naturopathy profession, other forms of occupational regulation such as voluntary certification, co-regulation and negative licensing do not provide sufficient protection for consumers.

Background

Naturopathy is a valuable and often underestimated part of the health care systems of many countries. In 2002 the World Health Organization (WHO) published the *WHO Traditional Medicine Strategy: Geneva 1999*, the first global report on traditional and complementary medicine (T&CM) [1]. This initial report was followed by the *World Health Organization Traditional Medicine Strategy 2014 – 2023* which stated that T&CM is practiced in many countries of the world, and consumer demand for services is increasing [2, 3].

> *Many countries now recognize the need to develop a cohesive and integrative approach to health care that allows governments, health care practitioners and, most importantly, those who use health care services, to access T&CM in a safe, respectful, cost-efficient and effective manner* [3].

The *WHO Global Report on Traditional and Complementary Medicine* 2019 indicated that in 1999 only 25 of the WHO Member States had a T&CM policy, whereas in 2018 that number had increased to 98 [2]. That report also indicated that 98 Member States reported naturopathy as a type of T&CM that was used in their country and that only nine countries regulated the practice of naturopathy [2].

The WHO continues to encourage its 194 Member States to regulate T&CM practices, practitioners and products [1-3]. Likewise, the WHO *Declaration of Astana*, adopted at the *Global Conference on Primary Health Care* in October 2018 in Kazakhstan, recognized the role of traditional knowledge and extending access to a range of healthcare services, including traditional medicines, as an integral part of the drive for primary health care for all [4].

Regulation is an essential tool that is widely used by governments and other stakeholders to strengthen health systems and to assure the quality of health services. It encompasses occupational licensing laws and other non-statutory forms of regulation, registration and oversight, including bylaws and standards of practices set by professional associations that represent health professions. There is broad support from the public, health professions and policymakers for increased regulation of T&CM practice [5]. Furthermore, research on professional formation indicates the regulation of T&CM professions is at least as effective as regulation of conventional medical professions [6], and that inclusion of T&CM professions into regulatory systems supports the goals of safe, equitable access to healthcare for all [7].

In every country where naturopathy/naturopathic medicine is practiced, the naturopathic workforce is

subject to a range of local laws that impact and shape naturopathic practice, including criminal and civil law. Laws may require the licensing of businesses, facilities, equipment, or occupations. Some laws regulate specific activities such as the use of medicines and therapeutic goods, and/or impose practice obligations, for example, to deal with public health threats such as infectious diseases.

The aim of this chapter is to provide an analysis of the global profile of occupational regulation that applies to the naturopathic workforce and the practice of naturopathy/naturopathic medicine. This analysis identifies the gaps in regulation, the strengths and weaknesses of different regulatory models and the areas where existing regulatory regimes may be strengthened. It also establishes a baseline to enable changes to be monitored over time. The World Naturopathic Federation's (WNF) preferred approach to occupational regulation for the naturopathic profession is outlined and regulatory regimes that operate in ways that disenfranchise or marginalize naturopaths or unnecessarily restrict their scopes of practice (SoP) are discussed.

While we trust that this chapter will assist governments, professional organizations (e.g., professional associations and regulatory bodies), consumers, and practitioners to understand occupational regulation as it applies to the naturopathic profession worldwide, regulation is constantly evolving. We have used our best efforts to ensure the material presented here is up to date, comprehensive and complete.

Methodology

The data informing this analysis was compiled over a six-year period between 2014 and 2021. It included several different initiatives including online searches, a review of the published and gray literature, document analysis and data collected from three WNF surveys.

Online searches

In 2014-15, the WNF conducted an initial online search matching the name of every WHO Member State with the word "naturopathy" (or the language equivalent for that country). Using the results from this online search, supplemented by information provided to the WNF from national and regional naturopathic professional organizations (i.e., professional associations and regulatory bodies) and naturopathic educational institutions, a list of Member States was compiled where the data indicated that naturopathy is practiced. A further online search to identify any naturopathic professional associations or naturopathic educational programs available to support the naturopathic workforce was conducted and the websites of all known professional naturopathic organizations were reviewed to determine the structure and governance of the organization, the criteria for membership and types of services provided to members.

An additional online search of the responsible Ministries of Health (MoH) (or the equivalent government department) in those Member States identified as having a naturopathic workforce was conducted to identify relevant gray literature on licensing or other regulatory regimes relevant to the practice of naturopathy in that Member State. Where website information suggested the existence of an 'umbrella' law and/or multi-profession regulatory regime, a further search was undertaken to determine whether the naturopathic profession was included within the scope of the regime, or where the practice of naturopaths was otherwise impacted.

Global surveys of education institutions, professional associations, and regulatory bodies

Nine surveys of naturopathic professional associations, educational institutions and the naturopathic workforce were conducted by the WNF (see the Chapter on *Aims, Objectives and Methods*) between 2015 and 2021. Data from three of these surveys contributed to the body of information for this analysis, including the first international survey of the naturopathic profession which was conducted by the WNF in 2015 to gather data on the characteristics of naturopathic practice globally [8] and the 2016 WNF international survey of naturopathic educational institutions which identified what was taught in naturopathic educational programs [9]. The third survey which contributed substantially to this analysis was based on a detailed international cross-sectional survey examining the characteristics of naturopathic education and regulation [10]. This survey was conducted between 2016 and 2019 in collaboration with Jill Dunn, a New Zealand-based researcher from the University of Technology Sydney (Australia). Using purposive sampling, the online survey was sent to a list of organizations from the WNF's database and complemented by additional internet searches. Two hundred and twenty-eight naturopathy organizations (professional associations and registration bodies) and educational institutions from 46 countries were surveyed. Sixty-five organizations spanning 29 countries responded [10].

Search of legal databases

In addition to the search of government websites for gray literature, in 2021 a database search was undertaken to identify relevant laws and regulations that included the naturopathic workforce.

The search terms used included: *complementary & alternative medicine; traditional and complementary medicine; traditional medicine; complementary medicine;*

Voluntary certification

Under voluntary certification there is no underpinning statute enacted by government that confers powers on a regulator to license members of the profession or occupation. Rather, professionals join together and establish an association with a constitution, bylaws and rules for its members. The association may be registered as a body corporate under the relevant law of a country.

On joining the association, professional members agree to abide by the rules of the association and its code of ethics. The association may operate a consumer complaints mechanism and the rules may provide for members to be expelled for serious breaches of the code of ethics. However, the system is entirely voluntary – practitioners can choose not to join an association and still practice and can continue to practice if expelled from an association for misconduct.

A variation on this type of occupational regulation is where a legal entity is established specifically to carry out regulatory functions on behalf of a profession separately from the professional association/s. While there is organizational separation of the regulatory functions from the membership representation and advocacy functions, the system continues to be entirely voluntary. While consumers, insurers and health service providers may rely on the professional association for trusted advice about who is qualified to practice the profession, there is no direct involvement or recognition from government.

Co-regulation

Co-regulation is similar to voluntary certification. The key difference is that some of the functions of the self-regulating professional association may be either delegated from or recognized by government. This government recognition or delegation may be conditional on the certification body meeting specified standards in relation to governance and its certification standards and processes. This recognition process establishes, in effect, a partnership between government and the certifying body, and the benefits that flow to practitioners from certification create incentives for practitioners to comply with the professional association's standards.

Negative licensing

Under a negative licensing system, there is no legal barrier to entry to an unregistered profession – anyone can set out their shingle and practice, no matter what their level of training or skill. However, a law is enacted that provides a mechanism for a statutory regulator to receive and investigate complaints about a practitioner. The regulator may issue a prohibition or banning order to remove a practitioner from practice when the regulator finds that a practitioner have committed an offense or a breach of minimum standards of practice and their continued practice presents a serious risk to the public. There may be offenses for breach of a prohibition order and an online searchable public register of prohibition orders.

Occupational licensing (also known as statutory registration)

Under an occupational licensing system, the purpose and functions of the system are not determined by the profession alone (as in the case of voluntary certification) but are set out in legislation and are subject to public scrutiny (through the responsible parliament and minister). The legislation establishes a regulatory body with powers to register/license and regulate practitioners. Entry to a regulated profession is limited only to those the regulatory body considers to be properly qualified and of good character. This gate-keeping role is underpinned by statute, with powers for the regulatory body to prosecute unregistered persons who 'hold themselves out' as qualified to practice the profession when they are not. The statute provides an effective mechanism for restricting entry to the profession, and disciplinary powers to deal with practitioners whose practice falls below an acceptable standard.

There are two distinct models of occupational licensing: **reservation of title** and **reservation of practice**. While registration/licensing laws generally prohibit unregistered/unlicensed persons from using restricted professional titles or pretending to be qualified and registered when they are not (reservation of title), some laws go further, prohibiting unregistered persons from providing certain types of clinical services (reservation of practice). Such laws create an exclusive scope of practice, in effect a monopoly, for the profession or occupation concerned.

Figure 5.1 Types of occupational regulation [11]

alternative medicine; naturopathic medicine; naturopathy; naturopath; naturheilpraktiker; heilpraktiker; alternative therapist; non-conventional therapies; health professions; natural and traditional medicine; and *natural medicine*. The following databases were also searched: HeinOnline, WestLaw, Legal Information Institute Cornell University LII, WorldLII, AfricanLII, SAFLII, NZLII, AustLII, PacLII, E-Justice Europa and AsianLII.

Document analysis

Content analysis was used to analyze the documents obtained from the searches of government websites and legal databases. This data was triangulated with data from the online searches and the survey of professional associations, to establish the type/s of occupational regulation operating in each country. The regulatory arrangements identified in Member States were categorized according to the types of occupational regulation set out in Figure 5.1 [11]. A sample of naturopathy professional associations was selected for further analysis. Documents and other content from their websites were examined, to identify key features of the governance and operation of these organizations.

Table 5.1 compares the four types of occupational regulation against key parameters such as whether the regime has a statutory basis, whether there are powers to enforce minimum standards for entry to practice, the ability to deal with complaints about the conduct or fitness to practice of practitioners and remove practitioners from practice if necessary.

Voluntary certification and co-regulation regimes generally have a public register of qualified (or disqualified) practitioners. Some co-regulation regimes have a statutory basis, others are administrative and some provide for accreditation of qualifying programs for entry to practice (such as the UK PSA program), others do not. Only statutory registration/occupational licensing provides enforceable minimum qualification and probity standards for entry to practice and provides powers for the regulator to actively monitor compliance with standards.

Table 5.1: Comparison of occupational regulation types against key parameters [12]

Parameter	Type of Occupational Regulation			
	Voluntary Certification	Co-regulation	Negative licensing	Statutory registration/ occupational licensing
Statutory basis	No	Maybe	Yes	Yes
Enforceable minimum qualifications for entry to practice	No	No	No	Yes
Probity checking of persons prior to entry to practice	No	No	No	Yes
Accreditation of qualifying programs for entry to practice	Yes	Maybe	No	Yes
Enforceable minimum standards of practice	No	No	Yes	Yes
Mandatory Continuing Professional Development	Yes (for members)	Maybe	No	Yes
Obligation to report professional misconduct by fellow practitioners	No	No	Yes	Yes
Powers to monitor practitioner compliance with practice standards	No	No	No	Yes
Powers to impose conditions on a practitioner's practice	No	No	Yes	Yes
Practice guidelines/codes issued	Yes	No	No	Yes
Complaints and disciplinary powers	Yes (for members only)	Maybe	Yes	Yes
Powers to remove unfit practitioners from practice	No	No	Yes	Yes
Offenses and penalties for unauthorized use of professional titles	No	No	No	Yes
A publicly accessible register of qualified practitioners	Maybe	Maybe	No	Yes
A publicly accessible register of disqualified or barred practitioners	No	No	Yes	Yes
Publication of disciplinary decisions	No	No	Yes	Yes
Protection from civil liability for board members discharging regulatory functions	No	No	Yes	Yes

Results

Analysis of the data indicates that naturopathy is practiced in at least 108 WHO Member States. Based on the synthesis of data from the online searches, surveys and literature reviews, Table 5.2 outlines the types of occupational regulation that were identified for each Member State with a naturopathic workforce.

Table 5.2: Types of occupational regulation that apply to the naturopathy profession, by WHO Region & Member State

WHO Region	Type of occupational regulation				
	No occupational regulation, licensure or registration identified	Voluntary Certification	Co-regulation	Negative licensing	Statutory registration / occupational licensing
African Region	Angola, Kenya, Mauritius Zambia	None identified	None identified	None identified	Botswana, Democratic Republic of the Congo, Ghana, Namibia, Nigeria, South Africa, Swaziland, Tanzania, Uganda, Zimbabwe
Region of the Americas	Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, British Virgin Islands, Costa Rica, Dominica Republic, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Saint Martin, Trinidad and Tobago, Venezuela, Virgin Islands	Bermuda, Brazil, Canada[1], United States of America[1], Uruguay	Brazil	None identified	Canada, Chile, Colombia, Cuba, Ecuador, Peru, Puerto Rico, Saint Lucia, United States of America
Eastern Mediterranean Region	Bahrain, Egypt, Iran, Kuwait, Morocco, Qatar	None identified	None identified	None identified	Saudi Arabia, United Arab Emirates
European Region	Austria, Bosnia and Herzegovina, Finland, Hungary, Israel, Luxembourg, Russia, Slovakia, Ukraine	Belgium, Czech Republic, Denmark, France, Greece, Ireland, Italy, Norway, Netherlands, Slovenia, Spain, Sweden, United Kingdom	Norway, United Kingdom	None identified	Albania, Cyprus, Germany, Iceland, Liechtenstein, Portugal, Romania, Switzerland
South-East Asia Region	Indonesia, Sri Lanka, Thailand	None identified	None identified	None identified	India, Nepal
Western Pacific Region	Cambodia, China, Fiji, Japan, Philippines, Republic of Korea, Singapore, Vanuatu, Viet Nam	Australia, Hong Kong, New Zealand	Australia	Australia	Cook Islands, Malaysia, Samoa

[1] Voluntary certification regimens are present in some provinces (Canada) and States (USA) when occupational licensing or statutory registration is absent.

The following highlights the regulation status of the global naturopathic workforce.

- No occupational regulation, registration or licensure was identified for half of the Member States with a naturopathic workforce.
- Voluntary certification regimes are found in 21 Member States across three WHO Regions. No voluntary certification was identified in Member States of the African, Eastern Mediterranean and South-East Asian Regions.
- Co-regulation is found in four Member States across three WHO Regions – Australia, Brazil, Norway, and the United Kingdom.
- Negative licensing is found in only one Member State, in the Western Pacific Region (Australia).
- Statutory registration or occupational licensing is found in all WHO Regions, spanning a total of 34 Member States.
- Some Member States have up to three types of occupational regulation that apply to the naturopathic workforce, operating in parallel.

The following sections present the main findings for each of type of occupational regulation.

Voluntary Certification

As outlined in Table 5.2, voluntary certification for the naturopathic workforce is operational in 21 of the Member States across three out of six WHO Regions. Table 5.3 lists key features of four of these voluntary certification regimes, in two Member States (Spain and the United Kingdom) from the European Region and two Member States (Australia and New Zealand) from the Western Pacific Region.

These voluntary certification regimes generally include the following:

- a constitution and/or bylaws that set out the rules of the association;
- a Board of Directors constituted with persons elected by members of the association;
- published membership requirements that include:
  - a recognized qualification in naturopathic education
  - compliance with a Code of Conduct and standards of practice;
- a process for assessing and approving naturopathic education programs for membership eligibility

Table 5.3: Key features of voluntary certification regimes in selected Member States

	WHO European Region		WHO Western Pacific Region	
Key features	**Spain**	**United Kingdom**	**Australia**	**New Zealand**
Name of professional association	Organización Colegial Naturopática [13]	General Council and Register of Naturopaths [14]	Australian Register of Naturopaths and Herbalists [15]	Naturopaths and Medical Herbalists of New Zealand [16]
Constitution and Bylaws	Yes	Yes	Yes	Yes
Board of Directors	Yes	Yes	Yes	Yes
Educational requirements for membership	Yes	Yes	Yes	Yes
Accreditation of education programs for membership	Yes	Yes	Yes	Yes
Malpractice / civil liberty insurance requirement	Yes	Yes	Yes	Yes*
Background check prior to registration	Yes	Yes	Yes	Yes
Website listing of naturopaths / NDs	Yes	Yes	Yes	Yes#
Undertake advocacy for the profession	Yes	Yes	Yes	Yes
Information on the naturopathic profession on their website	Yes	Yes	Yes	Yes
Complaints and disciplinary process	Yes	Yes	Yes	Yes
Formal policy statement in support of occupational licensing	Yes	Yes	Yes	Yes

*NZ has a national no fault accident compensation system

Members may request that their details not be published on website

purposes;
- operation of a publicly accessible web-based register of practicing naturopathic members;
- policies and processes for receiving complaints about members and dealing with any misconduct;
- a mandate to undertake advocacy on behalf of members;
- a formal policy statement that the organization supports occupational regulation for the naturopathic profession.

A key function of a voluntary certification regime is to set standards of practice for members. Table 5.4 lists the practice guidelines published on the websites of the four example professional organizations (i.e., professional association or registration body) engaged in voluntary certification as outlined in Table 5.3.

Co-Regulation

Co-regulatory regimes were identified in four Member States – Australia, Brazil, Norway, and the United Kingdom – across three WHO Regions. There is considerable diversity in the design and operation of co-regulatory arrangements which range from a well-developed program where the regulator has a suite of statutory powers and a web presence, to less formalized administrative arrangements without a statutory basis or web presence.

The most developed co-regulatory regime that involves the naturopathic workforce is in the United Kingdom where the Professional Standards Authority (PSA), a statutory regulator, has powers to operate an 'accredited voluntary registers program' [17]. Under the program, the PSA has published minimum standards for the operation of public registers. A professional association that operates a public register of qualified members may apply to the PSA for accreditation of its register. The association pays a fee to the PSA for the assessment. A practitioner who has met the membership requirements of the association and whose name appears on an accredited register may advertise that fact to the public. When choosing a health service, consumers are encouraged to choose a practitioner who is a member of a PSA accredited register. The PSA has statutory powers to suspend the accreditation of a voluntary registrant, apply conditions or remove a professional association's accreditation.

In Norway, the Norwegian Directorate of Health and Social Affairs approves practitioner organizations with at least 30 members under a voluntary registration system through the Central Coordinating Register for Legal Entities. The professional association must have articles that govern and impose professional behaviors, activities and requirements of members including a Code of Ethics and a complaints and disciplinary procedure. Changes in professional association conditions must be reported to the Directorate. Practitioner registration, implemented by the Brønnøysund Register Centre – a governmental

Table 5.4: Practice guidelines published by professional associations from four Member States: Spain, United Kingdom, Australia, and New Zealand

WHO European Region		WHO Western Pacific Region	
Spain	**United Kingdom**	**Australia**	**New Zealand**
Organización Colegial Naturopática	General Council and Register of Naturopaths	Australian Register of Naturopaths and Herbalists	Naturopaths and Medical Herbalists of New Zealand
• Professional principles & ethics • Professional obligations • Relations with the corporation, of the naturopaths, with each other, with the health professions & with other institutions • Confidentiality • Patient safety • Advertising • Clinic signs & supplementary specifications • Special designations • Continued education • Procedural guarantees	• Professional conduct for registered naturopaths • The registered naturopath and the law • Relationships with patients • Relationships with medical practitioners and surgeons • Relationships within the profession • Relationships with other health care practitioners • Scope and standards of practice • The management and control of practices • Promoting the individual and the profession • Professional misconduct • Disciplinary procedures	• Professional conduct • Providing good care • Communication, confidentiality, informed consent, adverse events • Working within the healthcare system • Minimizing risk • Maintaining professional performance • Professional behaviors • Reporting obligations • Conflict of interest • Teaching, supervising & assessing • Undertaking research	• Professional conduct • Integrity & professionalism • Competence & standards • Respect for colleagues • Respect for community • Working with clients • Commercial bias, advertising & recommendation of products, brands, and services • Confidentiality • Professional boundaries • Position statements • Telehealth guidelines

body under the Norway Ministry of Trade, Industry and Fisheries which consists of several different national computerized registers – requires that applicants have an approved professional association practitioner number and valid insurance for financial liability [18].

In Brazil, regulatory functions are carried out by a number of organizations. The Ministry of Labour, through the Brazilian Register of Occupations (CBO), recognizes two levels of naturopathic practitioner – a *naturologist* (equivalent to a naturopathic doctor) [19] and a mid-level technical professional referred to as a holistic therapist or naturopath [20]. The Ministry of Education accredits higher education studies in naturopathy in order to qualify as a naturologist but does not accredit training for mid-level technical practitioners, i.e., the naturopath or holistic therapist. As of 2020 there are four private universities accredited to deliver four-year undergraduate degrees in naturopathy by the Ministry of Education (MEC) for naturologists [21]. While the profession of naturopathy (termed *naturologia*) does not currently have occupational licensing, naturologists are approved to provide services within a limited scope of practice, as part of the Integrated National Health System (SUS), under the direction of the National Policy of Integrative and Complementary Practices (PNPIC) governed by the Ministry of Health [22].

In Australia, patient consultation fees charged by a naturopath may be exempt from the goods and services tax if the naturopath is qualified as a 'recognized professional' under the goods and services tax legislation [23]. As naturopathy is currently not a 'regulated health profession' [24] in Australia, to qualify for this tax-exempt status, the naturopath must be a member of a professional association that has 'uniform national registration requirements relating to the provision of those services'. While there is no legislated definition of these requirements, the Australian Taxation Office has advised that a professional association would be expected to meet certain criteria, such as to be a not-for-profit organization, have articles of association, by-laws or codes of conduct, the ability to set its own admission requirements, standards of practice and ethics, requirements for ongoing professional development and the right to impose sanctions on members who fail to abide by its rules [25]. Similar arrangements exist for recognition of naturopaths by the Australian Therapeutic Goods Administration for the purposes of eligibility for privileges such as extemporaneous product compounding and dispensing and access to restricted materials [26].

Negative licensing

Australia is the only Member State identified with a negative licensing regime that impacts the naturopathic workforce. This negative licensing regime is in operation in four Australian states – New South Wales, Queensland, South Australia and Victoria – with a national agreement in place for regimes to be implemented in every state and territory in Australia in accordance with a nationally agreed policy framework [27]. The four negative licensing regimes operate in broadly the same way:

- A law is enacted that includes a definition of 'health service' and 'health care worker' (or equivalent). These definitions determine the scope of the regime and who it applies to.
- A statutory 'code of conduct' is made by regulation and sets minimum standards of practice for all unregistered health care workers who provide a health service, regardless of their discipline or occupation, the nature of their practice, the titles they use, or how they badge, describe or advertise the services they provide. See for example, the regime in Queensland, Australia [28].
- The regulator (a complaints commissioner supported by an administrative office) has statutory powers to receive and investigate complaints from health service users or other interested parties and has the power, if warranted, to issue a 'prohibition order', to attach conditions to a worker that limit their scope of practice, or to ban them from practice altogether.
- If a health care worker who is subject to a prohibition order breaches the order, they may be prosecuted through the courts. Offenses are punishable by fines or up to two years imprisonment.
- A publicly accessible, online register of prohibition orders informs the public of the identity of prohibited or banned workers and provides details of the misconduct. See for example the register of prohibition orders published by the NSW Health Care Complaints Commissioner in Australia [29].

Occupational licensing/statutory registration

Occupational licensing or statutory registration is the most common type of occupational regulation for the naturopathic workforce. Occupational licensing regimes are operating in 34 Member States across all WHO Regions. Tables 5.5 to 5.12 list, by WHO Region, those Member States where occupational licensing or statutory registration applies to the naturopathy profession, as well as the legislative instrument, the name of the regulator and the classes of practitioner that are regulated under the system.

African Region

As outlined in Table 5.5, ten Member States in the African Region have an occupational licensing regime that applies to the naturopathic workforce.

Table 5.5: Legislative instruments, regulators and classes of practitioners regulated in the African Region

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Botswana (1987)	Botswana Health Professions Regulations 1988 [30]	Botswana Health Professions Council	Naturopath
DR Congo (1952)	Politique Nationale de Médecines Traditionnelle 2001 [31]	Not located	Traditional Healer Naturopathic Doctor
Ghana (2000)	Traditional Medicine Practice Act 2000 [32]	Traditional Medicine Practice Council	Naturopath
Namibia (2004)	Allied Health Professions Act, 2014 [33]	Allied Health Professions Council of Namibia	Naturopath
Nigeria (2004)	Decree No 78 under The Medical and Dental Council of Nigeria (MDCN) 2004 [34]	Medical and Dental Council of Nigeria	Naturopathic Doctor
South Africa (1982)	Allied Health Professions Act 63 of 1982 [35]	Establishment of Allied Health Professions Council of South Africa	Naturopath, Naturopathic Doctor
Swaziland (1978)	Natural Therapeutic Practitioners Regulation 1978 [36]	Not located	Naturopath
Tanzania (2002)	The Traditional and Alternative Medicines Act No 23 of 2002 [37]	Traditional and Alternative Health Practice Council	Not specified
Uganda (2019)	The Traditional and Complementary Medicine Act 2019 [38]	National Council of Traditional and Complementary Medicine Practitioners	Not specified except NOT allowed to refer to themselves as a doctor, nurse, or professor
Zimbabwe (1981)	The Health Professions Act 2001 (Chapter 27: 19) [39]	Allied Health Practitioners Council of Zimbabwe	Naturopath

Region of the Americas

Nine Member States in the Region of the Americas have an occupational licensing regime for naturopaths/naturopathic doctors including Canada, the United States of America (USA), six Member States in Latin America – Chile, Columbia, Cuba, Ecuador, Peru, and St Lucia – and one 'Associate' Member State in the Caribbean – Puerto Rico (USA).

In Canada and the USA, the power to license health professions resides with sub-national governments. Table 5.6 lists the provinces of Canada where occupational licensing applies to naturopaths/naturopathic doctors and Table 5.7 lists the states in the USA where occupational licensing is enacted.

Five out of ten Canadian provinces have legislated occupational licensing for naturopaths/naturopathic doctors. While Nova Scotia is included, its system provides for protection of title but does not include the full suite of powers that are available in the other Canadian provinces, such as powers to maintain a public register of licensed naturopathic physicians, receive and investigate complaints about the professional conduct of licensees, to conduct disciplinary hearings and to remove a person from the register who is found to be unfit to practice.

Table 5.6: Legislative instruments, regulators and classes of practitioners regulated by Canadian province

Province (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Alberta (1948)	Health Professions Act, Naturopaths Professions Regulation 126/2012 [40]	College of Naturopathic Doctors of Alberta	Naturopath Naturopathic Doctor
British Columbia (1923)	Health Professions Act [RSBC 1996] Chapter 183, Naturopathic Physicians Regulation B.C. Reg. 282/2008 [41]	College of Naturopathic Physicians of British Columbia	Naturopath Naturopathic Doctor Naturopathic Physician
Manitoba (1946)	The Naturopathic Act 2007 [42]	Manitoba Naturopathic Association	Naturopath Naturopathic Doctor
Ontario (1925)	Naturopathy Act 2015 [43]	College of Naturopaths of Ontario	Naturopath Naturopathic Doctor
Nova Scotia (2008)	Naturopathic Doctors Act, Chapter 5 of the Acts of 2008 [44]	Nova Scotia Association of Naturopathic Doctors	Naturopath Naturopathic Doctor
Saskatchewan (1954)	The Naturopathy Act 1978, Chapter N-4 of the Revised Statutes of Saskatchewan 1978 [45]	Saskatchewan Association of Naturopathic Practitioners	Naturopath Naturopathic Doctor

As outlined in Table 5.7, almost half of the USA states/districts (24 out of 51) have occupational licensing regimes for their naturopathic workforce.

Table 5.7: Legislative instruments, regulators and classes of practitioners regulated by USA state

State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Alaska (1987)	Alaska Statutes and Regulations Naturopaths [46] Naturopath Statutes (AS 08.45) Naturopath Regulations (12 AAC 42)	The Department of Commerce, Community, and Economic Development	A person who practices naturopathy (Doctor of Naturopathic Medicine)
Arizona (1935)	Arizona Revised Statutes Title 32 – Professions and Occupations Chapter 14 Naturopathic Physicians [47] Chapter 32 Health Professionals [48]	Naturopathic Physicians Medical Board	Doctor of naturopathic medicine Naturopathic medical assistant Naturopathic medical student
California (2003)	California Business and Professions Code, Division 2, Chapter 8.2 Naturopathic Doctors Act [49]	California Department of Consumer Affairs: Naturopathic Medicine Committee	Naturopath Naturopathic doctor
Colorado (2013)	Colorado Revised Statutes 2021, Title 12, Article 37.3 Naturopathic Doctor Act [50]	Colorado Department of Regulatory Agencies: Office of Naturopathic Doctor Registration	Naturopath Naturopathic doctor
Connecticut (1922)	General Statutes of Connecticut Chapter 373. Naturopathy [51]	Department of State Health	Naturopath Naturopathic doctor
District of Columbia (2012)	District of Columbia Municipal Regulations and District of Columbia Register. Title: 17 Business, Occupations and Professionals. Chapter: 17 – 52 Naturopathic Medicine, 2012 [52]	DC Board of Medicine	Naturopath Naturopathic doctor
Hawaii (1925)	Hawaii Revised Statutes Chapter 455 Naturopathic Medicine – no date [53] Hawaii Administrative Rules, Title 16, Chapter 88 Naturopaths 2018 [54]	State of Hawaii Department of Commerce and Consumer Affairs Professional & Vocational Licensing: Board of Naturopathic Medicine	Naturopath Naturopathic doctor

State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Idaho (2020)	Title 54 Professions, Vocations, and Businesses. Chapter 51 Naturopathic Medicine Licensing [55]	Idaho Naturopathic Medical Board	Naturopathic medical doctor
Kansas (2002)	Kansas Statutes Annotated Chapter 65, Article 72 Naturopathic Doctors [56]	Kansas State Board of Healing Arts	Naturopathic doctor
Maine (1996)	Maine Revised Statutes Title 32, Chapter 113-B: Complementary Health Care Providers. Subchapter 3: Naturopathic Medicine Licensing Requirements and Scope of Practice [57]	State of Maine Complementary Health Care Providers Board	Naturopathic doctor
Maryland (2014)	Code of Maryland (Statutes), Article – Health Occupations, Title 15, Section 14-5F [58]	Maryland Department of Health Maryland Board of Physicians	Naturopath Naturopathic doctor
Massachusetts (2017)	Session Laws, Acts (2016), Chapter 400 An Act Establishing a Board of Registration in Naturopathy [59]	Board of Registration in Naturopathy	Naturopath Naturopathic doctor
Minnesota (2008)	Minnesota Statutes, Chapter 147E. Registered Naturopathic Doctors [60]	Minnesota Board of Medical Practice	Naturopath Naturopathic doctor
Montana (1992)	Montana Code Annotated 2019, Title 37, Ch 26 Naturopathic Physicians 2019 [61]	Montana Department of Labor & Industry Business Standards Division: Board of Alternative Health Care	Naturopath Naturopathic doctor
New Hampshire (1995)	New Hampshire Statutes Occupations and Professions, Chapter 328-E: Naturopathic Health Care Practice [62]	New Hampshire Office of Professional Licensure and Certification: Naturopathic Board of Examiners	Naturopath Naturopathic doctor
New Mexico (2020)	Naturopathic Doctors' Practice Act [63]	New Mexico Medical Board	Naturopath Naturopathic doctor
North Dakota (2011):	North Dakota Century Code, Title 43, Chapter 43-58 Naturopaths [64] North Dakota Administrative Code, Title 112, Article 112-02 Naturopathic, 2013 [65]	North Dakota Board of Integrative Health Care	Naturopath Naturopathic doctor
Oregon (1927)	Oregon Revised Statues 2019 Edition Chapter 685 — Naturopathic Physicians [66]	State of Oregon Board of Naturopathic Medicine	Naturopath Naturopathic doctor
Pennsylvania (2016)	Naturopathic Doctor Registration Act. Act No. 128 [67]	Pennsylvania Department of State: State Board of Medicine.	Naturopath Naturopathic doctor
Rhode Island (2018)	State of Rhode Island, 2017-H5474, Chapter 5-36.1 License of Naturopathy Act of 2017 [68]	Rhode Island Department of Health	Naturopath Naturopathic doctor
US Virgin Islands (2001)	Professions and Occupations. VI Code, title 27, Chapter 4 [69]	Virgin Islands Department of Health: Board of Naturopathic Physicians	Naturopath Naturopathic doctor
Utah (1996)	Utah Code. Table 58. Occupations and Professions. Chapter 1: Division of Occupational and Professional Licensing Act [70]	Utah Naturopathic Physician Licensing Board	Naturopath Naturopathic doctor
Vermont (1996)	Vermont Statutes Annotated, Title 26, Chapter 81: Naturopathic Physicians [71]	Office of Professional Regulation Naturopathic Physician Licensing	Naturopath Naturopathic doctor

State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Washington State (1919)	Revised Code of Washington, Title 18, Chapter 18.36a Naturopathy [72, 73] Washington Administrative Code, Title 246, Chapter 246-836 Naturopathic Physicians [74]	Washington State Department of Health	Naturopath Naturopathic doctor

In addition to these state- and province-based regulators, national organizations that have been established in Canada and the USA to support the regulators' activities, the Federation of Naturopathic Medical Regulatory Authorities (FNMRA) supports the efforts of all the statutory regulators in the USA [75] and in Canada, the Canadian Alliance of Naturopathic Regulatory Authorities (CANRA) has been established with a similar purpose [76].

As outlined in Table 5.8, occupational licensing for the naturopathic workforce operates in seven Member States in Latin America and the Caribbean.

Table 5.8: Legislative instruments, regulators and classes of practitioners regulated in Latin America & the Caribbean

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Chile (2013)	Chile Decree No. 42/2005 [77] Chile Decree No. 5/2013 [78]	Department of Pharmaceutical Policy and Medical Professions of the Division of Healthy Public Policy and Advocacy	(1) Naturópata (2) Holistic Naturopath
Colombia (2007)	Law 1164/2007 Human Talent in Health [79] Law 30/1992 Basics of Higher Education [80]	Not specified	N/A
Cuba (2009)	Ministerial Resolution 261/2009 [81] Decree Law 133/1992 The National System of Scientific Degrees [82]	Regulatory Bureau for Health	N/A
Ecuador (2016)	Organic Health Law 2006 Ministerial Agreement 000037.2016 [83]	National Health Authority	Alternative therapist, Naturopath
Peru (1997)	General Health Law 26842 Title II Chapter 1 Ministerial Resolution 207-2011 MINSA [84]	Not specified	N/A
Puerto Rico (USA) (1999)	(1) Laws of Puerto Rico Title 20, Chapter 80 Board of Examiners of Doctors [20 L.P.R.A. § 2451] [85] (2) Naturopathy & Chapter 80A Board of Examiners of Naturopaths [20 L.P.R.A. § 2501] [86]	Board of Regulators attached to the Department of Health	(1) Naturopathic Doctor (2) Licensed Naturopath
Saint Lucia (2006)	Health Practitioners Act 33/2006 [87]	Medical and Dental Council	Naturopath

Eastern Mediterranean Region

As outlined in Table 5.9, two Member States in the Eastern Mediterranean Region – Saudi Arabia and United Arab Emirates (UAE) – have occupational licensing for their naturopathic workforce.

Table 5.9: Legislative instruments, regulators and classes of practitioners regulated in the Eastern Mediterranean Region

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Saudi Arabia (2009)	Organization of the National Center for Alternative and Complementary Medicine. Cabinet Resolution No. (367) dated 7/11/1430 [88] Ministry of Health Regulations of Complementary and Alternative Medicine Second Edition 1441H (2019G) The Regulation of the National Centre for Complementary and Alternative Medicine.	Kingdom of Saudi Arabia, Ministry of Health, The National Centre for Alternative and Complementary Medicine	Naturopathy
United Arab Emirates (2011)	Unified Healthcare Professional Qualification Requirements [89]	Health Regulatory Authorities in the United Arab Emirates: Ministry of Health Department of Health Abu-Dhabi Dubai Health Authority Health	Naturopath

European Region

As outlined in Table 5.10, nine Member States in the European Region – Albania, Cyprus, Iceland, Germany, Liechtenstein, Norway, Portugal, Romania, and Switzerland – have some form of occupational licensing for their naturopathic workforce, although the legislative, governance and administrative arrangements vary. Switzerland's licensing arrangements for naturopaths are in the process of being implemented across its 26 Cantons.

Table 5.10: Legislative instruments, regulators and classes of practitioners regulated in the European Region

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Albania (2009)	Law on Healthcare Law 10.107 [30.03.2009], Art.20 – regulates treatment not practitioner [90]	Minister of Health	Restricted to medical doctors
Cyprus (2008/2011)	Natural Medicine Act 2008 (Law 33 (I) / 2008) [91] and The Law on Registration of Physicians of Medicine (Amending) Law of 2011 (Law 45 (I) / 2011) [92]	General Council of Alternative and Complementary Medicine	Restricted to medical doctors
Iceland (2012)	NR1220/2012 Regulation on the education, rights and obligations of natural scientists in health care and the conditions for obtaining an operating license [93] Act No 34/2012 on Healthcare Practitioners [94] Recognition under EU Directive 2005/36/EC	Medical Director of Health	Náttúrufræðingur í heilbrigðisþjónustu [naturalist]
Germany (1939)	Law on the professional practice of medicine without approbation as a medical doctor (Heilpraktikergesetz) [95]	State Public Health Authority	Heilpraktiker
Liechtenstein (2008)	Health Act (GesG) [94] Liechtenstein National Law Gazette No. 39. Health Ordinance [GesV] 2008 [96]	Office of Public Health	Naturheilpraktiker
Norway (2003)	Act on Alternative Treatment of Illness Health Personnel Act 1999 [97]	Director of Health Approved Professional Associations ALTBAS Registry [98]	Alternative therapist

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Portugal (2003)	Republica Portuguesa. Law No.45/2003 [99]	Administração Central do Sistema de Saude (ACSS)	Profissão de Naturopata
Romania (2007)	LAW no. 118 of May 2, 2007 [100]	Ministry of Public Health	Not specified
Switzerland (2015)	Federal Constitution of the Swiss Confederation Article 118a [2009] [101] Administered at the Canton level	Organisation of the World of Work Complementary Therapy (OrTra MA) oversees Federal Degree examination NAREG National register	Naturheilpraktiker mit Eidgenössischem Diplom

South-East Asia Region

As outlined in Table 5.11, two Member States in the South-East Asia Region – India and Nepal – have occupational licensing for their naturopathic workforce. In India, national standards for naturopaths are in the process of being implemented in the 29 States and seven Union Territories.

Table 5.11: Legislative instruments, regulators and classes of practitioners regulated in the South-East Asian Region

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
India (1970 / 2014)	Central Council for Research in Yoga & Naturopathy (CCRYN) [102]	Central Council for Research in Yoga and Naturopathy	Naturopath Naturopathic Doctor
Nepal	National Policy on Traditional Medicine [103]	Nepal Health Professional Council	Naturopathic Physician Naturopath

Western Pacific Region

As outlined in Table 5.12, three Member States in the Western Pacific Region have occupational licensing for their naturopathic workforce – the Cook Islands, Malaysia, and Samoa. Malaysia's regime is still in the process of implementation.

Table 5.12: Legislative instruments, regulators and classes of practitioners regulated in the Western Pacific Region

Member State (Year licensing first enacted)	Legislative instrument	Regulator	Class of person registered or licensed
Cook Islands (2013)	Ministry of Health Act [104]	Ministry of Health	Naturopath
Malaysia (1971)	Act 775 Traditional and Complementary Medicine Act 2016 [105]	Traditional and Complementary Medicine Council (administered within the Ministry of Health)	No titles gazetted to date. Recognized practice areas include Traditional Indian Medicine. Prescribed qualifications for registration include 'Yoga and Naturopathy'
Samoa (2014)	Allied Health Professions Act [106]	Allied Health Professions Council	Naturopath

Key features of occupational licensing laws

The legislative frameworks and the details contained in the statutory registrations vary across WHO Regions and within countries. Table 5.13 lists key features of the occupational licensing arrangements in two Member States in the African Region (Nigeria and South Africa) and two in European Region (Switzerland and Portugal) and Table 5.14 sets out key features of the occupational licensing arrangements in four Member States in the Region of the Americas – Canada (the province of Ontario), Chile, Puerto Rico, and the United States (the State of Oregon).

Table 5.13: Key features of occupational licensing laws for naturopaths in two Member States in Africa & two Member States in Europe

Key feature	African region		European region	
	South Africa	Nigeria	Switzerland	Portugal
Legislative instrument	The Allied Health Professions Act [63 of 1982] [35]	Medical and Dental Practitioner's Act. Decree No 78 [34]	Federal Constitution of the Swiss Confederation Article 118a [2009] [101]	Republica Portuguesa. Law No.45/2003 [99] Republica Portuguesa. Law No.71/2013 [107]
Regulator	Professional Board for Homeopathy, Naturopathy and Phytotherapy	The Medical and Dental Council of Nigeria (MDCN)	The Swiss Alternative Medicine Organization [OrTra MA] an umbrella organization of 11 professional associations under the supervision of the State Secretariat for Education, Research and Innovation (SERI). The Swiss Red Cross is responsible for undertaking academic equivalency assessment and naturopaths/NDs are listed on a national register of health professionals termed Nationales Register der Gesundheitsberufe (NAREG) [108]. Implementation of regulation is in process at the Canton level.	Administração Central do Sistema de Saude (ACSS)
Professions regulated	Acupuncture, chiropractic, naturopathy, phytotherapy, therapeutic massage therapy, Chinese medicine, Ayurveda, homeopathy, osteopathy, therapeutic aromatherapy, therapeutic reflexology, Unani-Tibb	Naturopathy, homeopathy, acupuncture, osteopathy	The Naturopath Degree is divided into four specialties: European Traditional Medicine, Traditional Chinese Medicine, Ayurvedic medicine and Homeopathy [109, 110].	Acupuncture, chiropractic, osteopathy, phytotherapy, naturopathy, traditional Chinese medicine and homeopathy
Reserved Titles	Naturopath	Medical Practitioner	Naturopathic Practitioner with Federal Diploma [101]	Naturopath [111]
Entry requirements	**Educational requirements:** a three-year degree in basic medical sciences with a two-year specialization in naturopathy from the University of the Western Cape	**Educational requirements:** Bachelor of Medicine and Surgery Internship requirements	**Educational requirements:** training in excess of 4,250 hours [101]	**Educational requirements:** training of at least 240 credits over the duration of eight semesters, totaling around 6,000 hours

Table 5.13: Key features of occupational licensing laws for naturopaths in two Member States in Africa & two Member States in Europe continued

Key feature	African region		European region	
	South Africa	Nigeria	Switzerland	Portugal
Restrictions on scope of practice	Naturopaths are not allowed to compound and dispense – restricted to homeopaths and phytotherapists; Naturopaths can only prescribe proprietary herbal products; Naturopaths cannot prescribe homeopathy except for tissue salts Naturopaths cannot inject or draw blood. Letters of indisposition (sick notes) may be issued	None identified	Determined at a Canton level [112]	None identified
Scope of Practice	The following acts specifically pertain to the profession of a naturopath: (a) The physical examination of any person for the purpose of diagnosing any physical defect, illness or deficiency in such person. (b) The treatment or prevention of any physical defect, illness or deficiency in any person by- (i) light therapy; (ii) hydrotherapy; (iii) thermal therapy; (iv) acupuncture or acupressure therapy; (v) electrotherapy; (vi) massage therapy; (vii) exercise therapy; (viii) vibration therapy; (ix) reflex therapy; or (x) remedies, dietary advice or dietary supplementation. Naturopathic can prescribe vitamins except injectable forms of vitamin A and B12; can prescribe substances intended for exclusive use on skin except homeopathic preparations; can prescribe minerals except homeopathic; can prescribe tissue salts.	Medical practice with additional use of alternative medicine – naturopathy, acupuncture, osteopathy	Naturopaths/naturopathic doctors can treat patients with acute, chronic, somatic or psychosomatic problems. Scope includes dietetic and nutrition, manual therapies, detox therapy, phytotherapy, therapy using medication, vital substances and the diagnostic tools (e.g., laboratory testing and iridology)	Naturopaths undertake practices that support health promotion, disease prevention, health maintenance and restoration of health. Naturopathy consists of a holistic, energetic and natural approach to the human being, through methods of diagnosis, prescription and naturopathic treatments – nutrition, dietary counseling and dietary supplementation, guidance on lifestyles, phytotherapy, homeopathy, hydrotherapy, geotherapy, manipulation therapies, use of energy therapies. Uses physical agents and energy methods, based on Western and Eastern philosophies, through which it diagnoses, treats and cares for patients, using systems and practices that are based on treatments and care of bio-psychophysiological and hygienic action, which aim to rebalance the organic functions and other abnormal situations for health maintenance and to support recovery to achieve self-healing.
Complaints & discipline	Yes	Yes	Complaints received/actioned by Canton Health Authority	Yes

Table 5.14: Key features of occupational licensing laws for naturopaths in four Member States in the Region of the Americas

Key feature	Ontario (Canada)	Oregon (USA)	Chile (Latin America)	Puerto Rico (The Caribbean)
Year first regulated	1925	1927	2012; 2004	1997
Legislative instrument	Naturopathy Act 2007 [43] Health Professions Procedural Code in Schedule 2 of the Regulated Health Professions Act 1991	Oregon Revised Statutes Chapter 685 – Naturopathic Physicians Occupations and Profession [66]	Decree 5 recognizes naturism and regulates Naturopathy as an Auxiliary Health profession [2013][78] Decree 42 Approved Regulations for the Exercise of Alternative Medical Practices such as Auxiliary Health Professions and the Venues in which they are carried out [2005] [77]	1: Laws of Puerto Rico Title 20, Chapter 80 Board of Examiners of Doctors [20 L.P.R.A. § 2451] [85] 2: Naturopathy & Chapter 80A Board of Examiners of Naturopaths [20 L.P.R.A. § 2501] [86]
Name of Regulator	College of Naturopaths of Ontario	Oregon Board of Naturopathic Medicine	Ministry of Health	Two boards under the Ministry of Health: 1: The Puerto Rico Board of Examiners of Doctors [of] Naturopathy 2: The Puerto Rico Board of Examiners of Naturopaths
Governance arrangements	15 Council Members 8 NDs and 7 public members	7 Council Members 5 NDs and 2 public members	License and oversight provided by Regional Ministerial Secretariat of Health	1. ND Council – 5 Council Members – 3 NDs; 1 MD; 1 public member 2. Naturopaths Council – 7 Council Members – 5 Licensed naturopaths, 1 physician who practices naturopathy and 1 public member
Qualification requirements	**Educational requirements:** Graduation from a CNME-accredited school (4,000+ hours post University graduation) Clinical training program in Naturopathic Medicine (NM) Completion of entrance to practice examination Fit-to-practice assessment Internship: 1,200 hours	**Educational requirements:** Graduation from a CNME-accredited school (4,000+ hours post University graduation) Clinical training program in NM Completion of entrance to practice examination Fit-to-practice assessment Internship: 1,200 hours	**Educational requirements:** The regulation in Chile stipulates specific courses that must be included and a minimum requirement of 1600 hours, yet the two naturopathic schools recognized by the Chilean government exceed this and provide naturopathic programs of 2400 hours.	**1: Naturopathic Doctor.** Graduation from a CNME-accredited school (4,000+ hours post University graduation) Clinical training program in NM Completion of entrance to practice examination Fit-to-practice assessment **Internship:** 1,200 hours **2: Licensed Naturopaths:** 90 credits approved by the Council on Higher Education of Puerto Rico. Postgraduate studies in naturopathic science in a university institution. Entrance exam given by the Board.

Table 5.14: Key features of occupational licensing laws for naturopaths in four Member States in the Region of the Americas continued

Key feature	Ontario (Canada)	Oregon (USA)	Chile (Latin America)	Puerto Rico (The Caribbean)
Reservation of Title	Yes Naturopath, Naturopathic Doctor	Yes Naturopathic Doctor, ND, Naturopathic Physician	Yes – two levels *Naturopatas* [naturopath] *Holistic naturopath* [T&CM therapist]	Yes – two levels Doctor of Naturopathy (ND) Licensed Naturopath (Nat)
Scope of Practice defined in law/ regulation	Yes	Yes	Yes	Yes, for both ND and Licensed Naturopath
Identified Scope of Practice	The practice of naturopathy is the assessment of diseases, disorders and dysfunctions and the naturopathic diagnosis and treatment of diseases, disorders and dysfunctions using naturopathic techniques to promote, maintain or restore health.	Naturopathic medicine is a unique and distinct system of health care that emphasizes the use of prevention and natural therapeutics. The doctors are trained to serve as primary care general practitioners who engage in the prevention, diagnosis, management, and treatment of both acute and chronic health conditions. Oregon naturopathic physicians may prescribe medication from one of the most comprehensive formularies in the nation. Naturopathic physicians may perform minor surgery, practice natural childbirth, and administer injection therapies, giving Oregon NDs an expansive scope of practice.	Evaluate people's health status, using the knowledge and techniques of Naturopathy. Indicate and administer therapies related to the agents of nature and procedures typical of naturism. Advise on Naturopathy techniques to maintain or optimize the health of healthy people and a healthy lifestyle. In the course of their activities, the naturopath can use food, food supplements, food for athletes, traditional herbal medicines, direct selling phytopharmaceuticals and homeopathic preparations, in the event of having training as a homeopathic therapist. Help in the medical treatment granted by conventional medicine. Collaborate with the health authority in health promotion programs in the context of their competences.	**1: Naturopathic Doctors** **(a)** Recommend or prescribe natural products that do not require a medical prescription. **(b)** Make evaluations or diagnoses and provide treatments and therapies proper to naturopathic medicine. **(c)** Listing of therapeutic modalities **(d)** Listing of the diagnostic tests **2: Naturopaths** are engaged in the prevention of diseases and to the restoration and maintenance of the health. *Condensed from SOP:* **(a)** Lifestyle education and the use of natural therapies. **(b)** Collaboration: Interact and participate with physicians and other health professionals. **(c)** Recommend or prescribe natural or integral feeding and other natural, non-toxic products that do not require a medical prescription. **(d)** Use of use assessment methods germane to naturopathy.

Table 5.14: Key features of occupational licensing laws for naturopaths in four Member States in the Region of the Americas continued

Key feature	Ontario (Canada)	Oregon (USA)	Chile (Latin America)	Puerto Rico (The Caribbean)
Authorized Acts	Putting an instrument, hand or finger beyond the labia majora but not beyond the cervix. Putting an instrument, hand or finger beyond the anal verge but not beyond the rectal-sigmoidal junction. Administering, by injection or inhalation, a prescribed substance. Performing prescribed procedures involving moving the joints of the spine beyond the individual's usual physiological range of motion using a fast, low amplitude thrust. Communicating a naturopathic diagnosis identifying, as the cause of an individual's symptoms, a disease, disorder or dysfunction that may be identified through an assessment that uses naturopathic techniques. Taking blood samples from veins or by skin pricking for the purpose of prescribed naturopathic examinations on the samples. Prescribing, dispensing, compounding or selling a drug designated in the regulations.	(a) Administering, dispensing or writing prescriptions for drugs (recognized by US Pharmacopeia, National Formulary, US Homeopathic Pharmacopoeia or another drug compendium). (b) Recommending the use of specific and appropriate over-the-counter pharmaceuticals. (c) Administering anesthetics or antiseptics in connection with minor surgery as defined in ORS 685.010. (d) Ordering diagnostic tests. (e) Using radiopaque substances administered by mouth or rectum necessary for Roentgen diagnostic purposes. (f) Administering substances by penetration of the skin or mucous membrane of the human body for diagnostic, preventive or therapeutic purposes.	None specified	None specified except NDs can use physicians' diagnostic methods for diagnosis of physical conditions.

Table 5.14: Key features of occupational licensing laws for naturopaths in four Member States in the Region of the Americas continued

Key feature	Ontario (Canada)	Oregon (USA)	Chile (Latin America)	Puerto Rico (The Caribbean)
Standards of Practice (SOP)	Website lists 31 Standards of Practice[1]	Website lists 14 Standards of Practice[2]	Website lists four Standards of Practice[3]	For NDs the website lists two Standards of Practice[4] For naturopaths listing of restrictions.
Complaints & Discipline Process	Yes	Yes	Yes	Yes
Quality Assurance of Practice Process	Yes	Yes	Yes	Yes
Links to other statutory laws included in the regulation for the naturopathic workforce.	Regulated Health Professions Act, 1991 Canadian Charter of Rights and Freedoms Drug and Pharmacies Regulation Act Health Care Consent Act Laboratory and Specimen Collection Centre Licensing Act Ontario Human Rights Code Official Languages Act Occupational Health and Safety Act Personal Health Information Act	DEA Drug Schedules Formulary Laws & Rules Division 60 Formulary Compendium Exclusions OAR 850-060-0223 Formulary Compendium Classifications OAR 850-060-0226	Health Code Penal Code	None identified

[1] Standards of Practice include Core Competencies, Code of Ethics, Acupuncture, Advertising, Collecting Clinical Samples, Communicating a Diagnosis, Compounding, Conflict of Interest, Consent, Delegation, Dispensing, Dual Registration, Emergency Preparedness, Fees & Billing, Infection Control, Inhalation, Injection, Internal Examinations, Intravenous Infusion Therapy, Manipulation, Performing Authorized Acts, Point of Care Testing, Prescribing, Recommending Non-Scheduled Substances, Record Keeping, Requisitioning Laboratory Tests, Restricted Titles, Scope of Practice, Selling, Therapeutic Relationships and Professional Boundaries

[2] AANP Code of Ethics, Advertising, Child Abuse, Communicable Disease, Continuing Professional education, Drug listing classification, Prescription of Controlled Substances, Education & Reporting Requirements for Injection & Intravenous Therapy, Elder Abuse, Natural Childbirth Certification, Oregon Acute Opioid Prescribing Guidelines, Telemedicine Guidelines, Telemedicine: Treating patients in states other than Oregon

[3] Clinic Facilities, Diagnosis and referral, Record Keeping, Title protection

[4] Title protection, Diagnosis and referral

Regulation of the use of natural health products by naturopaths

The naturopathic workforce employs a range of therapeutic modalities as part of naturopathic practice including herbal medicines, nutraceuticals, homeopathy, essential oils, and other natural health products [8, 113]. Also, the naturopathic workforce in some Member States is regulated as primary care clinicians and their scope of practice may also include the use of intravenous therapies, regenerative injection therapies and pharmaceutical drug prescription rights [114]. Access to the tools of trade for naturopathic practice is a necessary consideration both when regulating natural health products and the naturopathic workforce.

According to the *WHO Global Report on Traditional and Complementary Medicine 2019,* 110 WHO Member States indicated the use of herbal medicine and 100 the use of homeopathy. In comparison, only 24 of those same Member States indicated that they regulate the use of herbal medicine and 22 indicated that they regulate the use of homeopathy [2].

The *2015 international WNF survey* indicated the modalities and treatments that were commonly used as part of naturopathic care around the globe. An excerpt of the applicable data from this survey is presented in Table 5.15 outlining those natural health products commonly used in naturopathic practice and the rate of use and access as reported by naturopathic organizations [8].

The findings from the 2015 WNF survey have been supported by the 2016 WNF survey of naturopathic educational institutions, the International Survey of Patients and Practices conducted in 2021 (see Chapter 9) [113], and the Access and Equity in Naturopathic Care survey of naturopathic community clinics (see Chapter 12) [21].

Table 5.15: Reported use of natural health products as reported by naturopathic organizations.

	Allowed in all regions (doesn't require legislation)	Allowed in all regions (under legislation)	Allowed in some regions	Allowed with additional training	Restricted in some way	Prohibited	Not applicable
Clinical nutrition/nutraceuticals	66.67%	13.33%	0.00%	6.67%	13.33%	0.00%	0.00%
Herbal medicine	66.67%	20.00%	0.00%	0.00%	13.33%	0.00%	6.67%
Homeopathy	64.71%	11.76%	0.00%	5.88%	5.88%	11.76%	0.00%
Pharmaceutical prescribing	16.67%	25.00%	8.33%	8.33%	8.33%	33.33%	16.67%
Bio-identical hormone prescribing	9.09%	18.18%	9.09%	9.09%	18.18%	36.36%	18.18%
Intravenous Therapy	25.00%	16.67%	8.33%	8.33%	16.67%	16.67%	16.67%

Discussion

This chapter demonstrates the diversity in the types of occupational regulation that is applied in those Member States with a naturopathic workforce. While all four occupational regulation types are evident, the most common type is occupational licensing or statutory registration. The least common type is negative licensing which is a relatively new type of regulation as applied to health occupations and found in only one Member State. Voluntary certification is found in 21 Member States and co-regulation is found in four.

The following section discusses key findings from the analysis, in particular: the trends in occupational licensing of the naturopathic workforce; whether voluntary certification and other regulatory models provide sufficient public protection; concerns with occupational licensing laws that restrict the naturopathic workforce from practicing, responding to the structure of the naturopathic workforce, ensuring access to the naturopathic tools of trade, and the preferred type of regulation for the naturopathic workforce.

Trends in occupational licensing or statutory registration of the naturopathic workforce

While the *WHO Global Report on Traditional and Complementary Medicine 2019* reported nine Member States with occupational licensing of the naturopathic workforce [2], our analysis indicates 34 Member States spanning all six WHO Regions have some form of occupational licensing or statutory registration. The reason for this difference in reported numbers is unclear and may have been impacted by the self-reporting nature of the WHO report. The difference may also reflect the difficulties in identifying whether naturopathy is a licensed profession when the legislative mechanism used is that of an 'umbrella law' and a multi-profession regulatory regime is in operation, or where regulation of health professionals occurs at a sub-national (e.g., State, Provincial, Cantonal) rather than a national level.

Another contributing factor may be that Member States are enacting new licensing laws for the naturopathic profession, at an accelerating rate. For instance, since 2010, eight Member States have introduced occupational licensing for their naturopathic workforce and in the federated jurisdiction of the USA eight US States/Districts have also introduced occupational licensing during this same timeframe.

The number of occupational licensing regimes is highest in the African Region (ten Member States), the Region of the Americas (nine Member States) and in the European Region (eight Member States). This is perhaps not surprising given the European tradition of naturopathy was exported via colonization to the Americas, and African countries have a strong tradition of herbal medicine which has facilitated the growth of the naturopathic profession in that region. Factors that impact occupational licensing implementation include level of professional formation in the Member State, national versus sub-national implementation, the legislative mechanism enacted and regulatory best practices. Below are some examples.

Professional formation

The high proportion of jurisdictions in Canada and the USA with occupation licensing may reflect the fact that the naturopathic profession has a high level of professional formation and has been actively campaigning for licensing of the naturopathic workforce for over three decades [115].

Close to half the USA States/Districts, and half the Canadian Provinces/Territories have occupational licensing regimes. These are generally well-developed with all the key statutory functions expected present including enforceable standards for entry to practice, maintenance of a public register of qualified practitioners, title protection, powers to assess and accredit education programs for entry to practice, defined standards of practice, power to deal with complaints and discipline and offenses for unauthorized practice.

There are national and provincial/state professional associations and there is a strong institutional base for collaborative and cooperative work across jurisdictions, with bodies such as the Association of Accredited Naturopathic Medical Colleges (AANMC) [116], the Council on Naturopathic Medical Education (CNME) [117] and the North American Board of Naturopathic Examiners (NABNE) [118] which support the high standard of naturopathic education in this region. Also, the Federation of Naturopathic Medical Regulatory Authorities (FNMRA) [75] and the Canadian Alliance of Naturopathic Regulatory Authorities (CANRA) [76] provide an opportunity for the naturopathic regulatory colleges to support each other.

These organizations have played an important role in fostering collaboration and improving standardization of naturopathic education and regulatory practice in these jurisdictions. The naturopathic organizations in Canada and the USA also work together aiding licensure efforts in unlicensed jurisdictions through provision of resources, infrastructure, and policy capacity.

National versus sub-national implementation

In some federated jurisdictions such as India and Switzerland, national laws have been enacted to establish occupational licensing for the naturopathic workforce with implementation of administration proceeding at the sub-national (state or canton) level. Likewise, Australia's negative licensing arrangements are being implemented at the sub-national (state and territory) level. While federated systems of government have provided the opportunity for innovation and trialing of new regulatory approaches, the diffusion of innovation generally takes time and results in a patchwork of regulation across sub-national governments, often with variability in standards [11].

Legislative mechanism

The legislative mechanism used by Member States to enact occupational licensing for the naturopathic workforce varies. For instance, in some Member States there is a specific law enacted for the naturopathic profession (i.e., a 'Naturopathy Act') whereas in other Member States naturopaths/naturopathic doctors are licensed under an umbrella law.

In some cases, the umbrella law is a generic 'health professions law' with regulations enacted for each participating profession (such as in the Provinces of Alberta and British Columbia in Canada). In others, the naturopathy profession is regulated alongside other allied health or traditional medicine professions (such as in Samoa and South Africa).

In most Members States (28 out of 34, or 82%), the legislative mechanism used is an umbrella law. There are some advantages of this approach for governments, however, this type of legislative mechanism may not sufficiently include naturopathic-specific expertise in regulatory decision-making and therefore may not support effective regulation. For instance, there may be no naturopaths/naturopathic doctors on the governing board of the regulator and there may be little, or no naturopathic-specific material published on entry to practice qualifications, scope of practice or standards of practice. Effective profession-specific input into regulatory decision-making is a key foundation for good regulation.

Whatever legislative mechanism is used, the WNF considers it critical to ensure sufficient naturopathy expertise is brought to bear in regulatory decision-making, that is, in setting standards for entry to practice, in setting and applying accreditation standards to assess education programs and providers, in monitoring professional practice and in dealing with complaints and discipline that are not only critical and rigorous, but appropriate, responsive and representative for the profession being regulated. Ensuring the principle of peer review underpins the system should safeguard standards, promote trust, and better protect the public.

Best practice regulation

Legislative frameworks (laws, regulations, codes, guidelines) require regular review and updating to ensure they remain fit for purpose. The regulations governing the naturopathic workforce are no different. They should be regularly reviewed to ensure that they support safe and effective naturopathic practice, foster a flexible, responsive and sustainable naturopathic health workforce and enable innovation in education and service delivery. As the profession evolves and standards of training increase, licensed naturopaths should have opportunities to expand their scopes of practice in accordance with their competencies.

Voluntary certification, co-regulation and negative licensing may not provide sufficient public protection

Voluntary certification, co-regulation and negative licensing systems can be effective mechanisms to offer some protection for the public from unqualified, unfit, or unethical practitioners of naturopathy, but they may have serious limitations.

Voluntary certification and co-regulation

Relying solely on voluntary certification can be problematic where the practices of a health profession present potentially serious risk to public health and safety.

> *Where there are no statutory powers to restrict entry to a profession, those with minimal or no qualifications can set up practice and use the titles of the profession without meeting acceptable minimum standards of training and practice. This has led to widely varying standards of practice and levels of qualifications, substantial fragmentation of these professions, and no widely recognized and accepted peak bodies [118].*

The oversight of voluntary certification and co-regulation falls to the professional association/s. Although this maximizes profession-specific expertise, it also presents challenges. Most associations rely on volunteers drawn from the profession and may lack access to the necessary skills, resources and capacity to handle the complexity associated with effective regulation, particularly as they are generally excluded from the support mechanisms and collaborative activities associated with statutory schemes [119, 120]. Conflicts of interest in the operation of voluntary certification can compromise public protection, for instance, where the professional association is responsible for representing its members' interests and at the same time accrediting programs that are tied to membership and dealing with complaints about members.

A voluntary certification system that is established and governed at arms-length from the member-based professional association/s goes some way to addressing these shortcomings. For example, in Australia a voluntary certification regime has been established with its principal mandate to protect public health and safety. It operates independently of the naturopathy professional associations, while the associations continue to represent the interests of their members and lobby for statutory registration [119, 120]. However, such models are often constrained by poor resourcing and policy capacity, and as with all voluntary certification, the standards apply only to those practitioners who choose to opt-in.

Seven key elements of an effective self-regulation (voluntary certification) system have been identified [118]. While many of these elements are evident in the voluntary certification regimes detailed in Table 5.3, such systems generally lack two important elements:

- Effective incentives for practitioners who choose not to be part of the voluntary scheme to comply with profession-specific codes of practice and sanctions for non-compliance.
- Strong and consistent institutional support for the system from the profession, educational institutions, employer bodies and government.

Professional associations may have difficulty establishing and enforcing practice standards and guidelines via self-regulatory measures alone [121]. For instance, a United Kingdom study found only one of eleven unregulated professions had evidence-based guidelines compared with 100 percent of the regulated health professions [122].

Another deficiency with voluntary certification or co-regulation relates to the right of practitioners to use (prescribe or administer) restricted medicines. In some Member States, the legal right to prescribe some herbal

medicines is limited to medically qualified or registered practitioners. Hence access to herbal medicine and natural health products listed on specific schedules is often restricted and access to high-dose natural health products (e.g., Vitamin D above 1,000 IU) may be prohibited altogether for naturopaths [118].

Case Example: Voluntary certification of naturopaths in Australia

In the absence of statutory registration, a voluntary register – the Australian Register of Naturopaths and Herbalists (ARONAH) – was established by the profession to set minimum standards of education and practice for naturopathy and Western herbal medicine. The function of ARONAH mirrors statutorily regulated Boards administered by the Australian Health Practitioner Regulation Authority (AHPRA) of the National Registration and Accreditation Scheme and it is intended as a stepping-stone to statutory registration for these professions. ARONAH competencies and standards for naturopathic training reach beyond Australia with New Zealand increasingly looking to a trans-Tasman agreement in education standards [15].

With voluntary certification or co-regulation, the naturopathic workforce may be overlooked or actively excluded from participation in national healthcare policies or in communications from government to the general healthcare workforce (such as public health notifications), which are often limited to professions that are regulated [123]. This is highly problematic, particularly during health crises, as naturopaths, as primary care physicians, need to stay informed of public health directives.

The entirely voluntary nature of this type of occupational regulation remains its key limitation – practitioners can simply choose not to join an association and still practice, even if expelled from an association or non-naturopathic profession for misconduct. Without reservation or protection of title for the naturopathic workforce, few probity checks or minimum standards of education and training can be enforced. This generally results in a lack of recognition and equality compared to other health care professions with occupational licensing or statutory registration.

Without some form of official recognition or oversight, the professional representation is often fragmented with the risk of multiple sets of education and practice standards which results in confusion for the profession and other stakeholders and exacerbates risk to the public. Although there is greater involvement of government under co-regulatory arrangements, the limitations and challenges of co-regulation are similar to those of voluntary certification – a practitioner expelled from an accredited register for misconduct can continue to practice without scrutiny or oversight.

Negative licensing

Compared with occupational licensing, negative licensing is a relatively low-cost form of regulation that provides an effective mechanism to remove unfit practitioners from practice where they commit a serious offense or breach of minimum standards [124]. However, it is largely reactive, with regulatory action triggered by a complaint, usually once harm has already occurred. It does not provide proactive measures such as enforceable minimum qualifications and probity checks for entry to practice, meaning any person may practice an unregulated profession no matter what their level of training or skill [121].

Under a negative licensing regime, the threshold for regulatory action is generally 'serious risk to public health and safety' or commission of a serious criminal offense. This is a high threshold. As a consequence, only the most egregious cases result in a prohibition order. Also, negative licensing schemes do not provide the infrastructure to enable proactive and non-punitive quality assurance. For instance, minimum levels of practitioner training are not enforceable, nor are education programs to assist practitioners to identify and prevent inappropriate practice behaviors – measures that would be expected to prevent recidivism and reduce the risk of breaches by other practitioners [124].

Naturopaths/naturopathic doctors are primary care practitioners, commonly operating in independent private practice. Their scopes of practice in many Member states include practices deemed higher risk if practiced improperly, such as acupuncture, herbal medicine, intravenous therapies, regenerative therapies and other natural therapeutics. As outlined in *Chapter 7, Safety and Risks of Naturopathic Practice,* the risk profile of the naturopathic profession is changing. Factors include increasing interest in natural medicine, co-option of the term "naturopath" by untrained and unqualified persons (some of whom have taken the title to continue practice after being prohibited from practicing regulated professions). Court cases have highlighted the importance of enforceable barriers to entry, particularly given the link between training and safe and effective practice. As such, reliance on accredited voluntary register systems, co-regulation or negative licensing alone does not provide sufficient public protection for consumers of naturopathic services.

Concern with occupational licensing laws that restrict the naturopathic workforce from practice

In a few Member States, such as Albania and Cyprus, occupational licensing laws operate to restrict or prevent a naturopath from practicing their profession unless they are also qualified and licensed as a medical practitioner. Even where such restrictions are not present, regulations that designate naturopathy as a practice rather than a profession – as seen in Cuba and Peru – effectively limit those with specific training in naturopathy from practicing naturopathy as a whole system of health care, and instead encourage naturopathic modalities to be co-opted by other health practitioners [81]. This has constrained the development and integration of the naturopathy profession in Member States with such laws, stifling innovation and preventing realization of the benefits of naturopathic practice.

Such laws operate in ways that are anti-competitive, unreasonably restrain trade and are contrary to regulatory best practice [125]. They also deny members of the public the right to access the health services of their choice. Restrictions of this nature can be considered contrary to the intent of the Declaration of Astana and WHO policies designed to support the integration of T&CM practitioners into the mainstream public health systems, as well as the development of paramedical, direct-entry and graduate entry (for other health professions) education programs for all health professions.

Responding to the structure of the naturopathic workforce

The design of an occupational licensing law must be based on an understanding of the profile of the naturopathic workforce and the differences in educational attainment of its members. This is particularly important in jurisdictions where there has been a long history of a naturopathic practice and where professionalization of naturopathy is well progressed. When a licensing scheme is introduced for the first time, there must be provision to bring into the scheme those practitioners who qualified some years ago when educational options were more limited and degree level training was not available. This process is known as 'grandparenting' and should specify the broad powers of the regulator to grandparent existing practitioners onto the register based on policies developed in consultation with the profession. The legislation should specify the broad powers of the regulator to grandparent existing practitioners onto the register based on a combination of qualifications and a safe practice record but may also include requiring a practitioner to undertake further training as a condition of registration or requiring an applicant to sit an examination to assess their competence.

Case Example: Naturopaths and Naturopathic Doctors in Puerto Rico

In Puerto Rico both naturopaths and naturopathic doctors are subject to occupational licensing [114]. The legislation limits naturopaths to disease prevention and maintenance of well-being [85] whereas the naturopathic doctor has the additional ability to order some laboratory tests, to provide a diagnosis and to treat disease [85]. This dual practice arrangement was implemented in response to arrests of and criminal charges against practitioners of natural medicine for illegally practicing medicine [126]. Court challenges led legislators to declare naturopathy to be a "socially valuable curative practice that is not worthy of criminal repression as an illegal practice of medicine" [127], with transitional arrangements put in place to both decriminalize naturopathy and to develop an academically trained primary-care naturopathic profession [127].

Where a Member States has two levels of naturopathic practitioner (e.g., naturopathic technician and naturopathic doctor), it is appropriate to implement a differentiated register with two levels or divisions – naturopaths and naturopathic doctors – that reflect these different levels of education and training (similar to licensing of nurses and nurse practitioner). This approach provides a more flexible mechanism for bringing the profession into the licensing regime. The research conducted by the WNF indicates that all naturopathic practitioners share common foundational philosophies and principles, with the main differences in educational training related to biomedical knowledge and biomedical assessment and diagnostic skills (outlined further in *Chapter 6: Educational Standards for the Naturopathic Workforce*). Legislation outlining the scope of practice for the naturopathic workforce with 'doctor-equivalent' recognition tends to include controlled acts that are more in line with conventional medical assessment and diagnosis and for treatments that carry a higher risk, in recognition of advanced training in that group. Whereas legislation outlining the scope of practice for non-doctor-equivalent practitioners tends to focus either on the restrictions of practice or on the application of assessment and treatments that are considered low-risk and that are often

within the public domain. Such a distinction is well outlined in Table 5.14 in the legislative framework for the naturopathic workforce in Puerto Rico, where accredited doctoral-level education has been introduced, but arrangements have been put in place to allow existing practitioners to continue practicing.

Ensuring access to the naturopathic tools of trade

The lack of access to natural health products commonly used by the naturopathic workforce can prevent naturopaths/naturopathic doctors from practicing to their full scope. Some Member States, especially in the European Region and in Latin America have placed restrictions on the ability of the naturopathic workforce to access and use their tools of trade, making it difficult for them to practice to the full breadth of naturopathic care and thereby encouraging co-option and anti-competitive practices [10]. Occupational licensing provides a robust and reliable mechanism for suitably trained naturopaths/naturopathic doctors to be authorized to access their tools of trade.

T&CM products are used widely by the public throughout the world [128]. Regulation of these products is an important step towards improving the quality of products globally, to ensuring effectiveness, public safety and in providing consumers access to important information with which to make informed healthcare decisions [129]. Naturopathic researchers around the globe are actively engaged in research on T&CM products and in adding to the growing body of scientific evidence for natural health products.

Profession-specific occupational licensing is the preferred regulatory model for the naturopathic workforce

On balance, profession-specific statutory regulatory mechanisms (such as occupational licensing) appear to be the most appropriate regulatory regime for the naturopathy profession and accords with WHO recommendations that all member states regulate T&CM professions, practices and products [2, 3]. The main reasons for recommending occupational licensing or statutory registration include reservation of title, risks association with naturopathic practice and the flexibility to design a legislative scheme that reflects and supports local naturopathic practice.

Reservation of title

Occupational licensing or statutory registration protects the public by affording reservation of title to naturopaths/naturopathic doctors. Reservation of title, also known as title protection, generally prohibits unregistered persons from using restricted professional titles or pretending to be qualified and registered when they are not. This approach ensures that consumers are able to identify appropriately trained individuals who have undergone probity checks and met entry requirements (i.e., minimum standards of accredited training and education) before providing care to the public.

Risks associated with naturopathic practice

The risks associated with the naturopathic profession (both by virtue of their scope of practice and role in primary health care), necessitate regulatory requirements above and beyond voluntary certification, co-regulation and negative licensing systems. As outlined in *Chapter 7: Safety and Risks of Naturopathic Practice*, there are inherent direct and indirect risks associated with an unqualified individual providing services as a 'naturopath' to the public, and naturopathic titles appear to be more at-risk from co-option by unqualified practitioners due to their high level of recognition by the public, deliberate confusion with 'natural medicine' movements, and alignment with growing consumer preferences for non-pharmacological approaches to disease. This causes confusion for the public and may result in adverse events for the public. Naturopathic practice carries greater risks than many other health professions that are, at least in some Member States, already subject to licensing. More thorough processes of regulatory impact assessment have reached the same conclusion [119]. In some instances, occupational licensing may also regulate the professional scope. The data presented indicate a diversity of approaches to regulating professional scopes of naturopathic practice. Some laws legislate scopes of practice and offenses for unlawful practice, others legislate core practice restrictions or 'restricted acts' that only registered practitioners may carry out.

Various legislative options are available

Occupational licensing can be implemented through either standalone, or 'profession specific' law, or through 'umbrella' law enacted via multi-profession administrative agencies. The trend in health workforce regulation is towards the latter as this approach enables governments to streamline their statute books and better maintain an up-to-date and responsive regulatory framework, as well as encouraging standardization between professions. Regardless of legislative model employed, it is critical that sufficient naturopathic expertise is brought to bear in regulatory decision-making; that is, in setting standards for entry to practice, in setting and applying accreditation standards to assess education programs and providers, in monitoring professional practice and in dealing with complaints and discipline. It is also important to ensure profession-specific requirements – such as minimum standards of naturopathic-specific education and

training – are explicitly incorporated into such schemes. Ensuring the principle of peer review underpins such a system should safeguard standards, promote trust and better protect the public. It is also important to ensure that the professional titles most used by naturopaths in a Member State are reserved by law, and that naturopathic practitioners are authorized to practice to their full scope, in accordance with their training and competencies. Research shows that standards of education and practice are highest and consistency more apparent in countries with regulation [10], and that where such regulation is lacking, research in the naturopathic profession has shown it be counter to the development of consistent standards of education and professional standards, resulting in difficulties in enforcing and sustaining minimum standards of training and practice [119].

Summary

With growing consumer demand for T&CM globally, those T&CM professions widely utilized by the community, such as naturopathy/naturopathic medicine, should be regulated in the same way as other primary care professions [130]. Although some governments have been slower to regulate T&CM practice than T&CM products, there is broad support for such regulation [5] and there are clear benefits to the community [7].

Occupational licensing or statutory registration is the most common form of regulation in the naturopathic profession and is found in 34 of the 108 countries with a naturopathic workforce, while voluntary certification is in place in 21 countries. No occupational regulation, registration or licensure was identified for half of the Member States with a naturopathic workforce. The number of occupational licensing regimes is highest in the African Region (ten Member States), the Region of the Americas (nine Member States) and in the European Region (eight Member States).

The most developed occupational licensing regimes and the broadest scope of practice for the naturopathic workforce exists in Canada and the United States. In most WHO Regions there is diversity in the types of occupational regulation that apply to the naturopathic workforce. In some countries (e.g., DR Congo, Samoa) there is comprehensive legislation but no educational standards or programs, whereas in other countries (e.g., Australia and New Zealand) there are well-established educational standards and degree level university based naturopathic educational programs but no statutory registration. Although significant progress has been made in recent years, there remain many jurisdictions where naturopathic practice is restricted or even prohibited [10].

The current evidence suggests the best outcomes to ensure public safety and access to naturopathic care are achieved through the occupational licensing of the naturopathic workforce. Occupational licensing ensures reservation of title, can effectively address the safety issues associated with naturopathic practice and can be implemented via a range of legislative models in accordance with the requirements of the Member State.

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6 Educational Standards for the Naturopathic Workforce

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HIGHLIGHTS

- There are over 130 naturopathic educational programs, spanning six WHO Regions.
- *Benchmarks for Training in Naturopathy* were first published by the WHO in 2010.
- There are two main types of naturopathic educational programs.
  - Doctorate-level training programs (over 4,000 hours), which represents more than 50% of naturopathic educational programs
  - Practitioner-level training programs (around 2,500 hours)
- There is diversity in naturopathic educational programs in some WHO Regions, especially Europe and Latin America, though there is a trend towards higher naturopathic educational programs globally.

It is essential that the naturopathic workforce be appropriately trained to ensure they can provide safe, effective, and appropriate care to patients. Educational standards are an important step in professional formation and often influence the regulation of the naturopathic workforce. This chapter provides an overview of the analyses conducted by the World Naturopathic Federation (WNF) on the global status of naturopathic education, an overview of naturopathic education by WHO Region, as well as outlining the framework of naturopathic educational programs and the future of naturopathic education globally.

Background on Naturopathic Education

Formal naturopathic educational programs have been in existence for over 100 years. The first educational institution specifically focused on naturopathic education was established in New York City, USA in 1901 [1]. Further expansion of naturopathic education took place in Europe – first in Spain in 1925 [2] and Germany [3] and the United Kingdom [4] in 1936. Naturopathic medical training has been offered in India since the 1950's and has been in Latin America and the Caribbean since 1958 with the first school in that Region being established in Chile. In Australia the oldest and still existing naturopathic school, Southern School of Natural Therapies (SSNT), was established in 1961 in Melbourne. Since 2000 there has been a tremendous growth in the interest in naturopathy and naturopathic medicine which has resulted in significant increase in the number of naturopathic educational programs around the world [5].

Government-recognized standardization of naturopathic education has been in place since 1978 in both North America and in India. In the USA, the Council on Naturopathic Medical Education (CNME), an accrediting agency for doctoral programs in naturopathic medicine (ND programs) that exceed 4000 hours was established in 1978 to ensure consistency of naturopathic medical educational programs in Canada and the USA. In India, naturopathic educational programs are overseen by the Central Council for Research in Yoga & Naturopathy (CCRYN), an autonomous institution for Research and Development in Yoga & Naturopathy, under the Societies Registration Act, 1860. CCRYN is fully funded by the Ministry of AYUSH, Government of India. The objectives of CCRYN include undertaking any educational, training, research and/or other programmes in Yoga & Naturopathy. The naturopathic programs under CCRYN include a 5 ½ year undergraduate medical degree in yoga and naturopathy with graduates earning the title Bachelor of Naturopathy and Yogic Studies (BNYS) [6, 7].

In 2010 the WHO published the *Benchmarks for Training in Naturopathy* that states that the minimum educational standards for naturopaths/naturopathic doctors consists of a minimum of 1500 hours, including no less than 400 hours of supervised clinical practice [8]. As part of an ongoing effort of the global naturopathic profession to ensure the highest in naturopathic educational standards in their country, many naturopathic professional organizations, through their voluntary certification processes, require specified educational requirements for membership in their association. Recognition of naturopathic educational programs by the WNF requires that the program must meet the *WHO Benchmarks for Training in Naturopathy*, that it offers the highest educational standards set by the professional associations in the respective country and that at least 60% of the naturopathic educational program be offered face-to-face.

Methodology

Since 2016 the WNF has conducted two online surveys of naturopathic educational institutions, has conducted online analyses of naturopathic educational programs, and has collaborated with a naturopathic researcher on an international cross-sectional survey exploring the educational and regulatory status of the naturopathic profession. Figure 6.1 presents an overview of the progression of the methodology used to collect the data informing this chapter.

Between 2014 and 2016 the WNF conducted an online search matching the word "naturopathy" and "naturopathic education" (or the language equivalency for that country) with every country identified within the various WHO Regions. A listing of countries with a naturopathic presence was compiled based on the online search and collaboration with naturopathic organizations globally. A further online search was conducted for those countries that were identified as having a naturopathic workforce to determine if they recognized or delivered naturopathic educational programs.

In 2016 an online survey was sent to 85 naturopathic educational institutions from 49 different countries across six WHO Regions identified as having a naturopathic program that, at a minimum, met the *WHO Benchmarks for Training Naturopathy* [8]. As a follow-up to the 2016 WNF survey, members from the WNF Educational Committee conducted a more extensive online analysis to determine the length and program content of naturopathic educational programs and the credentials associated with each type of program [9].

Between 2016 and 2019, in collaboration with Jill Dunn, a New Zealand based researcher from the University of Technology Sydney, an international cross-sectional survey examining the characteristics of naturopathic education and regulation in countries with a naturopathic workforce was undertaken [10]. Naturopathic organizations were identified by the WNF and complemented by additional interest searches. Using purposive sampling, the online survey was sent to a list of organisations from the WNF's database. Two hundred and twenty-eight (228) naturopathy organizations (educational institutions, professional associations, and regulatory bodies) from forty-six (46) countries were surveyed. Sixty-five (65) organizations spanning twenty-nine (29) countries responded.

Based on the online analyses conducted up to 2020 and the results of the previous surveys, 177 educational institutions / programs around the world were identified as teaching a naturopathic program. In 2020 all naturopathic educational institutions identified were invited to complete a subsequent online survey capturing further details about their naturopathic programs.

Results

Below is a synopsis of the results from the two WNF online surveys, the online analyses conducted by the WNF Educational committee and the results of the international cross-sectional survey of naturopathic education and regulation.

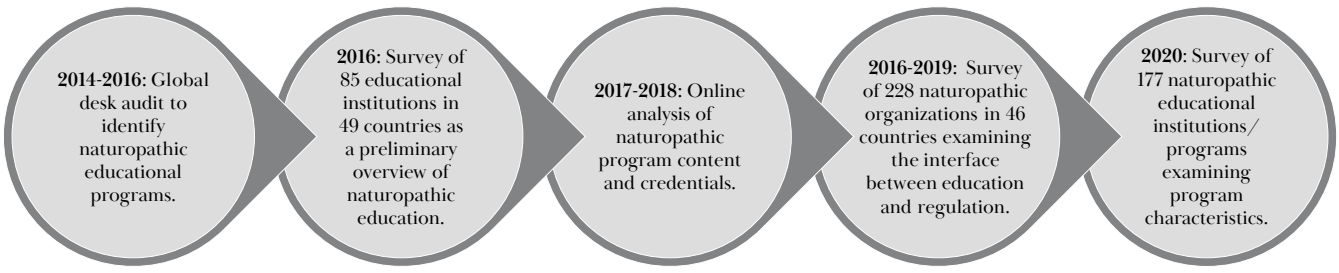

Figure 6.1: Progression of studies examining naturopathic education

Preliminary survey of naturopathic educational programs

Thirty educational institutions from 17 countries across five WHO Regions responded to the 2016 survey with the results published in the *WNF Naturopathic Roots Report June 2016* [7]. The results of the 2020 survey supported many of the results received from the 2015 survey [3] that was sent to professional naturopathic organizations. The areas of consistency included:

- Agreement on the naturopathic philosophies, principles and theories that are foundational to naturopathic practice.
- Agreement on the breadth of naturopathic practice including the assessment and diagnostic skills taught in naturopathic educational programs.
- Agreement on the core therapeutic modalities common to naturopathic practice.

Mapping of Naturopathic Education and Credentials

The results of the detailed online analysis of naturopathic educational programs was published in August of 2018 in the WNF report titled, *WNF Education and Credentials* [9] and outlined the five different naturopathic programs offered globally:

- Diploma in Naturopathy consisting of a 1500-hour program.
- Professional diploma in Naturopathy consisting of a 2500-hour program.
- 3-year professional degree in Naturopathy consisting of a 3500+-hour program.
- 4-year professional degree in Naturopathic Medicine consisting of a 4000+ hour program.
- 2-year naturopathic bridge program for those healthcare providers with another designation wanting to study naturopathy.

International Survey on the Characteristics of Naturopathic Education and Regulation

Sixty-five organizations (educational institutions (n=25), professional associations (n=35), and regulatory bodies (n=5)) from 29 countries responded to the international cross-sectional survey on the characteristics of naturopathic education and regulation. As outlined in Table 6.1, 63.1% of participants reported naturopathic education met or exceeded the WHO education guidelines for naturopathic training with 25 participating schools (80%) reporting programs that exceeded three years and almost 50% indicated programs that were four years in length [10]. Most schools (68%) reported program delivery via a national qualification's framework [NQF], with higher education most apparent (60%). Program delivery via a NQF was reported in Australia, Brazil, Canada, Nepal, NZ, Puerto Rico, South Africa, the UK, and the USA.

According to the international cross-sectional survey, naturopathic education is provided by the private education sector and qualifications accredited by the countries National Qualification Authority or regulatory bodies (e.g., South Africa, Switzerland, and the UK) or voluntary professional organizations (e.g., France and Sweden). Countries in North America [Canada, Puerto Rico and the USA] reported regional accreditation by an independent professional accreditation body – the Council on Naturopathic Education [CNME] [11].

Most naturopathic educational institutions (76%) (n=19) reported some form of external audit – mostly content delivery and assessment, and clinical program audit. The most frequently reported program audits were undertaken by professional associations (33.3%) (n=12), followed by government (30.5%) (n=11) and accreditation bodies (30.5%) (n=11). In Canada, Mexico, Italy and the USA independent accreditation and regulatory bodies were reported, and in Nepal, Portugal, Switzerland, and South Africa dual purpose boards for both accreditation and regulation were reported.

Table 6.1 Characteristics of global naturopathic education, programs, and institutions [10]

Characteristics of naturopathic educational programs (n=25)		
Program length		
2 years	4	16.0
3 years	8	32.0
4 years	12	48.0
Program and Qualification type		
Vocational (Diploma or unspecified qualification level)	10	40.0
Higher education	15	60.0

Undergraduate bachelor's degree [Australia, Brazil, NZ]	6	24.0
Postgraduate qualification [Canada, Puerto Rico, South Africa, UK, USA]	9	36.0
Qualification delivered by national qualifications' framework		
**Yes*	17	68.0
No	8	32.0
Characteristics of naturopathic educational institutions (n=25)		
For profit	15	60.0
Not for profit	9	36.0
State	1	4.0
Year educational institution first offered naturopathic program		
1956-1975	4	16.0
1976-1995	5	20.0
1996-2015	14	56.0
Characteristics of program audits (n=25)		
Schools reporting some type of external audit		
Yes	19	76.0
No	6	24.0
Organizations responsible for external audits1		
Government	11	30.6
Private	0	0.0
Professional association	12	33.3
Accrediting body	11	30.6
Other	2	5.6
External audit type[2]		
Governance/quality assurance	18	19.8
Course content, delivery, and assessment	27	29.7
Clinical processes	20	22.0
Financial	17	18.7
Other	9	9.9
Characteristics of organizational influence on naturopathic education (n=65)		
Perceived influence of organizations (other than educational institution) on delivery and content of education		
National Professional Association	49	75.4
Regional Professional Association	13	20.0
Accreditation Body	27	41.5
Regulatory Board	22	33.8
National Government	18	27.7
Regional Government	6	9.2
Other Health Professionals	14	21.5
Third-Party Funders	13	20.0
Multi-National Body	8	12.3

*Included Italy based on UNI ISO standard; 1. (n=19 [36 responses]); 2. (n=24 [91 responses])

WNF Naturopathic Educational Report

According to the 2021 *WNF Naturopathic Educational Programs Report,* 131 naturopathic educational programs across 29 countries, spanning six WHO Regions have been identified and recognized by the professional naturopathic organizations in their country [5]. Thirty-eight percent (38%) of the naturopathic educational programs reside in Asia, 27% in Europe, 22% in the Region of the Americas (15% in Latin America and the Caribbean and 7% in North America), 9% in the Western Pacific, and 4% are located in Africa [5]. Many of the naturopathic educational programs exist within naturopathic-dedicated educational institutions, yet there is a growing number that exist as part of the formal accredited comprehensive University sector including naturopathic programs offered in Australia, Brazil, India, Mexico, South Africa, Spain, Thailand, and the United States.

Naturopathic Education by WHO Region

The countries that offer a naturopathic educational program and the number of naturopathic programs offered within each WHO Region is shown in Table 6.2.

Figure 6.2 presents the number of naturopathic educational programs currently in operation based on the year they were established and the length of naturopathic program. It indicates that there has been tremendous growth in naturopathic educational programs in the last 40 years. It also demonstrates that the recent growth in naturopathic programs has favoured the longer naturopathic medical educational programs, with the greatest growth evident in the number of naturopathic programs with over 4,000 hours in length.

Table 6.2: Overview of the number of naturopathic educational programs, by WHO Region [5]

WHO Region	Countries with naturopathic educational programs	Total no. of naturopathic educational programs
African Region	Ghana, Nigeria, South Africa, Zambia	8
Region of the Americas	Argentina, Brazil, Canada, Chile, Mexico, Paraguay, Puerto Rico, United States of America, Venezuela, Uruguay	29
Eastern Mediterranean Region	None identified	–
European Region	Belgium, Czech Republic, France, Germany, Italy, Netherlands, Norway, Portugal, Slovenia, Spain, Switzerland, United Kingdom	35
South-East Asia Region	India, Nepal	51
Western Pacific Region	Australia, New Zealand	8

Note: Listing of naturopathic educational programs that meet the WHO Benchmarks for Training in Naturopathy and the highest naturopathic educational standards in their respective country.

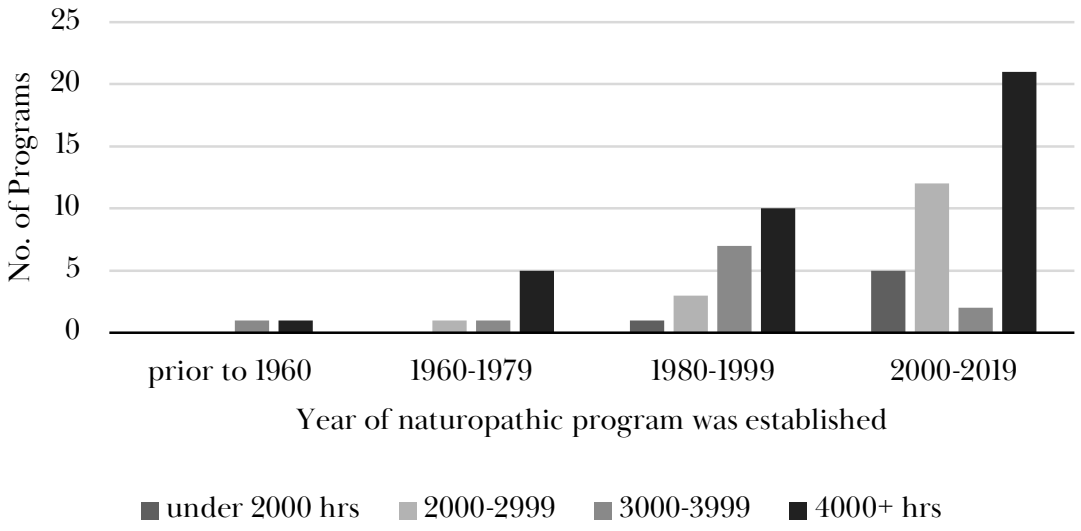

Figure 6.2: Number of naturopathic educational programs based on year of establishment and the number of hours of the program duration

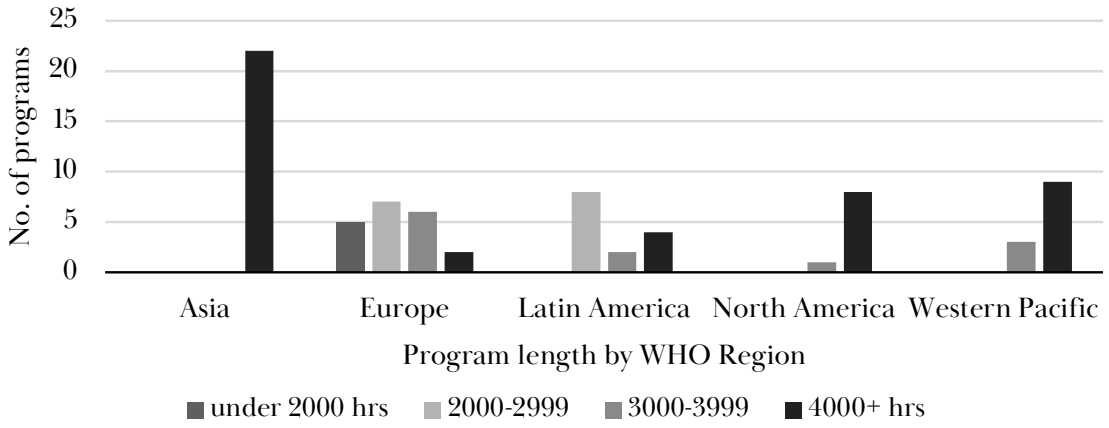

Figure 6.3: Duration of naturopathic educational program, by WHO Region

Diversity in the length of naturopathic programs primarily exists in Europe and Latin America. As seen in Figure 6.3, the naturopathic programs in Asia, North America and Western Pacific are commonly over 4,000 hours in length. The naturopathic educational programs in Europe range from under 2,000 hours to programs exceeding 4,000 hours. Most naturopathic programs that are between 2,000 and 2,999 hours are in Latin America.

Naturopathic Education Program Content

The 2016 and 2020 WNF educational surveys identify that there is a high degree of consistency in the educational framework of naturopathic educational programs, despite the diversity in length of programs in some WHO Regions. The full breadth of naturopathic knowledge covered in naturopathic educational programs includes [9]:

1. Naturopathic history, philosophies, principles, and theories (expanded upon in Chapter 2 & 3)
2. Naturopathic medical knowledge, including basic sciences, clinical sciences, laboratory and diagnostic testing, naturopathic assessment, and naturopathic diagnosis.
3. Naturopathic practice and treatments (expanded upon in Chapter 1)
4. Supervised clinical practice.
5. Ethics and business practices.
6. Research (expanded upon in Section 4).

Figure 6.4 presents an overview of the naturopathic educational program content compared by naturopathic program duration [9].

Due to the integration of naturopathic program content (i.e., nutritional biochemistry as part of both Biochemistry and Clinical Nutrition), it is often difficult to delineate the actual hours in each section. However, the survey results suggest that the time spent on each aspect

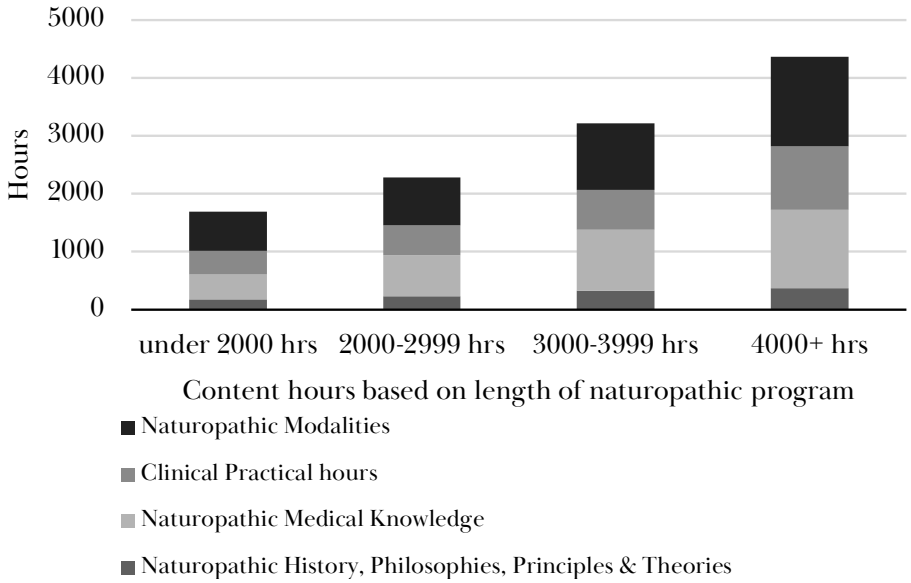

Figure 6.4: Overview of program content based on naturopathic program duration, in hours

of the naturopathic curriculum increases proportionally to the total number of hours; the longer the program, the more time spent in each aspect of the naturopathic curriculum. This is especially true for the contact hours dedicated to naturopathic medical knowledge and naturopathic clinical practice which is generally substantially longer in naturopathic educational programs 4000 hours in length or longer [5].

Discussion

Ensuring the highest in education standards for the naturopathic profession supported by quality assurance processes that engender constant quality improvement is an essential step of professional formation. Educational standards influence or reflect the type of regulation and the legislative framework for the profession, and they impact the ability of the workforce to offer the public safe and consistent effective healthcare. The analyses conducted by the WNF on the global status of naturopathic education has revealed the following strengths and challenges of naturopathic educational programs.

Consistency in the Core Components of Naturopathic Education

The research conducted by the WNF has identified that the full breadth of naturopathic knowledge includes the following six components:

1. Naturopathic history, philosophies, principles, and theories (expanded upon in Chapter 2 & 3)
2. Naturopathic medical knowledge, including basic sciences, clinical sciences, laboratory and diagnostic testing, naturopathic assessment, and naturopathic diagnosis.
3. Naturopathic practice and treatments (expanded upon in Chapter 1)
4. Supervised clinical practice.
5. Ethics and business practices.
6. Research (expanded upon in Section 4).

The naturopathic profession is defined by its philosophies, principles and theories and the WNF surveys have indicated this is an area of global consensus [6, 7]. The details of this have been codified in the *WNF White Paper: Naturopathic Philosophies, Principles and Theories* [12]. The WNF surveys have also substantiated that naturopathic practice is multi-modal and offers diversity in naturopathic modalities, therapies and practices [6, 7]. Based on an international practice survey of the naturopathic workforce, naturopathic visits include the use of four or more therapies [13]. There are a set of core therapeutic modalities and practices that are common to naturopathic care [6, 7, 14]:

- Clinical nutrition and diet modification/ counselling
- Applied nutrition (use of dietary supplements, traditional medicines, and natural health care products)
- Herbal medicine
- Lifestyle counselling
- Hydrotherapy
- Homeopathy, including complex homeopathy
- Physical modalities based on the treatment modalities taught and allowed in each jurisdiction including yoga, naturopathic manipulation, muscle release techniques.

A strength of naturopathy / naturopathic medicine is that it is an integrated system; as such, each jurisdiction incorporates modalities based on regional traditional health care practices and on the level of education and regulation in the region. Modalities integrated into practice include acupuncture, and therapies associated with additional education such as intravenous therapies and prescribing of restricted products.

Naturopathic medical knowledge – including basic sciences, clinical sciences, laboratory and diagnostic testing, naturopathic assessment skills, and naturopathic diagnosis – is the component of naturopathic knowledge with the greatest diversity in the number of hours provided within the various naturopathic programs. When comparing the naturopathic educational programs under 2500 hours versus those that are over 4000 hours there is often a three-fold difference in the number of hours dedicated to naturopathic medical knowledge [5].

The naturopathic educational programs 4000 hours or longer generally include over 1100 hours of supervised clinical practice, whereas the minimum supervised clinical practice hours set by the WHO is 400 hours [5, 8]. Engagement in and use of research is becoming increasingly prevalent in naturopathic care. The role of naturopathic research is expanded upon in Sections 3 and 4 of this HTA.

Diversity in Length of Naturopathic Educational Programs

Diversity in the length of naturopathic educational programs has been a challenge in the professional development of the naturopathic workforce in some WHO Regions, especially in the European Region and the Region of Latin America and the Caribbean.

Since the late 1990s the interest in naturopathic and natural medicine has grown significantly. With this increased interest has come a growth in the establishment of naturopathic educational programs. This has been both advantageous and challenging for the global naturopathic profession. For example, this growth has resulted

in tremendous expansion of naturopathy in India with all schools having defined educational standards set by the Central Council for Research in Yoga & Naturopathy (CCRYN) which includes naturopathic programs that are over 4,000 hours and graduates earn the title Bachelor of Naturopathy and Yogic Studies (BNYS) [15]. It has also resulted in an increase in naturopathic programs, especially throughout Europe and Latin America, with some schools offering programs that are not reflective of the comprehensive knowledge expected in a naturopathic educational program, either through inadequate hours especially as it applies to naturopathic medical knowledge, or a focus on natural medicine education (i.e., the use of natural therapies) without adequate training in naturopathic philosophies and principles.

The minimum standards set for naturopathic education in the *Benchmarks for Training in Naturopathy* and the lack of regulation in many countries has made it difficult to establish or sustain advanced levels of naturopathic education in some WHO Regions, even with professional and public support [16]. Many countries are working to establish naturopathic educational standards to ensure that the integrity of the naturopathic profession and patient safety is paramount. Efforts are being made by many WHO Regions, with the support of the WNF, to ensure a higher level of consistency in naturopathic educational standards with WHO Regions.

Diversity in Naturopathic Credentials

The naturopathic profession includes naturopathic practitioners with the credentials of a traditional naturopath, licensed naturopath, a diploma or degree in naturopathy, naturopathic doctor or naturopathic physician, and a master's degree in naturopathy [9]. This variation in credentials is reflective of external factors influencing the degree structure or model of regulation, the educational standards permitted by local legislation and the educational programs available in the different WHO Regions [9]. In some jurisdictions, such as Australia, even though the standard of education is commensurate to that of a primary care provider, the doctor title is largely unused due to sociocultural preferences among the local naturopathic profession although legally allowed. In other jurisdictions, such as North America, the titles 'naturopathic doctor', 'doctor of naturopathy', 'doctor of naturopathic medicine' or 'naturopathic physician' – referred to as an ND or NMD are often protected [7]. Some naturopathic educational institutions also offer bridge programs, generally around 2,200 hours, for healthcare professionals with a recognized health care designation (i.e., MD or DC) that are seeking dual recognition as a naturopathic doctor [9].

In some jurisdictions the regulations around education credentials are adversely impacting the development of appropriate naturopathic education. For example, in France naturopathic qualifications are ineligible for inclusion in official credentials regardless of appropriate length or content, and in New Zealand government degree requirements limit naturopathic education to three years compared to four-year minimums seen in countries with similar education frameworks such as Australia.

The WNF report titled, *WNF Education and Credentials* outlines the credentials most applicable and most commonly associated with the different naturopathic programs and states [9]:

- The title of naturopath is common to the general naturopathic workforce.
- The title of naturopathic doctor is generally reserved for those in the naturopathic workforce with more advanced naturopathic training.

Limitations in Naturopathic Education in some WHO Regions

In some WHO Regions the naturopathic workforce is limited in their ability to assess and diagnose either due to restrictions in regulation and/or limitations in their naturopathic education. Programs under 2500 hours and those limited by existing regulation often limit the scope of naturopathic assessment and diagnosis. When naturopathic education and/or legislative restrictions limit a naturopath's access to general physical examination, and laboratory tests it may limit the naturopath's ability to properly identify risk, or it can impede objective analysis of the optimal naturopathic treatment approach. As such pathophysiology and clinical content in education may have limitations which has potential public safety or scope of practice implications [10].

- Full access to biomedical or conventional physical examination is reported as being either partially or fully limited in Belgium, Chile, Czech Republic, Egypt, Peru, Slovenia, Spain, and Uruguay.
- Full access to requisitioning blood tests is reported as being either partially or fully limited in Belgium, Chile, Czech Republic, Egypt, France, Hong Kong, Slovenia, UK, Uruguay, and Venezuela.

Accreditation of Naturopathic Educational Programs

Accreditation of naturopathic educational programs occurs through non-governmental accrediting agencies, governmental accrediting agencies and through self-accreditation. Results from the international cross-sectional survey found that countries in which naturopathy was unregulated reported audits by the professional

association as the primary method of accreditation, whereas accreditation body and government audits were more commonly reported where the profession was regulated. Government audits were also reported when programs were delivered via a national framework regardless of regulatory status, although as reported in Australia such audits may focus more on educational features rather than professional outcomes. [11].

Non-Governmental Accrediting Agencies

Formal national standardization offered by non-governmental accrediting agencies for naturopathic educational programs occurs in Canada and the United States, and Australia and in parts of New Zealand.

North America currently has one of the highest accreditation standards for naturopathic medical educational programs globally. Programs exceeding 4,000 hours in length (17) are accredited by the Council on Naturopathic Medical Education (CNME), recognized as the programmatic accreditor for naturopathic medical programs by the U.S. Department of Education. CNME is an independent accrediting agency formed in 1978 to accredit naturopathic medical programs in North America [17]. Graduates of North American accredited naturopathic programs and those practicing in regulated jurisdictions or belonging to their professional association are required to pass standardized entrance-to-practice exams. In 1999, the North American Board of Naturopathic Examiners (NABNE) an independent, non-profit organization formed as a service to the naturopathic profession in North America and the agencies that license/register naturopathic physicians in this Region [18]. NABNE serves regulating bodies by qualifying applicants to take the NPLEX (Naturopathic Physicians Licensing Examinations), administering the examinations, and sending exam results and transcripts to regulatory authorities [18]. In Ontario, and a few other provinces in Canada, the entrance to practice exam is administered by the College of Naturopaths of Ontario [19].

The Association of Accredited Naturopathic Medical Colleges (AANMC) was established in 2001 to advance the naturopathic medical profession by actively supporting the academic efforts of accredited and recognized schools of naturopathic medicine. The AANMC supports the six CNME-accredited naturopathic medical educational programs in Canada and the United States [20].

Although there are currently no government-recognized educational standards in the Western Pacific for naturopathy/naturopathic medicine, there is a high degree of consistency in naturopathic education and practice within this Region due to the work of the Australian Register of Naturopaths and Herbalists (ARONAH). The ARONAH complements government accreditation of higher education. ARONAH is a voluntary and independent regulatory body that maintains minimum standards for naturopathic education and delivery of programs through the 'National Qualifications Frameworks' in this Region [21]. Similar efforts to enforce minimum standards through ARONAH are also underway in New Zealand.

Government-based Accrediting Agencies

Some naturopathic educational programs are accredited by government-based accrediting agencies, such as those in India, Portugal, and Switzerland.

The naturopathic educational programs in India fall under the Central Council for Research in Yoga & Naturopathy (CCRYN), an autonomous institution for Research and Development in Yoga & Naturopathy, established in 1978 under the Societies Registration Act, 1860. The Council is fully funded by the Ministry of AYUSH, Govt. of India. The objectives of the Council include undertaking any educational, training, research and/or other programs in Yoga & Naturopathy. The naturopathic programs under CCRYN include a 5 ½ year undergraduate medical degree in yoga and naturopathy with graduates earning the title of Bachelor of Naturopathy and Yogic Studies (BNYS) [6, 7].

In Switzerland the Organisation der Arbeitswelt Alternativmedizin Schweiz (OdA AM) accredits naturopathic programs under Traditional European Naturopathy (TEN). The OdA AM has developed a procedure for the accreditation of training providers and module degrees. Only candidates who have attended the modules and module degrees at an accredited training provider can be admitted to the higher specialist examination for naturopathic practitioners. Those who pass the exam receive a diploma signed by the Directorate of the State Secretariat for Education, Research, and Innovation (SERI) and by the Presidium of the Quality Assurance Commission and are entitled to use the title: *Naturopath with a Federal Diploma in Traditional European Naturopathy TEN.*

Self-Accredited Educational Programs

The professional naturopathic associations in many countries engage in voluntary certification as a way of ensuring a level of consistency of their members (see Chapter 5). In the absence of statutory regulation, voluntary certification often includes professional naturopathic associations stipulating the educational requirements for their members and self-accrediting those naturopathic educational programs that qualify.

As of this report, efforts are underway amongst the naturopathic educational program providers and the naturopathic professional organizations in Europe to establish standards for naturopathic educational programs in this Region.

Technology-Enhanced Educational Programs

Technology-enhanced education is part of the future of higher education. Virtual education – that is any distance education conducted in a virtual environment with electronic study content designed for self-paced (asynchronous) or live web-conferencing (synchronous) online teaching and tutoring and where teachers and learners are physically separated in terms of either place, time, or both – needs to be carefully considered as part of education delivery. In March of 2021 the WNF, based on the input from its members, published the *WNF Technology Enhanced Education* report which recommends that face-to-face education be the preferred method of delivery for the central aspects of naturopathic educational programs and encompasses a minimum of 60% of the total naturopathic program hours. [22].

Recommendation for Naturopathic Educational Programs

There has been significant global growth in naturopathic educational programs over the last 40 years. The emerging trend is for two different naturopathic programs to be recognized: one commensurate to naturopathic-doctor level training (over 4000+ hours of training) and one at the level of a naturopathic practitioner (around 2500 hours of training). The WNF and its members recognize the importance of high educational standards and the relationship between education, accreditation, and regulation. The WNF recommends training and education commensurate with primary care provision in each country that ensures public safety.

Summary

Currently there are over 131 identified naturopathic programs providing medical education to students wishing to become naturopaths/naturopathic doctors. Just over half (52%) of all naturopathic programs are over 4,000 hours in length. The full breadth of naturopathic training encompasses naturopathic history, philosophies, principles, and theories; naturopathic medical knowledge; naturopathic therapeutic modalities and practices; supervised clinical practice; ethics and business practices; and research. The longer the naturopathic educational program, the more hours that is spent in each aspect of the program.

There is a global trend towards levels of naturopathic education commensurate with the appropriate level for primary health care practice. There is broad support for this trend from the public, profession, and government policymakers. However, lack of regulation, or lack of recognition of naturopathic education, particularly within higher education regulations, has limited the development of naturopathic education in some jurisdictions.

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Section 3: Practice and Implementation of Naturopathy in Health Care Systems

Amie Steel, ND PhD

HIGHLIGHTS

- Direct risks associated with naturopathic care have been reported very infrequently and the vast majority are minor.
- Naturopathic care is cost-effective, particularly for longer-term and chronic conditions and for persons with higher disease burden.
- Naturopaths/NDs provide health care for diverse chronic and acute health conditions throughout all stages of life and support preventive and palliative care with three out of four patients seeking naturopathic care to address non-communicable diseases.
- Although the naturopathic workforce has a significant presence globally, there are limited data on the prevalence of naturopathic consultations. It is estimated that the global naturopathic workforce sees over 5.5 million patients per month.
- There are more than 100 naturopathic community clinics around the world that provide care to marginalized and underserved populations.
- Naturopaths/NDs are actively engaged in various forms of community education and health promotion activities and can support public health initiatives aimed at increasing community health literacy.
- Naturopaths/NDs employ diverse knowledge and information in clinical practice, and actively mobilize knowledge to – as well as from – others.

There is extensive evidence describing clinical outcomes associated with naturopathic therapeutic modalities and practices, and a broad evidence base examining many other aspects of naturopathic practice providing a guide for how naturopathy/naturopathic medicine might fit into the global healthcare system.

Policymakers and other stakeholders seeking to understand how best to optimize the health workforce and integrate naturopaths/naturopathic doctors into their policies, programs, and services for community benefit must consider this evidence within the context of contemporary naturopathic practice. The following are the highlights of chapters in this section.

Safety and Risks of Naturopathic Practice (Chapter 7) describes the main categories of risk associated with naturopathic practice, and reports that these are similar to any other health profession that employs a broad scope of practice. Risks associated with naturopathic practice primarily result from naturopaths'/naturopathic doctors' primary care practice context and their 'tools of trade'.

- Direct risks associated with naturopathic care have been reported very infrequently and the vast majority are minor.
- Other risks presented by the naturopathic profession include rogue practitioners and misrepresentation of naturopathic care by co-option of the title 'naturopath'. The latter is further impacted by issues of licensure for the naturopathic profession, and inaccurate reporting in media.

Economics of Naturopathic Care (Chapter 8) provides a review of the cost-effectiveness of naturopathic care. The few economic evaluations of naturopathic interventions that have been conducted have reliably shown naturopathic care to be cost-effective, particularly for longer-term and chronic outcomes, and for persons with higher disease burden.

- Studies suggest societal economic benefits from naturopathic care, such as improved presenteeism and reduced absenteeism, and lower overall insurance costs per person. Integration of complementary therapies in multidisciplinary settings has also shown the ability to reduce costs of care while delivering equal or better clinical outcomes in general inpatient populations, oncology patients and pain patients, and such findings are suggestive of a potentially beneficial role for naturopaths/naturopathic doctors in integrative multidisciplinary settings.
- Naturopathic care globally is primarily covered by

third party insurers or out-of-pocket costs borne by consumers, rather than by government-funded programs. Multiple countries incorporate government-funded naturopathic care in limited circumstances, either for specific populations (e.g., veteran care) or circumstances (e.g., worker's compensation).

The **International Survey of Naturopathic Patients and Practices (Chapter 9)** presents an excerpt from a peer-reviewed research article titled, *"Overview of international naturopathic practice and patient characteristics: results from a cross-sectional study in 14 countries"* and describes the practice behaviours of the naturopathic workforce and the characteristics of their patients.

- Naturopaths/NDs treat a wide range of conditions with over 70% of patients presenting with chronic conditions.
- Naturopaths/NDs also treat acute conditions and focus on preventive and palliative care.
- A typical naturopathic visit will generally involve the prescription, recommendation or use of an average of four different naturopathic treatments, therapies, or practices.
- Naturopaths/NDs treat a wide range of health conditions both as primary care practitioners and in collaboration with other healthcare providers.

International Prevalence of Consultations with a Naturopath/Naturopathic Doctor (Chapter 10) reviews the available research reporting prevalence of consultations with a naturopath/naturopathic doctor in the general population. Although the naturopathic workforce has a significant presence globally, there is limited data on the prevalence of naturopathic consultations.

- The 12-month prevalence of consultations with a naturopath/naturopathic doctor ranged from 1% of the general population in the USA to 6% in the European and Western Pacific Regions, though there are significant differences between and within Regions, which may be driven by a range of policy, legislative and social factors.

Access and Equity in Naturopathic Care (Chapter 11) is an abridged version of the peer-reviewed research article *"Naturopathic community clinics: international cross-sectional survey"* which discusses the essential role of naturopathic community clinics (NCCs) in providing free or low-cost naturopathic care.

- There are over 100 NCCs globally. NCCs have been offered through various naturopathic educational institutions for over three decades.
- NCCs reach underserved, vulnerable, and marginalized populations such as low-income families, immigrants, refugees, people experiencing homelessness, indigenous peoples, people with HIV/AIDs and those dealing with addictions or drug use as well as individuals from diverse genders including transgender and non-binary.
- NCCs provide naturopathic care that is similar to that delivered in general naturopathic practice treating both chronic and acute conditions.
- Gastrointestinal, mental health, endocrine and musculoskeletal conditions are the most common presenting concerns of individuals visiting NCCs.

Community Education and Health Promotion Activities (Chapter 12) presents the results of the peer-reviewed research article, *"Community education and health promotion activities of naturopaths/naturopathic doctors: results of an international cross-sectional survey"* and reports the community education and health promotion efforts of naturopaths/ naturopathic doctors.

- Naturopaths/NDs use several educational tools, often at no cost to patients and consumers, to improve health literacy. The tools used focus on ways to change health behaviours, to provide self-care guidelines, to manage health concerns and to prevent future health issues.
- The main types of tools include information sheets and handouts, social and professional network communications and information talks for members of the community.
- Research indicates that individuals who visit with a naturopath/ND may be more motivated to engage in positive health behaviours. This combination of patient-centered education and a motivated patient group may mean the community education activities undertaken by naturopathic practitioner have a marked impact in their patient population.

The **Mobilization of Knowledge and Information in Naturopathic Clinical Practice (Chapter 13)** chapter is an abridged version of a peer-reviewed research article titled, *"Naturopath's mobilization of knowledge and information in clinical practice: an international cross-sectional survey"* and examines the way naturopaths/naturopathic doctors use and share knowledge and information in clinical practice.

- Naturopaths/NDs draw knowledge from a diverse range of information sources to inform their clinical decision-making including published research, traditional knowledge, clinical experience, and the patient's expertise regarding their own health condition.
- Naturopaths/NDs report actively sharing their knowledge with patients and the wider community, suggesting they may act as knowledge brokers.

7 Safety and Risks of Naturopathic Practice

Jon Wardle, ND PhD

HIGHLIGHTS

- Direct risks associated with naturopathic care have been reported very infrequently and the vast majority are minor.
- Unlicensed practitioners appear to have a higher risk profile.
- Co-option of the term "naturopath" has occurred in jurisdictions without occupational licensing which exposes the public to increased risks.
- Analysis of media reports concerning the risks of naturopathic care suggests reports have often been critical without justification to the merits of the situation being discussed or containing objective analysis.
- Naturopathic practice when performed by a professional and qualified naturopathic practitioner is safe, and patient safety is highly dependent on the educational standards and regulatory settings within jurisdictions.

To fully appreciate and appraise the relative merits of any practice and the provision of any health intervention, decision-makers need to be mindful that a range of potential risks may be associated with its use. All forms of health care have some form of risk that must be considered when comparing to potential benefits and determining appropriate use. Preventable risks are minimized when adequate clinical, regulatory and policy frameworks are put in place. Naturopathy/naturopathic medicine is no exception, with regulation of its practice being an effective tool in minimizing risks [1]. The main types of risk associated with naturopathic practice are similar to those from any other health profession that employs a broad scope of practice and results primarily from tools of trade and the primary-care context within which they work [2, 3]. However, in jurisdictions with no regulatory oversight, misrepresentation of naturopathic care by non-naturopaths also presents a risk to the public.

Although the focus of naturopathic practice on lower risk interventions means that naturopathic practice can be considered a relatively safe and low-risk practice, some harms may occasionally occur. This review focuses on the evidence that specifically reports adverse events and harms from naturopathic practice. It includes evidence regarding the adverse events and complications arising from naturopathic practice, identified through a systematic search of published literature, case reports and legal databases.

Risks Associated with Naturopathic Care

The following section outlines contemporary research that focuses on the risks of naturopathic care. It includes a workforce study that was conducted in Australia, a review of case studies that have highlighted risks or adverse reactions, an overview of the naturopathic published case studies that included adverse reactions in the findings, identified cases related to rogue practitioners and a summary of the deaths due to naturopathic care that have been reported.

Risk Classifications

Risk can be classified as *direct*, *indirect* or *non-health risks* [4]. ***Direct risks*** are directly associated with the provision of health care and have been reported very infrequently in naturopathy/naturopathic medicine. Examples of direct risks relevant to naturopathy/naturopathic medicine are potential hepatoxicity or interactions from use of botanical medicines or burns from treatments involving the application of heat. As a therapeutically eclectic profession with a broad primary health care scope of practice, each therapeutic modality or practice used by naturopaths/naturopathic doctors has its own inherent associated risks. ***Indirect risks*** are those risks not caused by medical intervention or errors of planning or execution, often termed as acts of omission [5]. Indirect

risks include opportunity costs caused by monopolization of care resulting in underuse or rejection of other effective health services and quality issues such as delayed diagnosis, failure to provide indicated treatments, or employing sub-therapeutic doses of medicines. ***Non-health risks*** are also possible and are defined as risks of using health services that harm the patient or consumer in ways not related to health – most commonly manifesting as economic harm as the result of healthcare costs or financial exploitation of patients.

Adverse Events from a Naturopathic Whole Practice Study

A large Australian national workforce study exploring the rate of adverse events from naturopathic practice was conducted as part of a larger project examining the regulatory requirements for the naturopathic profession in the state of Victoria [6]. Five survey items related to adverse events in naturopathy as a whole practice and specifically for the practices of clinical nutrition and herbal medicine. Naturopaths/naturopathic doctors were requested to indicate the number of times an adverse event had occurred over their time in practice. The most common adverse events that study participants reported were mild gastrointestinal symptoms (44.7% of all reported adverse events), headache (9.1%), significant skin reaction (4.2%), significant gastrointestinal symptoms such as vomiting and nausea (2.9%) or pain (2.8%). Referral to hospital services was required for 82 (1.1%) of the reported adverse events. Analysis of survey results from 859 naturopaths suggested that a naturopath in Australia had on average 1.2 adverse events per person-year and 2.3 adverse events for every 1,000 consultations. It should be noted, though, that mild gastrointestinal symptoms were excluded from this analysis so more serious adverse events could be given due attention. The stated figures would almost double if mild gastrointestinal symptoms had been included. Such numbers indicate that there is risk of potential harm from naturopathy/naturopathic medicine when practiced inappropriately. However, these results compare favourably to studies of conventional medical primary care, where long-term studies have identified at least 6.0 adverse events per 1000-person years [7], or with traditional Chinese medicine with 75.4 adverse events per 1000 consultations, largely related to acupuncture [8].

Case Studies Reporting Adverse Events due to Naturopathic Care

Eight research case reports have been published in the peer-reviewed literature that focused on adverse events from naturopathic practice. The reports were from the USA (n=4), Australia (n=1), Germany (n=1), Canada (n=1), and Hong Kong (n=1). The adverse events reported arose from inappropriate use of or harm from specific therapies (herbal medicine [n=4], clinical nutrition [n=3] and delayed care causing harm [n=1]). The following is a summary of those findings:

- One USA case report presented evidence of burns and cellulitis arising from a naturopathic recommendation of a raw garlic poultice applied to the feet [9].
- A German case reported a severe *Serratia liquefaciens* sepsis following intravenous vitamin C infusion by a naturopathic doctors due to poor hygiene practices [10].
- An Australian case report highlighted a case of a head injury that progressed to a massive erosive lesion after the treating naturopath had eschewed other treatments in favour of comfrey poultices and dietary therapies [11].
- A Hong Kong case report of *Torsade de Pointes* (a potentially fatal form of ventricular tachycardia) was reported in a patient after being prescribed nonradioactive caesium chloride for treatment of cancer by a naturopath [12].
- A USA case report of chronic hyperpigmentation arose from a burn due to a naturopathic prescription of a heated mustard compress [13].
- A USA case report of venous thrombosis, hyperthyroidism and gonadotrophic deficiency was attributed to supplement medicine use prescribed by a naturopath as part of an anti-ageing regime [14].
- A USA case report of hepatic mucormyocosis (fungal infection) in a bone marrow transplant patient was due to the ingestion of concentrated mushroom extracts provided by a naturopath [15].
- A Canadian case reported an incident of drug-induced hepatitis secondary to the use of a complex supplement regime prescribed by a naturopath [16].

In the literature there were additional case reports of adverse events for "naturopathic" products or practices that, upon further analysis, were not associated with naturopathic practice. For example, a recent review identified several case studies that identified practices or products as naturopathic, despite being self-prescribed or used by other health professionals (e.g. conventional medical practitioners) [17]. These were often the result of "naturopathic" being used as a synonym for natural medicine, rather than having any link with naturopathic practice or with a specific naturopath/naturopathic doctor.

Adverse Event Reporting from Naturopathic Research

Case reports are one of the preferred outlets for

documenting adverse events in the published literature [18]. In 2017, a review of eighteen naturopathic case studies found that approximately one-third related to the reporting of adverse events [17]. In the analysis of the original clinical research conducted by naturopathic researchers (see Sections 5 and 6), a number of studies assessed for adverse reactions and most trials reported no severe or clinically significant adverse events, or no difference in adverse reactions in either control or naturopathic intervention group [19]. Some individual naturopathic studies also reported adverse events of specific therapies or interventions. These included results that indicated worsened symptoms scores on the primary outcome, and included increased chemotherapy-induced peripheral neuropathy associated with acetyl-L-carnitine prescription [20], which persisted even after two years [21]; and increased progression to heart failure associated with a herbal intervention (*Crataegus* special extract WS 1442) that was prescribed with the aim to improve cardiac outcomes [22]. Other studies identified adverse events unrelated to primary outcome, including: an isolated episode of anxiety in a woman with breast cancer receiving freeze-dried extract of the mushroom *Trametes versicolor* to improve immune response [23]; significant bruising related to self-administered acupressure for cancer-related fatigue [24]; a high incidence of adverse events including one incidence of anaphylaxis related to the prescription of a phased regimen increasing up to 20mg/kg bodyweight of the isolated phytochemical andrographolide (derived from *Andrographis paniculata*) in a trial which also found improved immune response in people with HIV [25]; abdominal pain, diarrhea and reflux (n=1), and gout (n=2) in a trial of 23 patients taking green-lipped mussel (*Perna canaliculus*) for osteoarthritis or gastrointestinal concerns [26].

Rogue Practitioners

Some of the risks of naturopathic practice have resulted from rogue practitioners practising out of their scope, which in most cases has been dealt with by their naturopathic regulatory authorities but has occasionally extended to the broader court system. For example in *United States v. Feingold* USA courts affirmed the conviction of an Arizona naturopathic physician for unlawful distribution of narcotic (opioid) medications, which naturopathic physicians in that State were specifically prohibited from doing [27]. In *United States v Livdahl*, USA courts affirmed the conviction of another Arizona naturopath selling unapproved botulinum toxin type A, misrepresenting the product as an FDA-approved drug [28]. Even in jurisdictions where naturopathic practice is permitted, a few practitioners have been found by relevant courts to be placing the public at risk practising outside their scope of practice, by virtue of representing themselves as medical specialists where they did not possess training – for example in the Australian case of *Malaguti v. Orchard* where a regulatory appeal prohibiting a naturopath identifying as a medical oncologist without specialist qualifications was upheld [29]. The courts have also dealt with practitioners for unprofessional conduct and professional misconduct. German courts have found naturopaths liable on occasion for failing to warn patients of potential secondary harms caused by treatments – for example blistering that may form on the skin in moxibustion [30] – with failure to communicate these risks being viewed as unprofessional conduct. In the USA case *Bailey v Arkansas* an insanity acquittee with conditional release based on taking prescribed medications, had relapsed resulting in legal action after ceasing such medication based on advice from a naturopathic physician, with the courts highlighting the act as professional misconduct, though no action was taken as the practitioner was not within the jurisdiction of the case [31]. Courts have also dealt with criminal offences by naturopaths. An Australian naturopath was found guilty of multiple counts of sexual assault and rape on patients. Complainants had initially failed to take action due to fraudulent representations as to the medical nature of the sexual act [32].

The presence of rogue naturopaths/naturopathic doctors in the courts needs to be viewed in their context as highly utilized practitioners with a significant primary care role, and the typology of offences is not dissimilar from other health professionals. For example, a Canadian review of health professions charged with criminal negligence related to alleged errors in professional practice found that the instance of naturopaths in such actions compared with other medical and non-medical professions was no more than expected given the size and scope of that profession [33]. Where the negligence of naturopaths/naturopathic doctors has resulted in criminal court actions (e.g. medical manslaughter) [34, 35], this has been largely due to the lack of other regulatory arrangements (naturopaths being an unregistered profession in many countries, with few other avenues for legal recourse available as would be available in other professions) [36, 37], rather than specific or unique factors associated with naturopathic practice or the presence of more rogue practitioners than other health professional groups. Development of appropriate regulatory arrangements for naturopathic practice is likely to improve safety and reduce the number of cases involving naturopaths in court systems.

Deaths Due to Naturopathic Care

Communication breakdowns, diagnostic errors, poor judgment, and inadequate skill can directly result not only in patient harm, but also death, with medical error being a significant cause of death globally in healthcare [38]. Although practised by over 110,000 practitioners globally, deaths arising from naturopathic treatment

errors have been extremely rare. Only nine deaths from naturopathic practice have been publicly reported in the medical and legal literature since 2000. Four of the reported deaths have been due to reactions to intravenous administration of medications.

- In 2003, a 53-year-old woman with no evidence of coronary artery disease, intracranial disease or injury died after treatment in an USA (Oregon) naturopathic clinic after intravenous chelation therapy EDTA to remove heavy metals from the body. The cause of death was determined to be cardiac arrhythmia resulting from hypocalcemia associated with EDTA treatment [39].
- In the Canadian case of *R. v. Javanmardi* the intravenous nutrient injection applied by a Quebec naturopath was found to have been the cause of death for a patient receiving palliative care, though the naturopath was not found to be criminally negligent [40].
- Another USA (California) case report from 2017 details the death of a 31-year old woman from anoxic brain injury secondary to prolonged resuscitation after an adverse reaction to infused *Curcumin* solution provided for allergy treatment in a naturopathic clinic [41].
- Failure to follow established protocols was associated with a patient death in the intravenous application in a Canadian (Ontario) naturopathic clinic of a tissue- and wound-healing formulation including selenium for post-surgical support as part of integrative cancer treatment. The patient had received the formulation without issue on twelve previous occasions, but due to a compounding error arising from documenting "milligrams" instead of "micrograms" had received a fatal overdose [42].

The other causes of death included three from Australia; one due to monopolization of care in cancer treatment, another due to kidney failure from excess heat, hydrotherapy and fasting treatments [36] and the third was the death of a 43-year old naturopathic patient due to dissecting aneurysms of the vertebral arteries following cervical manipulation [43]. A Japanese case report highlights the death of a two-year old infant with acute lymphoblastic leukemia whose prognosis was deemed worsened by the fact that their parents had rejected all conventional cancer treatment and used naturopathic care as a sole alternative [44]. A New Zealand woman died as a result of multi-organ failure due to sepsis secondary to perforation of her rectum sustained while undertaking colonic irrigation performed by a naturopath [45].

Misrepresentation in Naturopathic Care

With the increased interest in natural medicine and the diversity in naturopathic educational standards and regulation, there are some risks that are unique or more common to naturopathic care including practitioners that co-opt the term "naturopathic", the presence of unlicensed naturopathic practitioners and the tendency for misleading media.

Co-option of the term "Naturopath"

In jurisdictions where naturopathic practice is unregulated co-option of the term "naturopath" is problematic and exposes the public to risk due to the lack of probity checks and completion of entrance requirements such as minimum standards of training and education. This may mean that practitioners without any naturopathic training or qualifications may identify themselves as a naturopath/naturopathic doctor. For example, an Australian woman was convicted of recklessly causing grievous bodily harm to an infant via prescription of extreme fasting practices that resulted in near-death by starvation [46]. Although widely cited in the community as a naturopath (and her services mistakenly sought in that capacity), the woman had had no formal training in naturopathy or naturopathic medicine [47]. In some cases this has also led to practitioners who have already been identified as problematic in one profession rebranding as a naturopath/naturopathic doctor – another Australian case of *Health Care Complaints Commission v Bao-Queen Nguyen Phuoc* provides an illustrative example, whereby the courts had to take specific action prohibiting an individual practising as a naturopath after they had been de-registered as a conventional medical practitioner for misconduct and had attempted to resume medical practice under the guise of providing naturopathic services [48]. Although this does not present evidence of harm from naturopathic practice, it does place the public seeking naturopathic care at risk, if they cannot be assured that their choice of naturopath/naturopathic doctor is suitably qualified. Although these risks are real, they may be readily ameliorated through proactive regulatory and legislative mechanisms that ensure minimum standards of naturopathic practice and education.

Such co-option also makes it difficult for naturopaths/naturopathic doctors to safely and openly practice and can lead to non-evidence based regulatory actions on naturopathic practice that can be counterproductive. In France, for example, the inter-ministerial agency *Miviludes* has facilitated multiple actions on the naturopathic profession on the assumption that naturopathy is readily co-opted by spiritual and religious movements, rather than the direct actions of naturopaths [49]. This regulatory activity itself has adversely affected naturopathic practice in that country resulting in significant heterogeneity and variability of standards and making it difficult to identify appropriately trained and qualified

practitioners [49]. This differs from the approach taken in other countries such as Slovenia where courts have recognised the development of naturopathic practice standards as reducing the impact of inappropriate practice in that country [50]. In some countries naturopathic practice is expanding more quickly than legislative and regulatory tools. In Chile, for example, it has been held by the courts that naturopathic treatment is a valid option for those rejecting other treatments (e.g. cancer treatments), as well as complement those treatments, but that such treatments must abide by similar codes of conduct as conventional medical practice [51].

Just as appropriate regulations are necessary to minimize the risks of naturopathic practice, inappropriate regulations may increase risks. For example, when German public health officials uncovered high incidences of poor hygiene, lack of essential equipment in practice and poor knowledge of local public health procedures among naturopaths in a large regional city, it was determined that factors excluding naturopaths from receiving updated information on new guidelines was the major factor for these failures, rather than specific actions by the practitioner community [52].

Unlicensed Versus Licensed Naturopathic Practitioners

Patient safety is highly dependent on the regulatory settings within jurisdictions, and the level of training and accountability of practitioners. This is a concern in naturopathic practice, especially in jurisdictions without regulation, as unregulated practitioners appear to have higher risk profiles. For example, although several FDA actions and warning letters against naturopaths/naturopathic doctors for unapproved, misbranded and misleading product or therapy claims in the United States were actioned, most were directed at unlicensed rather than licensed practitioners [53]. Australian analyses of disciplinary data from regulatory authorities for unregistered (including naturopaths) and registered practitioners found that across many categories outlining different issues the proportion of complaints were broadly similar amongst registered and unregistered health practitioners. However, the most significant difference observed – and one observed in naturopathic data – was between 'professional conduct' and 'treatment' categories, which was thought to be directly related to heterogeneity of standards associated with variable training levels and no enforced training minimums [36].

Misleading Media

Analysis of media discourses around complementary medicine have found that they are often disproportionately critical and can place an undue emphasis upon potential risks [54, 55], or may present limited perspectives [56, 57], with these imbalances increasing [58]. As such, it is also important to recognize that such sources may not be reliable or representative, highlighting cases of adverse events associated with naturopathic care, but neglecting to provide relevant contextual detail. For example, reporting of the very high-profile death of a Canadian infant from meningitis initially suggested that the parent's avoidance of necessary emergency care was based on the naturopathic doctor's advice, while regulatory investigation uncovered that the naturopathic advice had been evidence-informed and that the parents had ignored the naturopathic doctor's advice to immediately go to the hospital for emergency treatment [59]. A review of Canadian newspaper coverage of naturopathic medicine found that naturopathic medicine coverage tended to be negative, with risks often exaggerated, and in this case often mistakenly suggesting it was the naturopathic doctor who had convinced the parents to avoid emergency care [59]. The potential for biased or incomplete reporting in high-profile media representations highlights the importance for further rigorous, systematic, and objective research in the potential risks and benefits of naturopathic practice, and the regulatory models that best support safe and effective naturopathic care.

Summary

While risks associated with naturopathic practice are relatively rare, they are significant enough that regulatory initiatives aimed at minimizing risks should be encouraged [60]. Although naturopathic practice is not without risk, such risks should be viewed in the context and scope of the benefits of naturopathic practice, which offers significant clinical benefit (see Sections 5 and 6), and with the scope of risks being fairly similar to other professions performing primary health care functions [2, 3]. The results of this chapter also need to be viewed in the context of risks for other health professions. Most of the risks associated with naturopathic practice reported in this chapter are either not unique to naturopathic practice (e.g., adverse events from botanical or intravenous treatments) or are associated with rogue practitioners rather than representative of naturopathic practice (e.g., sexual assault or fraudulent behaviours). The typology of risks of naturopathic practice is broadly similar to what could be expected of any health profession with a substantive primary health care role and are usually substantively less than other practitioner groups performing similar roles.

It should be noted that the adverse events listed in this chapter are not likely to be exhaustive. Many of the articles found during the extensive review process referred not to the peer-review literature, but grey literature (government reports and institutional inquiries), newspaper and magazine news items and court documents as sources of information on risks, which do not lend themselves easily to systematic searches that can be comprehensive and representative. Regulatory decisions

are also not often published or accessible, for registered or unregistered practitioners, as are legal cases. This review also highlights that it would be beneficial to further develop and standardize reporting of adverse events in naturopathic practice.

From this review, it can be concluded that although there are some risks, naturopathic practice when performed by a professional and qualified naturopathic practitioner is safe, and that patient safety in this discipline is highly dependent on the educational standards and regulatory settings within jurisdictions. Risks associated with naturopathic practice are not inherently unique to problematic aspects of the profession, but rather are commensurate with any profession with the extent and scope of the naturopathic profession in health care. Where risks do exist, most of them can be effectively minimized through the development of appropriate regulations, which should be encouraged as a priority to ensure that the potential benefits of naturopathic medicine are maximized, and any potential harms minimized.

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8 Economics of Naturopathic Care

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HIGHLIGHTS

- Research indicates that naturopathic care is cost-effective when applied in appropriate circumstances.
- The preventive focus of naturopathic care addresses many modifiable risk factors – lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, dietary choices, and environmental exposures – associated with the increased cost of noncommunicable diseases.
- Additional studies are required to confirm and quantify the cost-effectiveness of naturopathic care across a broad range of conditions.

There are relatively few studies examining the economics of traditional, complementary, and integrative medicine and most of the studies investigating the economics of naturopathic practice have not focused on whole-practice naturopathic care, but instead have focused on the cost-effectiveness of specific therapies. Economic analyses exploring cost-effectiveness have recently been undertaken on specific individual therapies and practices employed by naturopaths/naturopathic doctors – including physical manipulation, acupuncture, nutritional and herbal medicines. These studies have found that naturopathic care is cost-effective when applied in appropriate circumstances [1]. Many of those individual therapies were found to be cost-effective (for example, St John's wort in treatment of mild to moderate depression [2], nutritional supplement regimes in post-surgical patients [3], manual therapies for multiple musculoskeletal disorders [4] or hydrotherapy treatments in Parkinson's disease [5]) and are commonly applied in naturopathic practice globally [6]. The transferability of such research is supported by the fact that the naturopathic community has taken a leadership role in evaluating the cost-effectiveness of individual complementary and conventional therapies even outside of naturopathic settings [7-10].

The focus of naturopathic care on holistic prevention and long-term outcomes aligns with approaches to care that are known to be cost-effective [11]. For example, in addition to the therapies themselves, the empowering naturopathic approach to treatment, especially the focus on *Docere* or doctor as teacher, supports and empowers persons with chronic conditions and helps them to perform self-care that improves their well-being, decreases morbidity and mortality and reduces health costs [12].

Overview of Studies

Three economic evaluations of naturopathic practice have been conducted that highlight the clinically and cost-effective application of whole-practice naturopathic treatment in a variety of settings from both a payer and patient perspective [13-15]. These studies are summarized in Table 8.1.

The incorporation of economic analyses into trials of naturopathic interventions can be challenging and may account for the current scarcity of trials. One trial of naturopathic care for anxiety, for example, reported including a cost-effectiveness analysis in its initial study design, but it could not proceed as fewer than half of study participants were willing to consent to the researchers being able to access additional medical records [16]. Another reason for such paucity is that many naturopathic researchers may conduct economic analyses of individual therapies rather than naturopathic care, a problem known to down-play the prevalence of naturopathic research in other areas [17]. For example, naturopathic researchers have led economic evaluations confirming the cost-effectiveness of Horsechestnut *(Aesculus hippocastanum)* for venous leg ulcers [7], mindfulness and cognitive behavioural therapy in low back pain [9] and generic integration of complementary therapies in hospital settings [8], but their link to naturopathic practice had not been made explicit in these studies. Due to the paucity of naturopathic-specific data, several researchers have attempted to examine the economic impact of naturopathic services in other ways, often using secondary data. A study of the USA National Health Interview Survey data examined the impact of accessing various complementary medicine services on work absenteeism. The study used propensity

score matching, a statistical matching technique that attempts to estimate the effect of a treatment, policy, or other intervention by accounting for the covariates that predict receiving the treatment. In the sample of 8,820 workers, the average number of workdays lost due to illness was 3.69. Visiting a naturopathic practitioner correlated with 2.359 and 2.521 fewer workdays lost due to illness for women and men, respectively [18].

Current Funding Models for Naturopathic Care

Naturopathic care globally is primarily covered by third party insurers or out-of-pocket costs borne by consumers, rather than by government-funded programs [19]. To date there has been relatively little integration of naturopathy/naturopathic medicine into public health or universal health care systems. Some jurisdictions – such as Switzerland and several US States – mandate the inclusion of naturopathy/naturopathic medicine in some insurance plans [19, 20]. However, even in countries where naturopathic treatment is included in public health systems – such as India – delivery and use remains higher in the private sector [21]. Integration of naturopathy/naturopathic medicine into health systems has been inconsistent. In countries that have allowed for funding for naturopathic services to occur, this is often only in limited circumstances. For example, long-standing legislative arrangement mean that in some German jurisdictions naturopaths are able to perform publicly subsidized primary health care services in rural areas if conventional primary health care services are not available [22], and in Australia naturopathic services are reimbursable in government workers' compensation schemes if directly referred by a medical practitioner [23]. Where naturopathy/naturopathic medicine has been approved as an intervention eligible for funding, decision-making may be decentralized and uptake ad-hoc and inconsistent. For example, although naturopathy/naturopathic medicine was included in the Brazilian national health system in 2017, relatively few local authorities have offered this service [24], and while naturopathic physicians are recognized as eligible providers in health services overseen by the US *Indian Health Service and Department of Veterans Affairs* their integration into these services remains variable [19]. While some third-party insurers have attempted to measure the economic impact of integration of naturopathy/naturopathic care into their programs, and are discussed below, there have not been formal attempts to measure the economic and systems impacts of integration of naturopathic care into public health systems. Clinical research evidence for several health conditions supports naturopathic integration into public health systems at a greater level than currently exists, but further integration of naturopathic care should be complemented with economic analyses to determine the cost-effectiveness and systems impacts of such integration.

Economic Impact on Health Insurers

Insurance reimbursement for naturopathic services tends to be fee-for-service based, rather than linked to specific conditions or interventions, making detailed economic analyses challenging. However, insurers have examined the economic impact of inclusion of naturopathic or other traditional, complementary, and integrative medicine services into their coverage. A USA (Washington) cost minimization study of insurance data for 39,491 people with three conditions (back pain, menopause, and fibromyalgia) matched for age, gender, total disease burden, found that the insurance expenditures in prior year for users of complementary medicine services (which included naturopathy as a major component) had $356 lower annual expenditure than those that did not use those services. Interestingly the results differed by disease burden; people with lower disease burden used more services and spent more total dollars yet use of complementary approaches in people with higher disease burden was associated with much reduced use of services, resulting in higher economic benefits [25].

Although reimbursement of naturopathic services in insurance programs does appear to increase naturopathic utilization [26], economic impost on insurers has been limited, with USA data indicating naturopathic care typically comprises less than 1% of total insurer payments even if fully incorporated as full-scope primary care practitioners [27, 28]. USA (Washington) insurance data suggest that incorporation into insurance programs is usually more cost-effective than modelled (as models are based on conventional medical care data), even with high use, and results in high satisfaction [29]. USA (Vermont) data has shown considerable cost savings from inclusion of naturopathic care as part of standard treatment, related primarily to reduced risk factors for chronic disease [15]. Three year data analysis from an Australian insurer found that rather than increasing cost per patient, incorporation of complementary medicines (which included naturopathy as its largest item by claims) reduced the average hospital costs of members by between $200 (standard coverage) to $430 (top ancillary cover) per year, though it was not known whether this effect was related to reduced health costs, or attraction of healthier member cohorts, as the change was also associated with a 55% rise in membership over 3 years [30].

Table 8.1: Economic studies investigating naturopathic practice

Study Title	Country, Year	Methods	Outcomes
A naturopathic approach to the prevention of cardiovascular disease: cost-effectiveness analysis of a pragmatic multi-worksite randomized clinical trial [13]	Canada, 2010	Economic evaluation alongside a pragmatic, multi-worksite, randomized controlled trial comparing enhanced usual care (usual care plus biometric screening) (n=122) compared to enhanced usual care with the addition of a naturopathic approach to cardiovascular disease prevention (n=124). Naturopathic care consisted of individualised lifestyle counselling, nutritional and botanical prescriptions.	Direct medical costs of naturopathic care were more expensive ($302 per participant) than biomedical screening alone, but less expensive than comparable medical pharmaceutical costs ($347-818 per participant). The addition of naturopathic care to enhanced usual care resulted in a net decrease of 3.3 (confidence interval: 1.7 to 4.8) percentage points in 10-year cardiovascular event risk (number needed to treat = 30). These risk reductions came with average net study-year savings of $1138 in societal costs and $1187 in employer costs. There was no change in quality-adjusted life years across the study year
Cost-effectiveness of naturopathic care for chronic low back pain [14]	Canada, 2006	Naturopathic therapy (n=39) vs. Physical therapy (n=36) for low back pain 3-month, once weekly, 30-minute visits. Naturopathic treatment included exercise, diet, relaxation training, acupuncture	Initial costs for naturopathic treatment were higher ($1469 vs. $337) Absenteeism estimates in naturopathic group saved 4.8 days ($817), compared to physical therapy group which lost 1.9 days or ($324) Other costs reduced by $840 in naturopathic group, including visits to chiropractors, massage, other physical therapists. Physical therapy group had increases in all these healthcare costs ($363) Minor difference between groups in pain medication use Naturopathic group – $188 total benefit vs. Physical therapy Group $1212 total cost If excluding absenteeism, naturopaths cost $629, physical therapists cost $700 Naturopathic QALY – 0.0293; Physical therapy QALY – 0.0036 (one-tenth of that created by naturopathic care)
Vermont Car Dealers Help to Quantify the Benefits of Naturopathic Care [15]	USA, 2006	Analysis of impact of the Vermont Automobile Dealers Association (VADA) expanding insurance coverage to include naturopathic care to its 1182 members.	VADA realized direct cost savings of US$315 817 (US$267.22 per person) and indirect cost savings of US$1 143 657 (US$967.56 per person) in the first year from users of naturopathic medicine, predominantly due to a 36% reduction in hypertension; a 17% reduction in hypercholesterolemia; and a 15% reduction in obesity.

Evaluation of Naturopathic Costs of Care

Some superficial assessment of costs of naturopathic treatment have also been conducted which have assessed cost of treatment, as opposed to *cost-effectiveness* of treatment. Data, from Germany for example, indicate that costs for naturopathic inpatient treatment in hospitals is higher than costs for conventional treatment of similar diagnosis-related billing group codes [31]. These are thought to be primarily related to the longer duration of patient stays, and associated nursing costs from increased patient-centred and educative care practices, and long-term cost impacts remain unknown [32]. However, in some settings, particularly musculoskeletal care, German insurance analyses indicate decreased institution-level costs have been shown for naturopathic inpatient care when compared to conventional orthopaedic comparators [33]. Such results need to be viewed in the context of improved long-term treatment outcomes from inpatient naturopathic care – which has a focus on delivering long-term and sustained improvements in health outcomes – when compared with naturopathic care [34, 35]. Future economic studies should consider the long-term as well as short-term economic impacts of naturopathic care to ensure that analyses are reflective of naturopathic practice.

Summary

The few economic evaluations of naturopathic interventions that have been conducted have reliably shown naturopathic care to be cost-effective, particularly for longer-term and chronic outcomes, and for persons with higher disease burden. Although naturopathic care can be initially more expensive in some instances, its focus on long-term outcomes and prevention can make it cost-effective in the long run. Studies also suggest societal economic benefits from naturopathic care, such as improved presenteeism and reduced absenteeism, and lower overall insurance costs per person. Integration of complementary therapies in multidisciplinary settings has also shown the ability to reduce costs of care while delivering equal or better clinical outcomes in general inpatient populations [8], oncology patients [36] and pain patients [37], and such findings are suggestive of a potentially beneficial role for naturopaths/naturopathic doctors in integrative multidisciplinary settings. Further, more rigorous studies are required to confirm the cost-effectiveness of naturopathic care in a variety of clinical settings, but all available data currently point to naturopathic care being a cost-effective health care intervention.

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9 International Survey of Naturopathic Patients and Practices

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HIGHLIGHTS

- Naturopaths/NDs practice as primary care providers and work collaboratively with other healthcare professionals.
- Naturopaths/NDs provide health care for diverse chronic and acute health conditions throughout all stages of life and support patients seeking preventive and/or palliative care.
- Three out of four patients seek naturopathic care to address non-communicable diseases.
- Naturopaths/NDs are an untapped health resource for governments to address high burden health conditions in the community.
- Naturopaths/NDs use an average of four or more therapeutic modalities or practices with each patient; the most common are *applied nutrition*, *lifestyle modifications*, *herbal medicines*, and *clinical nutrition*.

The World Naturopathic Federation (WNF) undertook an international cross-sectional survey in 2019 with the aim to describe the characteristics of typical naturopathic practices throughout the world and the characteristic of the patients accessing those services [1, 2]. This chapter presents an excerpt from that paper titled *"Overview of international naturopathic practice and patient characteristics: results from a cross-sectional study in 14 countries"* that was published in BMC Complementary Medicine and Therapies in 2020 [1]. The study included data from 56 naturopathic clinics in 14 countries within four WHO Regions including Europe (Portugal, Spain, Switzerland and the United Kingdom), the Americas (Brazil, Canada, Chile and the United States), the Western Pacific (Australia, Hong Kong, and New Zealand) and Africa (South Africa) and was administered in four languages – English, French, Portuguese and Spanish [1].

Implications

This international naturopathic practice survey presents the first known examination of international naturopathic practice. It supported the results received from previous WNF surveys of the profession [3, 4] and it provided key findings with particular importance for the understanding of naturopathy/naturopathic medicine in the context of contemporary healthcare practice and policy.

Naturopathic Practice as Primary Care

Significantly, in all geographic settings included in the study, naturopaths/naturopathic doctors appear to treat patients with a diverse range of conditions and across all ages and populations. The survey results indicate a balance between naturopaths/naturopathic doctors practicing as primary care providers and delivering care to patients without the involvement of other health professionals, and with them working collaboratively with other healthcare professionals. These characteristics highlight the versatility of naturopathic practice as the naturopathic workforces aligns with the established definition of primary care in that it "addresses any health problem at any stage of a patient's life cycle" [5]. The patient conditions reported in the survey not only demonstrate diversity, but also include conditions recognized as contributing significantly to the global burden of disease; i.e., four out of the five global leading causes of disability (low back pain, depressive disorders, headache and diabetes) were among those reported by participants as the primary reason of their patient's visit (see Figure 9.1) [6]. Furthermore, nine of the ten leading causes of early death in 2040 are featured in the list of conditions for which patients were described as seeking treatment from a naturopath/naturopathic doctor [7]. Given the

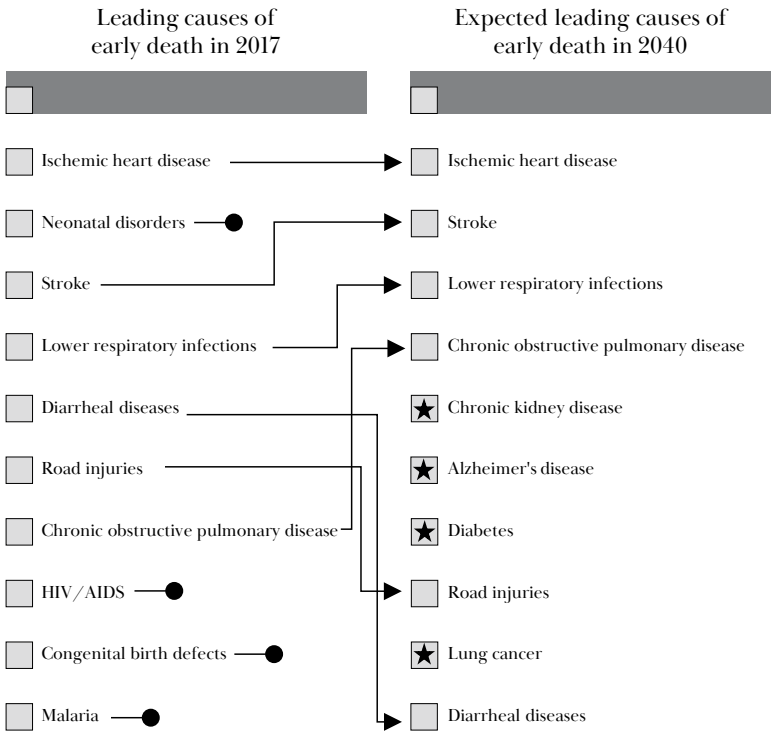

Figure 9.1: Changes between leading causes of early death in 2017 and expected leading causes of early death in 2040 (Source: Global Burden of Disease Study, 2017)[8] ★ = leading cause of early death 2021

priority placed on finding healthcare solutions to the challenges these conditions present to the global population, the contribution of naturopaths/naturopathic doctors should be considered.

Naturopathic Practice features Dietary and Lifestyle Prescription

Many of these conditions identified as being treated by naturopaths/naturopathic doctors are noncommunicable diseases (NCDs) with high quality established evidence for responding to preventive care and health promotion counselling to reduce established risk factors [9]. A prominent feature for the majority of the NCDs is the importance of diet and lifestyle factors as evidence-based primary prevention, particularly for cardiovascular disease [6, 9], diabetes [10], lung cancer [11], chronic kidney disease [12], and chronic obstructive pulmonary disease [13], with emerging evidence for Alzheimer's disease [14] and lower respiratory tract infections [15]. Interestingly for the latter, prevention of lower respiratory tract infections has been linked to various factors including improved sleep, dietary modifications, improved immune function and psychological support, suggesting that a holistic approach to clinical care is required [15]. The research presented in Section 5 of this Health Technology Assessment further supports the potential contribution of naturopaths/naturopathic doctors in supporting patients with these economically, socially, and individually important health conditions.

Naturopathy as a Holistic Practice

Holism is integral to naturopathic philosophy and preventive care is reflected in the core naturopathic principle of *Health Promotion and Disease Prevention* [16]. While primary prevention is a global priority for the health conditions causing early death and disability, it is also worth noting that primary care medical practitioners may be challenged to accommodate preventive health care service delivery within their usual care load [17]. As such, naturopaths/naturopathic doctors may be an untapped health resource in many healthcare systems which can relieve the burden on primary care medical physicians [18]. The data in the international practice survey suggests that naturopaths/naturopathic doctors were considering body weight, metabolic disorders, and diet and lifestyle changes in the context of patient care, all of which are important modifiable risk factors for morbidity and mortality [8]. A 2019 scoping review demonstrated that whole-system naturopathic practice was effective across a broad range of chronic diseases [19]. Further clinical research that explores the patient outcomes of naturopathic care for the prevention of these globally important conditions is urgently needed.

Naturopaths/Naturopathic Doctors commonly employ Multiple Types of Practices, Therapies and Treatments

The study describes unique and diverse practices and therapeutic interventions employed by naturopaths/naturopathic doctors as part of routine patient care, and that are often not employed by other types of clinicians. While some treatments were prescribed or recommended in most cases (dietary modifications, lifestyle changes, herbal medicines, nutritional products), there were many other treatment categories reported. In addition, the study results provide evidence that the naturopaths/naturopathic doctors were employing multiple treatments simultaneously in the care of an individual patient. This finding aligns with a report by the WNF describing the content of naturopathic curricula worldwide which noted that applied nutrition (dietary prescription), clinical nutrition (individualized nutritional product prescription), and herbal medicine (botanical medicine) are taught in more than 90% of recognized naturopathic programs internationally [4]. According to the WNF Roots Report [4], lifestyle counselling is not commonly taught as a standalone course within naturopathic curricula, but was still listed in more than 70% of cases in our study. While it is possible that lifestyle counselling may be integrated into other aspects of curriculum, this discrepancy between the use of lifestyle prescription in practice and the frequency of its specific inclusion in naturopathic curricula highlights a need for further investigation. In particular, a closer examination of the content and impact of tacit content and the need for naturopathic educational organizations to address any gaps in training in some countries is warranted. Given the importance of lifestyle interventions in prevention and management of NCDs and the findings of our study, this is an important area of naturopathic care.

Methods

The study included naturopaths/naturopathic doctors who were currently in practice and a member of a naturopathic association recognised by the WNF. Participants were required to have been in practice for at least five years, seeing more than ten patients per week, and to have a computer terminal in their clinic. Naturopaths/naturopathic doctors were excluded if they identified as practicing within a specialized field (e.g., primarily focused on treating cancer or female reproductive conditions).

Results

A total of 851 patient encounters were reported by the 56 naturopaths/naturopathic doctors that participated in the survey. Their results indicated that most patients seeking naturopathic care were female (72.6%). All age categories were represented with a similar proportion for 36 – 45 years (20.2%), 46 – 55 years (19.5%), and 56 – 65 years (19.3%) categories. Approximately two-thirds (67.0%) of patients were described as attending the naturopathic doctor's/naturopath's clinic for a follow-up visit. A substantial majority (75%) of patients were considered by the participating naturopath/naturopathic doctor to be presenting with a chronic health condition.

Health Conditions

The survey inquired about the patient's presenting complaint and associated symptoms or conditions that were considered important in the management of the primary condition. There were over 80 different conditions reported by patients which were grouped into the following categories: musculoskeletal, gastrointestinal, mental health, general wellness and prevention, female reproductive, skin/integumentary, respiratory, maternal health, neurological, endocrine, cancer, cardiovascular, weight management, autoimmune, urogenital, ageing/cognition, and infectious diseases.

The primary reason for the patient visiting with the naturopath/naturopathic doctor was quite varied and is presented in Table 9.1. The most prevalent categories of health conditions reported were musculoskeletal (18.5%), gastrointestinal (12.2%), and mental illness (11.0%). General wellness and prevention were also cited as a primary reason for patients consulting with their naturopath or naturopathic doctor (6.7%). Patients reported as presenting with a musculoskeletal complaint as their primary concern, were most frequently identified as having chronic musculoskeletal pain (48.4%), injury (19.1%) or osteoarthritis (12.7%). Participant naturopaths/naturopathic doctors indicated patients reporting a gastrointestinal condition were most frequently presenting with irritable bowel syndrome (31.7%), gastro-esophageal reflux (17.3%), or food allergy, intolerance, or sensitivity (16.4%).

Naturopathic practice is holistic and focuses on treating the whole person [16]. There is a recognition that all aspects of the body are interconnected. The results from this survey indicated that when naturopaths/naturopathic doctors were asked to identify other physiological systems or health concerns being considered in the management of each patient's health, they reported that the majority of patient's health concerns were considered to be influenced by more than one physiological system (two systems: 20.4%; three systems: 19.0%; four or more systems: 21.8%) [2]). The gastrointestinal system was most frequently selected (40.8%). Less common but still prevalent was general wellness and prevention (28.7%) and the endocrine system (23.8%).

Table 9.1: Primary health condition for which patients seek assistance and importance of other physiological systems in management of the patient's case, as reported by naturopaths/naturopathic doctors (n=854)

Physiological system or category of the primary health condition	All responses n (%)	Specific primary health condition	Responses within the system or category n (%)	Considered important in management of primary condition [All responses, n (%)]
Musculoskeletal	158 (18.5)	Chronic musculoskeletal pain	76 (48.4)	151 (17.7)
		Injury	30 (19.1)	
		Osteoarthritis	20 (12.7)	
		Fibromyalgia or chronic fatigue syndrome	12 (7.6)	
		Sciatica	4 (2.6)	
		Other	15 (9.6)	
Gastrointestinal	104 (12.2)	Irritable bowel syndrome	33 (31.7)	348 (40.8)
		Gastro-esophageal reflux	18 (17.3)	
		Food allergy/intolerance/sensitivity	17 (16.4)	
		Dysbiosis or parasites	8 (7.7)	
		Liver and biliary dysfunction and disease	6 (5.8)	
		Symptomatic constipation	3 (2.9)	
		Symptomatic diarrhea	2 (1.9)	
		Inflammatory bowel disorders	1 (1.0)	
		Other	16 (5.8)	
Mental health	93 (11.0)	Anxiety	26 (28.0)	133 (15.5)
		Depression	20 (21.5)	
		Stress or fatigue	17 (18.3)	
		Bipolar disorder	7 (7.5)	
		ADHD	6 (6.5)	
		Insomnia and other sleep disorders	5 (5.4)	
		ASD	2 (2.2)	
		Addiction	2 (2.2)	
		Other	8 (8.6)	
General wellness and prevention	57 (6.7)	–	–	245 (28.7)
Female reproductive	51 (6.0)	Menopausal symptoms	20 (39.2)	134 (15.7)
		Dysmenorrhea and other menstrual complaints	12 (23.5)	
		Polycystic ovarian syndrome (PCOS)	9 (17.7)	
		Endometriosis	6 (11.7)	
		Fibroids and other benign tumors	3 (5.9)	
		Other	1 (2.0)	
Skin/Integumentary	44 (5.2)	Inflammatory skin conditions	25 (56.8)	79 (9.3)
		Acne vulgaris	11 (25.0)	
		Other	8 (18.2)	
Respiratory	43 (5.0)	Congestive respiratory disorders	23 (53.5)	71 (8.3)
		Respiratory tract infection	8 (18.6)	
		Asthma	6 (14.0)	
		Other	6 (14.0)	

Maternal health	43 (5.0)	Fertility	23 (54.8)	29 (3.4)
		Pregnancy	11 (26.2)	
		Preconception care	5 (11.9)	
		Lactation, breastfeeding, and other postpartum care	3 (7.1)	
Neurological	43 (5.0)	Headache/migraine	24 (55.8)	67 (7.9)
		Neuralgia	7 (16.3)	
		Parkinson's disease	3 (7.0	
		Paralysis and partial paralysis	3 (7.0)	
		Carpel tunnel syndrome	1 (2.3)	
		Other	5 (11.6)	
Endocrine	40 (4.7)	Thyroid abnormalities	22 (55.0)	203 (23.8)
		Type 2 diabetes	5 (12.5)	
		Adrenal insufficiency	5 (12.5)	
		Insulin resistance or metabolic syndrome	4 (10.0)	
		Other	4 (10.0)	
Cancer	39 (4.6)	Active, malignant cancer	17 (43.6)	29 (3.4)
		Post-cancer recovery, support, and prevention	11 (28.2)	
		Management of cancer treatment side effects	5 (12.8)	
		Palliative care	3 (7.7)	
		Benign cancer	2 (5.1)	
		Other	1 (2.6)	
Cardiovascular	36 (4.2)	Hypertension	15 (41.7)	108 (12.7)
		Chronic venous insufficiency/poor circulation	9 (25.0)	
		Atherosclerosis and/or dyslipidemia	6 (16.7)	
		Stroke-related complaints	4 (11.1)	
		Other	2 (5.6)	
Weight management	34 (4.0)	–	–	147 (17.2)
Autoimmune	31 (3.6)	Systemic (e.g., SLE/lupus, Rheumatoid arthritis, ankylosing spondylitis)	18 (58.1)	74 (8.7)
		Gastrointestinal (coeliac, Crohn's, ulcerative colitis)	5 (16.1)	
		Nervous system (e.g., multiple sclerosis, myasthenia gravis)	3 (9.7)	
		Thyroid (e.g., Grave's, Hashimoto's)	2 (6.5)	
		Type 1 diabetes	2 (6.5)	
		Other	1 (3.2)	
Urogenital	21 (2.5)	Urinary tract infection	8 (38.1)	41 (4.8)
		Benign prostate hypertrophy	5 (23.8)	
		Kidney disease	3 (14.3)	
		Other infections	3 (14.3)	
		Incontinence	2 (9.5)	
Ageing and cognition	10 (1.2)	Alzheimer's disease or dementia	4 (40.0)	69 (8.1)
		Healthy ageing support	3 (30.0)	
		Other cognitive impairment	3 (30.0)	
Infectious disease	7 (0.8)	Lyme disease	3 (42.9)	27 (3.1)
		Epstein-Barr virus	2 (28.6)	
		Other	2 (28.6)	

Table 9.2: Categories of treatments prescribed to patients, as reported by naturopaths/naturopathic doctors (n=859)

Category of treatment prescribed	N (%)
Dietary changes	517 (60.5)
Lifestyle behaviour changes	486 (56.9)
Herbal medicines	463 (54.2)
Nutritional supplements	445 (52.1)
Acupuncture	233 (27.2)
Manual therapies	189 (22.1)
Homeopathy	188 (22.0)
Counselling and psychotherapy	160 (18.7)
Other energetic medicines	137 (16.0)
Testing or investigations	117 (13.7)
Hydrotherapy	115 (13.5)
Other Traditional medicine systems	110 (12.9)
Invasive therapies	58 (6.8)
Other treatments	222 (26.0)

Clinical management and collaborative care

As outlined in Table 9.2, the most common treatment categories prescribed or recommended to patients were dietary changes (60.5%), lifestyle and behaviour changes (56.9%), herbal medicines (54.2%) and nutritional supplements (52.1%). These therapies were followed by acupuncture (27.2%), manual therapies (22.1%), homeopathy (22.0%) and counselling (18.7%). Participating naturopaths/naturopathic doctors reported prescribing or recommending a mean of 4.0 different treatment categories for each individual case.

Approximately one third of patients (33.0%) reported to be only consulting with the participant naturopath/naturopathic doctors to manage their presenting health concern. Many patients were also under the care of a general practitioner (43.2%) or a specialist medical practitioner (27.8%). Co-treatment by an allied health practitioner (12.4%) or a complementary medicine practitioner (10.9%) was less prevalent.

Summary

Naturopaths/naturopathic doctors provide health care for diverse health conditions across the life span. Patients are consulting with naturopaths/naturopathic doctors for support with health conditions of global importance and there is emerging evidence to suggest naturopathic care may benefit individuals with some of these conditions. Naturopaths/naturopathic doctors across the world adopt an integrative approach to the diagnosis and treatment strategies of chronic and complex health care complaints. Overall, the study demonstrates that naturopaths/naturopathic doctors provide an aspect of primary care, and health promotion and disease prevention that is accessed by individuals around the world.

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10 International Prevalence of Consultations with a Naturopath/ Naturopathic Doctor

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HIGHLIGHTS

- Naturopaths/NDs may be consulted by between 0.4% and 8% of the general population in any 12-month period.
- There are over 110,000 naturopaths/ND practicing in at least 108 countries spanning all WHO Regions.
- The naturopathic workforce has a significant presence globally and it is estimated that the global naturopathic workforce sees over 5.5 million patients per month.
- Despite the many countries where naturopathy is practice, there is limited data outlining the prevalence of naturopathic consultations in each country.

In response to an increase in the use of traditional and complementary medicine (including the utilization of naturopathic health services), the World Health Organization (WHO) has developed global strategies to ensure access to safe and effective healthcare which include promoting the integration of traditional and complementary therapies (including naturopathy) into healthcare systems [1]. Several international research studies suggest the demand for naturopathic health services may be attributed to personal health care beliefs, dissatisfaction with biomedical care, increased disease severity and unmet health care needs [2-5]. Nevertheless, further research is required to explore the international prevalence of naturopathic health services utilization to help determine the current and potential contribution of naturopathy to the broader health system to help advance patient and population health care and outcomes. As such, this chapter presents an estimate, through meta-analysis of existing best evidence, of the global prevalence of consultations with a naturopathic practitioner by the general population.

Implications

This review presents the most recent available evidence of the global prevalence of consultation with naturopaths/naturopathic doctors and presents the 12-month prevalence of use of naturopathy/naturopathic medicine in the general population across four WHO Regions of the world. Of the Regions with reported prevalence rates, the highest was in Eastern Mediterranean (Israel) with 18% (2007) to 20% (1993) of the general population seeking the services of a naturopath/naturopathic doctor. The lowest reported national prevalence of consultation was observed in the Americas (USA) with 0.4% (2012). Lifetime prevalence of use was reported in only two countries: Canada (6% in 1997 to 11% in 2016); and India (7% rural, 12% urban in 2011/12). Where more than one timeframe of data was available there was a relative amount of consistency across time suggesting naturopathy/naturopathic medicine use is temporally stable in these countries. Despite the gaps in the available prevalence data, based on the estimated number of naturopaths/naturopathic doctors globally [6] and the known average number of patients seen by naturopaths/naturopathic doctors [7], it is estimated that the global

naturopathic workforce provides care to over 5.5 million individuals per month.

The wide range in the rates of consultation with a naturopath/naturopathic doctor may reflect differences in the perception and availability of naturopathy in specific countries. For example, while national prevalence of consultations with naturopaths in the USA is relatively low, this may obscure significant heterogeneity within that region. For example, insurance data from Washington state shows prevalence of naturopathic consultation to be four times higher than the national prevalence (1.6% v 0.4%) [8]. Such heterogeneity may be similarly observed in other regions and may be due to several factors. For example, in the USA recognition of the naturopathic profession through licensure is not uniformly applied across that nation [9], and distribution of the naturopathic workforce has historically been determined by the proximity to naturopathic schools [10]. Insurance coverage is also known to be a significant driver of naturopathic use [8], and variable insurance coverage arrangements for naturopathy – as observed in the USA [11] – may also result in regional differences. Further attention towards regional variations and heterogeneity, particularly as it relates to specific barriers and facilitators to appropriate utilization of naturopathic services – is warranted.

The wide range in rates of use may also reflect differences in scope and practice. For example, in the USA, naturopathic physicians are considered to bridge conventional medicine and CAM modalities [12], while in Germany, naturopathic practitioners known as "Heilpraktiker" are a distinct category and reportedly have inconsistent training and clinical abilities [13]. As such, the term naturopathy may be differentially classifying practitioners due to professionalization, resulting in an underestimate of use in some countries and overestimate in others. Further consideration of the implications associated with the inconsistent 'protection' of professional titles and defined scopes of practice for naturopaths/naturopathic doctors by country is likely to influence the prevalence of use by the public [14].

Prevalence data from some countries may also be impacted by definitional difficulties or confusion around the term 'naturopathy'. For example, naturopathy is often grouped under a broader nomenclature as one of the many modalities or therapies considered 'complementary approaches to healthcare"[15] and may not be individually evaluated and are not included in our analysis. Multiple practitioner types may also present difficulties for data collection. For example, a review of CAM services in the EU, of the (22,300) practitioners of naturopathy, 15,000 were identified as (mostly German) medical doctors [16]. Thus, patients may not identify obtaining naturopathy as a service per se, but as part of the standard care they receive from a medical doctor who integrates naturopathic principals or modalities into their practice. This may be one reason why three of the largest European countries by naturopathic workforce (Germany, Portugal and Spain [14]) were not represented in this review. To properly evaluate the potential role of naturopaths in care delivery, it is imperative that there should be a focus on capturing important naturopathic health services and workforce research data in all countries where there is a significant naturopathic presence.

Furthermore, although naturopathic practice is relatively consistent globally, local, and regional variations in preferred therapies may result in point-of-service differences that may impact prevalence of naturopathic consultations in those countries. For example, in the United Kingdom historical connections between osteopathy and naturopathy may drive naturopathic use for musculoskeletal conditions in that country more than in countries like Australia, where the professions naturopathy and herbalism have had a larger shared history and maintain connections [17]. Some studies in this review explicitly combined queries about naturopathic utilization with other CAM practices – for example, herbalism and naturopathy in the Australian study. Thus, it is important that a reliable validated instrument is developed for collecting more specific data about naturopathic service utilization within and across countries to establish 'true' prevalence of use information.

While the prevalence data provides a snapshot of a given populations' use of naturopathy, less is known about the factors associated with that use. For example, factors that have previously been raised as impacting the use of naturopathy/naturopathic medicine, include licensure and regulation, scope of practice, training of new students and therefore number of naturopaths/naturopathic doctors in the workforce, or country-specific health systems that influence the support and reimbursements of naturopathic services (e.g. insurance vs out of pocket)[18]. By focusing on general population utilization, this study may also not reflect differences in prevalence of use for different clinical conditions. For example, Australian studies published before 2010 show self-reported prevalence of naturopathic use among the general population of mid-aged women to be 8.7%, while rates for cancer (15.7%) and depression (22.2%) were significantly higher [3]. Similar variations were seen in insurance data from Washington state in the US, where 7.1% of insured cancer patients made claim for naturopathic treatment, compared to 1.6% of general enrolees [8].

Methods

A systematic electronic search of the research databases was conducted in September-October 2019. The databases searched were MEDLINE, AMED, EMBASE, CINAHL, Global Health, WHO Iris, PROQUEST dissertations database, and Lilac. A search for grey literature was also performed. The search targeted countries where,

according to the *WHO Global Report on Traditional and Complementary Medicine (2019)* [19], naturopaths/naturopathic doctors are providing care to the community. The search was performed using the Google search engine and the terms *prevalence*, *use*, *naturopathy*, *report*, and the country name. Articles were included that reported original data from cohort studies, cross-sectional studies, survey research, case-control studies, prevalence studies or epidemiologic studies. To be included in the review, the studies had to report on the general population prevalence of consultations with a naturopathic practitioner either in the previous 12 months, or over the user's lifetime. All relevant papers were included irrespective of language of publication or risk of bias score. Articles were excluded that presented results from specific sub-patient populations (e.g., children, female specific, age limitations, illness populations). Studies were also excluded if they only presented the prevalence of consultations with other health professionals that may use treatments commonly associated with naturopathy (e.g. herbal medicine, hydrotherapy, yoga etc.) but were not explicitly named as naturopathic practitioners, or where naturopathic consultation rates were conflated with a cumulative group of health practice, such as complementary and alternative medicine (CAM), rather than a specific prevalence of naturopathic consultations. Studies were also excluded if they were published before 2010. Identified papers were assessed for risk of bias of the reported studies using the tool developed by Hoy et al [20].

Analysis

The results were grouped for narrative presentation of results in accordance with the WHO Regions [21]. Where studies reported the results of more than one year, they were treated as different studies in the analysis. Articles with unclear numerators or denominators were calculated by the research team where the necessary information was provided or checked against source documents for the same study. Authors were contacted to verify information not able to be determined through these other methods.

Weighted prevalence rates with 95% confidence intervals (95% CI) were calculated for 12-month prevalence and lifetime prevalence separately. Further, separate analyses were conducted for a) country of origin and b) WHO Regions. Heterogeneity between studies was estimated based on the raw proportions, by using the I^2 statistics. Intervals were defined as follows [22, 23]: low heterogeneity (I^2 of 0 – 24%); moderate heterogeneity (I^2 of 25 – 49%); substantial heterogeneity (I^2 of 50 – 74%); relevant heterogeneity (I^2 of 75 – 100%). In order to assess heterogeneity, χ^2 tests were conducted with $p \leqslant 0.10$ [23].

Results

Search Characteristics

The database search identified 13968 citations including 2509 duplicates. Of these, 11370 were excluded through title and abstract filtering. The full text of the remaining 89 articles were assessed for eligibility against the inclusion criteria and 82 were excluded. This resulted in 7 articles being retained. The reference list and subsequent citations of the remaining articles were checked and an additional 19 articles (3 references; 16 citations) were identified of which one additional article was found to meet the inclusion criteria for this review.

Study Characteristics

The studies reporting naturopathy use in a national population over the previous 12 months represent four WHO Regions: European (n=2) [24, 25], Eastern Mediterranean (n=1)[26], Region of the Americas (n=3) [27-29], and the Western Pacific (n=1) [30] (see Table 10.1). One of these studies from Canada also presented prevalence of naturopathy use at any time over the users' lifetime [29]. One additional study from India (South East Asian Region) did not specify the period of use [21] (see Table 10.2). All studies sampled the general population of adults and were either reported as nationally representative or demonstrated a distribution of economic categories except for one study from Israel whereby the majority of participants' subjective economic status was 'very good' or 'good' [26]. Four studies included prevalence data from more than one time point [25-27, 29], with the earliest data collected in 1993 [26]. Two papers reported data from the same national cohort study, but from different time points [27, 28]. All studies included participants from both urban and rural locations. All studies included were determined to have a low risk of bias except for one study that was identified to be exposed to non-response bias [26].

Summary of findings

The included studies presented a prevalence of naturopathy use in the previous 12 months. Studies from the European Region reported between 2% in the UK [24] through to 7.7% in Switzerland. The only study from the Eastern Mediterranean Region reported prevalence rates for Israel [26] as 20% in 1993 through to 18% in 2007. Studies from the Region of the Americas reported between 3% (in 1997) and 5% (in 2016) of the general population using naturopathy in Canada [29] and between 0.25% (in 2002) and 0.4% (in 2015) in the United States [27, 28]. The only study providing national prevalence data from the Western Pacific Region was from Australia and reported 6.2% of the population used naturopathy in the previous 12 months [30]. In addition to the data reporting use in the previous 12 months,

Table 10.1: Summary information of included studies reporting prevalence of use of naturopathy in the previous 12 months

WHO Region	Country (WHO Region)	Author	Economic status	Year data collected	Population	Naturopathy descriptor	Setting (e.g., urban, rural)	N	Overall use (%)
European	England	Hunt et al (2010)	Nationally representative	2005	General population	Naturopathy	Both	7630	2%*
	Switzerland	Klein et al. (2015)	Nationally representative	2007, 2012	General population	Naturopathy	Both	*2007: 14,432* *2012: 18,357*	*2007: n=1185; 7.7%* *2012: n=1597; 7.7%*
Eastern Mediterranean	Israel	Shmueli, et al (2010)	Subjective economic status 'very good' or 'good' range from M=0,49 to M=0.58	1993, 2000, 2007	General population	Naturopathy	Urban	*1993: 2003* *2000: 2505* *2007: 752*	*1993: n=400; 20%* *2000: n=425; 17%* *2007: n=135; 18%*
Region of the Americas	Canada	Esmail (2017)	Evenly distributed (<$20 000 - >$79 999)	1997, 2006, 2016	General population	Naturopathy	National	*1997: 1500* *2006: 2000* *2016: 2000*	*1997: n=45; 3%* *2006: n=80; 4%* *2016: N=100; 5%*
	USA	Su and Li (2011)	Nationally representative	2002, 2007	General population	Naturopathy	National	*2002: 30267* *2007: 20769*	*2002: n=76; 0.25%* *2007: n=71; 0.34%*
		Clarke et al (2015)	Nationally representative	2012	General population	Naturopathy	National	38280	n=153; 0.4%
Western Pacific	Australia	McIntyre et al. (2019)	Manageability on household income; impossible, difficult all/some of time (58.6%), not too bad / easy (41.4%)	2017	General population	Naturopathy and Western Herbal Medicine	Both Urban: 72.6% Inner regional: 18.7% Outer reg/ remote: 8.7%	2019	n=126; 6.2%

* Estimated figure based on interpretation of the chart included in the article.

Table 10.2: Information of included studies reporting prevalence of use of naturopathy in the user's lifetime

WHO Region	Country (WHO Region)	Author	Economic status	Design (measure)	Year data collected	Population	Naturopathy descriptor	Setting (e.g., urban, rural)	N	Duration of exposure	Overall use (%)
Region of the Americas	Canada	Esmail (2017)	Evenly distributed (<$20 000 - >$79 999)	Cross-sectional (survey)	1997, 2006, 2016	General population	Naturopathy	Both	1500 (1997). 2000 (2006). 2000 (2016)	Ever used	*1997: 6%* *2006: 9%* *2016: 11%*
South-East Asian	India	Srinivasan and Raji Sugumar (2017)	Diversity of occupation, social group, education, and religion	Cross-sectional (survey)	2011-2012	Households in the general population	Naturopathy and yoga	Both	*Total: 65507* *Urban: 26996* *Rural: 38511*	*Not specified*	Total: n=6616 (10%) *Urban: n=3227 (12%)* *Rural: n=2607 (7%)*

two studies reported prevalence of use over other time periods. One study from the Region of the Americas, specifically Canada, indicated 6% of the general population in 1997, 9% in 2006 and 11% in 2016 used naturopathy at some time in the user's lifetime [29]. A second study from the South-East Asian Region reported a total of 10% of the population had used naturopathy and yoga, but the timeframe of their use was not specified [21].

Meta-analysis findings

The estimated 12-month prevalence rates of naturopathy use for different countries are shown in Figure 10.1. Prevalence rates significantly differed between countries ($p<0.001$) and ranged from less than 1% of the population in the USA to 8% in Switzerland. While the primary studies were subject to wide heterogeneity, significant heterogeneity was only found for Canada ($p=0.01$) and the USA ($p<0.001$). With regard to WHO Regions, 12-month prevalence of naturopathy use ranged from 1%

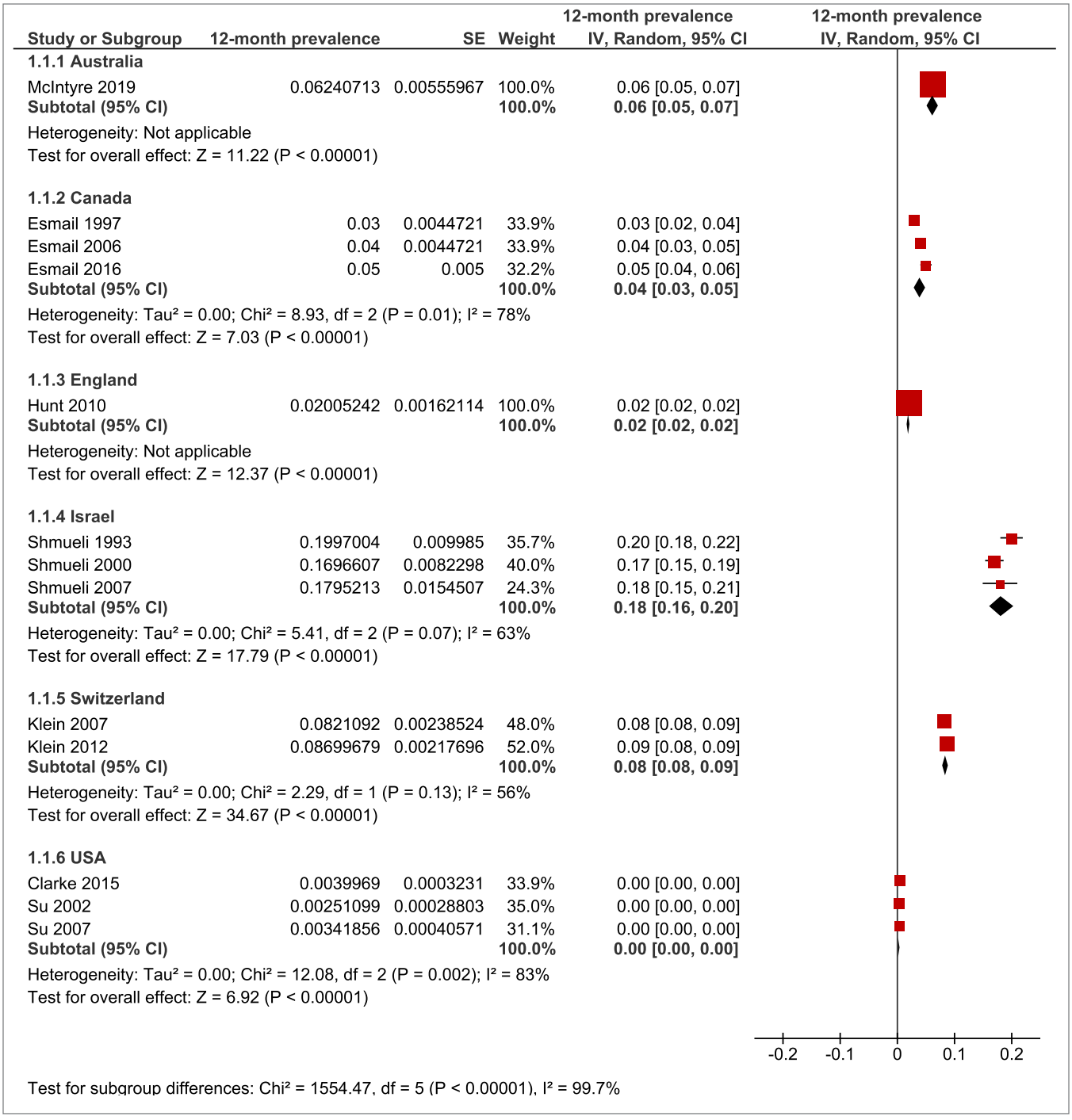

Figure 10.1: 12-month prevalence of naturopathy use in different countries

in the Region of the Americas to 6% in European and Western Pacific Regions, again with significant differences between Regions (p<0.001; Figure 10.2). Relevant and statistically significant heterogeneity was present in studies on European Region (p<0.001), and Region of the Americas (p<0.001). Since all studies were classified as low risk of bias, no sensitivity analyses were conducted. Due to the paucity and heterogeneity of studies reporting lifetime prevalence, no meta-analysis could be conducted.

Limitations

One of the limitations of prevalence studies in the context of naturopathy, is they fail to capture the breadth of treatments that is unique to naturopathy and they do not capture data associated with the quality of care, role within healthcare systems, nor the efficacy and safety of naturopathic approaches to the management of specific conditions [31]. Thus, research into the quality, safety, efficacy, and cost effectiveness of naturopathy/naturopathic medicine would provide pragmatic understanding about the contribution of naturopathy to healthcare within populations and more broadly across the world. Additionally, although limiting data collection to studies published after 2010 helps to ensure prevalence data most accurately reflects contemporary utilization, such time limits may have excluded some studies in regions that were missing from the review. Additionally, observing changes in prevalence of naturopathic consultations over time may also be able to offer insights into the changing role of naturopathy/naturopathic medicine in relation to health systems changes or generational health needs [32].

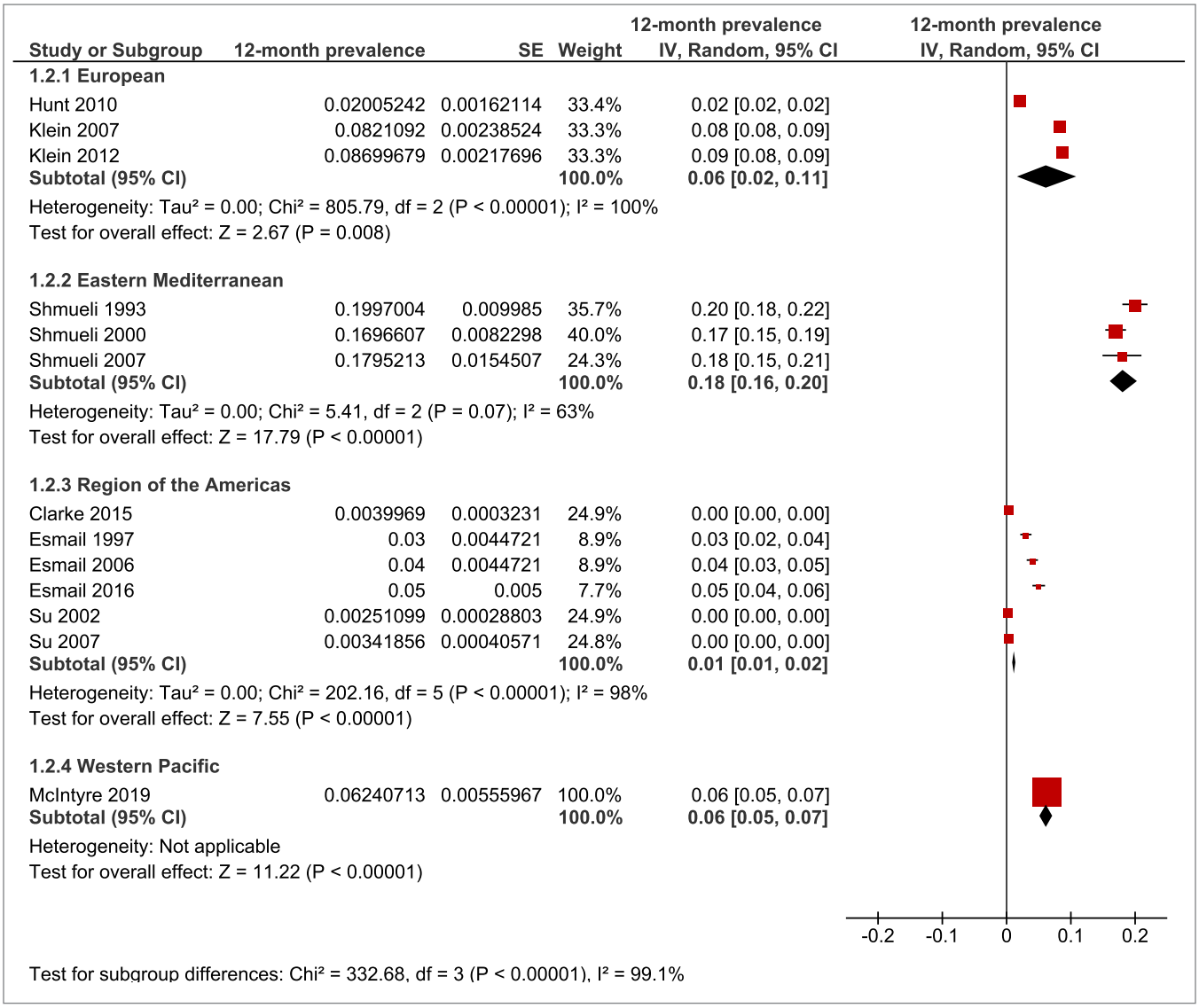

Figure 10.2: 12-month prevalence of naturopathy use in different WHO Regions

Summary

Although the naturopathic workforce has a significant presence globally, there is limited data on prevalence of naturopathic consultations. Twelve-month prevalence of naturopathy/naturopathic medicine use ranged from 1% in the Region of the Americas to 6% in European and Western Pacific Regions, though there are significant differences between and within Regions, which may be driven by a range of policy, legislative and social factors.

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11 Access and Equity in Naturopathic Care

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HIGHLIGHTS

- Naturopathic community clinics (NCCs) serve marginalized populations and other specialized groups for low or no cost to patients.
- There are at least 100 NCCs around the world with 51% located in North America.
- NCCs have been established more recently in African, South-East Asian, European, and Western Pacific Regions.
- Most NCCs are affiliated with naturopathic educational programs.
- NCCs increase accessibility to naturopathic primary care for diverse populations.

Naturopathic care is provided using a variety of models that vary depending on the country, regulation, availability of insurance coverage and funding sources. For the underprivileged, marginalized, low income, and underserved populations or other specialized groups, community clinics (also known as community health centres) provide free or low-cost healthcare services and play a key role in providing necessary primary healthcare that is accessible, culturally competent and person-centered [1]. The World Naturopathic Federation (WNF) undertook a survey in 2020 to map the landscape of naturopathic community clinics (NCCs) around the world. These results are an abridged version of the paper *Naturopathic community clinics: an international cross-sectional survey* published in BMC Health Services Research [2].

Implications

The findings from the WNF's 2020 survey of NCCs align with other research examining characteristics of naturopathic practice [1, 3, 4]. The NCCs appear to serve patients across a broad range of ages (covering nearly all ages), genders (including transgender and non-binary) and culturally diverse groups. Naturopaths/naturopathic doctors treat patients with a broad range of conditions with an emphasis on the gastrointestinal, mental health, endocrine and musculoskeletal conditions and patients seeking general health and wellbeing [1, 3, 4].

Additionally, the treatments being used in NCCs correspond with other research on international naturopathic practice with an emphasis on dietary advice (applied nutrition), lifestyle counselling, exercise advice, nutritional supplements (clinical nutrition) and herbal medicines [3, 4]. The results indicate the most common consultation model used in NCCs is a one-on-one model including a longer initial appointment (approximately 60 minutes) followed by shorter follow-up appointments (approximately 20-0-30 minutes) [2]. This is in line with other reports highlighting the longer nature of naturopathic consultations) [4, 5]. However, 20% of NCCs are reported to employ group consultations (in addition to one-on-one) – a model not often utilized in general naturopathic practice but becoming more common with medical and other integrative medicine practitioners for reaching diverse and underserved communities and addressing healthcare disparities [6, 7].

NCCs are reaching underserved, and/or marginalized populations including low-income families; immigrants and refugees; people experiencing homelessness; indigenous peoples; Lesbian, Gay, Bisexual, Transgender, Queer, 2 Spirit, Intersex, Asexual (LGBTQ2SIA); senior citizens and those with substance-use disorders; people living with HIV and AIDS; terminal illness and those patients seeking palliative care; as well as victims of domestic violence. Prior research studies have indicated that those who visit with a naturopath/naturopathic doctor generally are more likely to be female and from middle or upper socio-economic demographics [8]. In comparison, it appears NCCs may be reaching different populations who may not otherwise access the care

typical in a private practice setting.

Despite the demand for NCCs and the diversity in populations served, only 23% of NCCs report receiving government funding, with at least 60% of NCCs funded by donations. The lack of funding combined with demand and diversity in each of NCCs, shows more research is needed to explore suitable and sustainable funding models for naturopathic care in underserved settings [2]. Encouraging expansion of NCCs could have considerable benefits, with one US study suggesting that formally incorporating naturopathic care would reduce the numbers of counties classified as health profession shortage areas by 33-142 nationally [9].

Methods

The study employed a cross-sectional, descriptive design which consisted of an initial short screening survey followed by a 40-item survey covering nine domains: *demographic information*, *basic information about the NCC (including its affiliation with a naturopathic school and the length of time it has been in operation)*, *patient demographics*, *funding*, *consultation models*, *marketing*, *conditions and naturopathic therapeutic modalities*, *practices and treatments offered*, *inter-professional collaboration* and *basic information about the individual filling the survey*. The screening survey was sent to all known naturopathic educational institutions and full member organizations of the WNF representing naturopathic professional associations in 35 countries via email and was posted on the WNF social media platforms. Descriptive analysis including frequencies and means was conducted for all survey items.

Results

The screening survey was completed by 37 respondents, with 30 then completing the detailed follow-up survey. Table 11.1 outlines the distribution of NCCs by WHO Region. The study found that 51% of the NCCs are in North America where they are affiliated with naturopathic educational institutions which have an average of 6.1 NCCs per institution. Most of the NCCs in North America have been in operation for more than 10 years. More recently naturopathic schools in Africa, Asia and the Western Pacific have also started providing NCCs [2, 10-12]. In some Regions, such as the Western Pacific, private practitioners offer NCCs as a part of their clinic practice (i.e., one day a week or month) [2].

The provision of NCC services has continued to grow substantially in recent years with NCCs being offered as part of naturopathic educational institutions globally, as well as through relief or aid organizations, private practices and independent practitioners [2].

Conditions Treated and Treatments Used

The respondents indicated that on average 56±25% of the patients that visit NCC for naturopathic care did so for chronic complaints or conditions, 27±20% for acute care and 15±10% for general health management. Figure 11.1 outlines the frequency that patients present with various health conditions as estimated by the respondents. When asked "how often do the patients visiting the community clinic present with the following complaint/concern", gastrointestinal complaints were the most common with 93% of respondents selecting "often". This was followed by mental illness concerns (with 67% of respondents selecting "often") and endocrine and musculoskeletal complaints (with 60% of respondents selecting "often"). Similar to the international practice survey results [3, 4], patients that seek care in a NCC present with a wide range of conditions. As depicted on Figure 38.1, of the 17 groups of conditions outlined in the survey, 77% of the respondents indicated that patients that visit a NCC presented with at least 10 of them "sometimes" or "often". Even infectious diseases, which was the complaint that was the least reported, was selecting "often" or "sometimes" by 50% of respondents.

Figure 11.2 outlines the rate that treatments are performed, prescribed, suggested, or recommended at the community clinic by the naturopaths/naturopathic doctors (as estimated by the respondents). When asked "how often are the following treatments performed, prescribed, suggested, or recommended within the community clinic by the naturopathic practitioners?" the most common therapeutic modalities recommended 'often' were dietary advice (applied nutrition) (93%), lifestyle changes (93%), exercise advice (80%) and nutritional supplements (clinical nutrition) (70%). Herbal/botanical medicine, meditation and/or relaxation exercises, breathing exercises, counselling, massage or other soft tissue technique, acupuncture and physical body work techniques were all indicated as being often prescribed 50% – 67% of the time.

Table 11.1: Screening Survey: Respondents offering naturopathic community clinics by WHO Region

WHO Region	Distribution of NCC respondents n (%)	Total NCCs represented n (%)	Average number of NCCs per respondent
Africa	1 (4)	3 (3)	3.0
Asia	2 (7)	9 (9)	4.5
Europe	5 (19)	9 (9)	1.8
Latin America and the Caribbean	4 (15)	13 (14)	3.3
North America	8 (30)	49 (51)	6.1
Western Pacific	7 (26)	13 (14)	1.9
Total	**27 (100)**	**96 (100)**	**3.6**

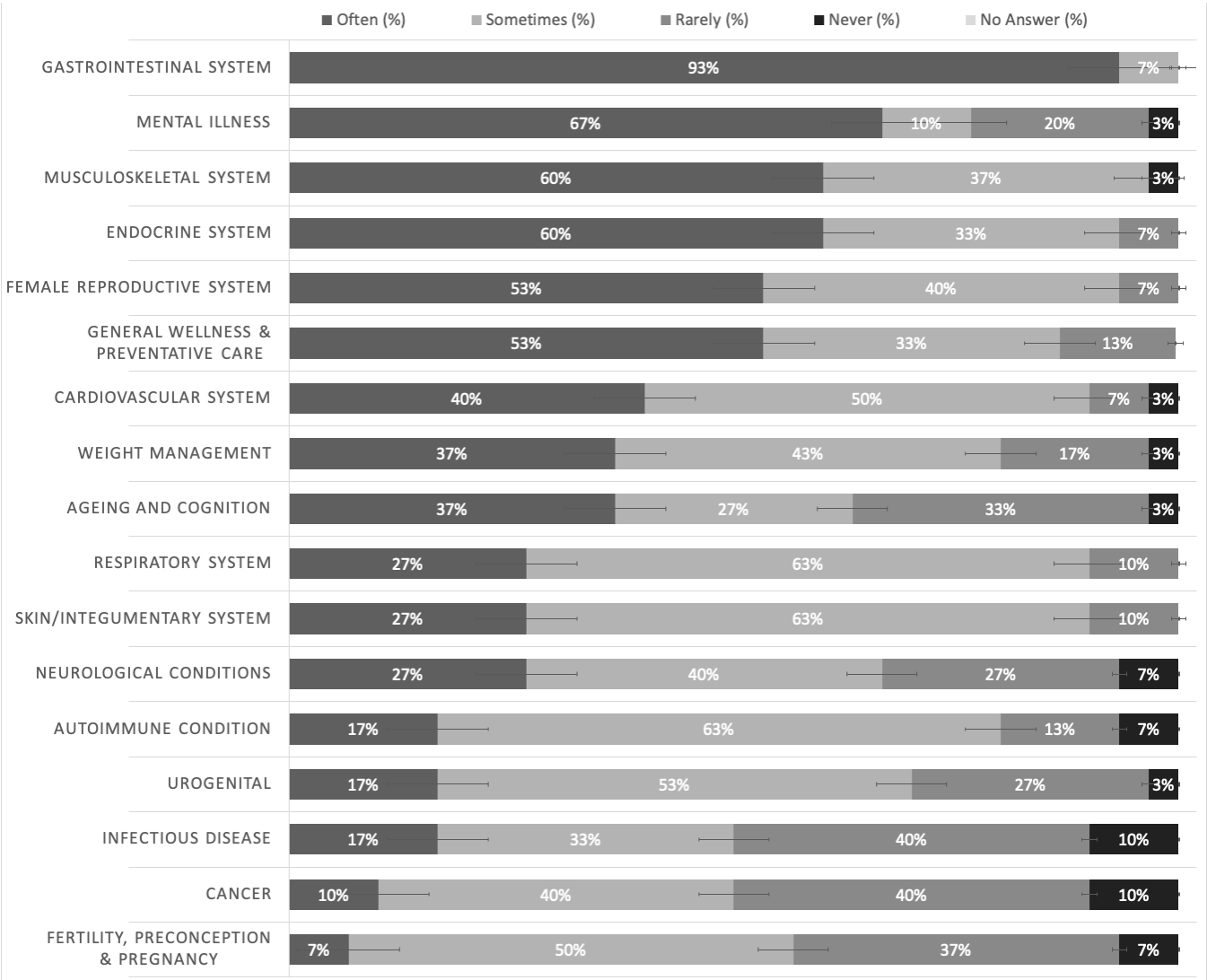

Figure 11.1: Conditions patients presented with in naturopathic community clinics

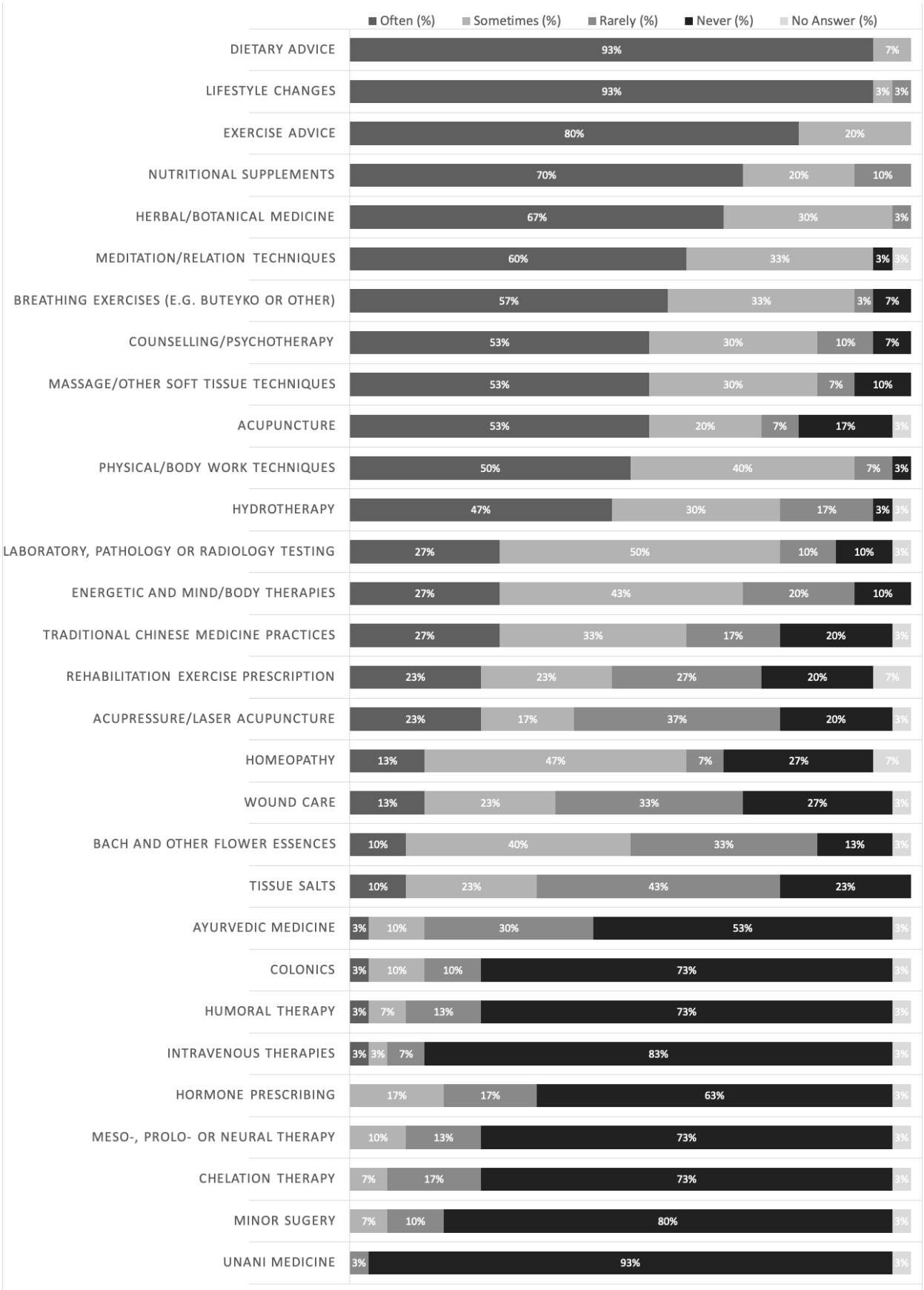

Figure 11.2: Treatments used by naturopaths/naturopathic doctors in naturopathic community clinics

Summary

According to a 2020 survey conducted by the WNF of naturopathic educational institutions, there are over 100 NCCs globally [2] with NCCs having been offered through various naturopathic educational institutions for over three decades [10, 11]. NCCs play an essential role in serving the underprivileged, marginalized, low income, and underserved populations and other specialized groups. The conditions treated in NCCs, and the therapeutic modalities and naturopathic practices employed are similar to what is seen in general naturopathic clinics. Expanding on the availability and access to NCCs would be beneficial for the naturopathic profession.

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12 Community Education and Health Promotion Activities of Naturopaths/Naturopathic Doctors

Amie Steel, ND PhD
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HIGHLIGHTS

- Health promotion activities play an important role in addressing non-communicable diseases.
- 98% of naturopaths/NDs engage in community education and health promotion activities.
- Most naturopathic community education activities are free to the public.
- Naturopaths/NDs play an essential role in community-based activities geared towards health promotion and increased community health literacy.

Health promotion and patient education are crucial to improved population health and are also among the core principles that define naturopathy/naturopathic medicine. Health promotion – defined as the process of enabling people to increase control over their health and its determinants, and thereby improve their health [1] – and patient education are reflected in the principles guiding naturopathic practice [2]. The application of these principles as an aspect of naturopathic practice is reported consistently by naturopathic professional organizations around the world [3]. Furthermore, naturopathic practice approaches are reported to encourage positive health behaviours and self-care [4], possibly due to the emphasis naturopaths/naturopathic doctors place on patient-centered care, health promotion and lifestyle counselling [5-7].

This chapter presents the results of an international survey of health promotion and community education behaviours of naturopaths/naturopathic doctors. These results are an abridged version of a paper published in BMC Complementary Medicine and Therapies titled, *Community education and health promotion activities of naturopaths/naturopathic doctors: results of an international cross-sectional survey* [8].

Implications

This chapter presents the first known examination of community education activities undertaken by naturopaths/naturopathic doctors and it identifies several important findings. Firstly, it found most naturopaths/naturopathic doctors engage in activities aimed at educating the community through diverse methods including talks and presentations, social and professional networks, information handouts and traditional media channels. The study also suggests that the behaviour of the naturopathic workforce aligns with recommended health communication practices as they use a range of communication channels to provide health information to the community [9]. One reason for the extent to which naturopaths/naturopathic doctors appear to engage with health promotion and community education is the alignment between these activities and the guiding naturopathic principles [2], which positions health promotion as central to naturopathic practice.

In contrast, other primary care practitioners (i.e. general practitioners and nurses) commonly perceive health promotion activities as educational tasks that are the responsibility of the community or government and therefore, as peripheral to their field of work [10]. This avoidance of health promotion activities among primary care professions has been linked to the biomedical perspective which de-emphasizes social determinants of health, illness prevention and promotion of healthy lifestyles [10]. Health promotion interventions carried out in primary care settings have historically focused on reducing risk factors associated with non-communicable diseases, encouraging physical activity, and

improving self-care in individuals with chronic illness [11]. These topics are all reflected in the topics discussed by the naturopaths/naturopathic doctors included in our study. However, it is notable that other topics such as naturopathic approaches to understanding health and talks on specific naturopathic treatments were also commonly reported and are likely unique to naturopathic practice [12]. Despite these differences, the study suggests naturopaths/naturopathic doctors are engaging in health promotion activities and as such their potential impact on community health should be examined within the broader context of health promotion in primary care practice. Naturopaths/naturopathic doctors employ diverse communication methods to educate the community.

The diversity of education methods employed by naturopaths/naturopathic doctors matches contemporary research regarding health communication [13]. It is particularly important in this context as research has shown that successful modification of health behaviours in the community targets specific populations and employs multiple communication activities and channels [13]. Given one of the most common topics reported by our study participants related to changing health behaviours to improve health, the varied approaches employed by naturopaths/naturopathic doctors to educate individuals in their community may improve the success of their efforts. This may be further supported by naturopaths/naturopathic doctors sharing knowledge developed through consideration of the patient's unique needs, as has been reported by other survey research involving the global naturopathic profession [14, 15] (see Chapters 9 and 13). Further, individuals who visit with a naturopath/naturopathic doctor may be more motivated to engage in positive health behaviours [11]. This combination of patient-centered education and a motivated patient group may mean the community education activities undertaken by naturopaths/naturopathic doctors have a marked impact in their patient population compared to health promotion initiatives targeting other members of the community.

Methods

The 15-item survey was offered in five languages (English, Spanish, French, Portuguese and Slovene) and covered four domains: *demographics and practice characteristics, community education activities, community education topics and populations, and planning and designing community education activities.* Participants were recruited via World Naturopathic Federation full member organizations, representing naturopathic professional associations in 35 countries. Descriptive analysis was conducted for all survey items, with frequencies and percentages calculated for categorical data and mean and standard deviation calculated for continuous data.

Results

The survey was completed by 813 naturopaths/naturopathic doctors with representation from all WHO Regions. The naturopathic practitioners that participated were predominantly female (77.5%) with 16.3% having qualified as a naturopath/naturopathic doctor more than 20 years ago and approximately one third of participants (31.3%) having received their first naturopathic qualification less than five years ago. The majority (83.0%) of respondents reported currently being in clinical practice, of whom 38.8% were in clinical practice on their own and 22.9% were co-located with other health professionals but not other naturopaths/naturopathic doctors and 22.2% indicated that they practiced in a multi-disciplinary clinic with other naturopaths/naturopathic doctors and other healthcare providers. Over half of all participating naturopaths/naturopathic doctors reported that they either provide home visit consultations (30.3%) or free consultations for specific patient populations (23.1%).

Almost all participants (98%) reported at least one community education activity. Most commonly reported were information sheets and handouts (92.7%), social and professional network communications (91.8%) and information talks presented to the community (84.9%), while traditional media channels were reported less frequently (52.8%). Naturopaths/naturopathic doctors most targeted their community education activities towards the general population (77.8%) and discussed naturopathic approaches to understanding health (72.1%) and effective ways to change health behaviours for improved health (69.9%). Further details of the community education activities undertaken by participants are presented in Table 12.1.

A substantial proportion of participants reported giving either individualized (84.5%) or pre-prepared information handouts (81.4%) directly to patients as part of consultations; or using social media (84.6%) to educate their community. Most users reported undertaking these activities daily, weekly, or monthly. Guest talks with community or patient-support groups (no fee charged to attendees) were also reported by many participants (72.4%) but were more commonly reported to occur every few months or less.

Participating naturopaths/naturopathic doctors reported contributing invited expert comments for newspaper and magazine articles (41.1%), with most of those respondents indicating this occurred less than once per year (35.8%). The topics covered by participants' community education activities included effective ways to change behaviours for improved health (69.9%), self-care (69.3%), managing current health issues (65.6%) and preventing future health issues (65.5%).

Table 12.1: Community education and health promotion activities undertaken by naturopathic practitioners

Community education/health promotion activity	Yes	Frequency					
		Daily	*Weekly*	*Monthly*	*Every few months*	*1 or 2 / year*	*< 1 / year*
Talks and presentations	*N (%)*	*N (%)*	*N (%)*	*N (%)*	*N (%)*	*N (%)*	*N (%)*
Guest talks with community or patient-support groups (no fee charged to attendees) (n=739)	535 (72.4)	33 (6.2)	47 (8.8)	70 (13.1)	132 (24.7)	136 (25.4)	117 (21.9)
Guest talks with community or patient-support groups (fee charged to attendees) (n=732)	412 (56.3)	37 (9.0)	40 (9.7)	49 (11.9)	78 (18.9)	109 (26.5)	99 (24.0)
Talks presented to the community and held within your clinic (no fee charged to attendees) (n=728)	388 (53.3)	14 (3.6)	26 (6.7)	46 (11.9)	78 (20.1)	108 (27.8)	116 (29.9)
Talks presented to the community and held within your clinic (fee charged to attendees) (n=724)	290 (40.1)	14 (4.8)	24 (8.3)	38 (13.1)	61 (21.0)	77 (26.6)	76 (26.2)
Online seminars or workshops (no fee charged to attendees) (n=716)	301 (42.0)	13 (4.3)	23 (7.6)	62 (20.6)	73 (24.3)	64 (21.3)	66 (21.9)
Online seminars or workshops (fee charged to attendees) (n=708)	268 (37.9)	7 (2.6)	30 (11.2)	33 (12.3)	58 (21.6)	61 (22.8)	79 (29.5)
Communication through social and professional networks							
Social media (e.g., Facebook, Instagram, Twitter) (n=728)	616 (84.6)	169 (27.4)	219 (35.6)	99 (16.1)	71 (11.5)	32 (5.2)	26 (4.2)
Blogs (n=725)	422 (58.2)	24 (5.7)	85 (20.1)	113 (26.8)	103 (24.4)	57 (13.5)	40 (9.5)
Email newsletter (n=722)	418 (57.9)	14 (3.4)	45 (10.8)	137 (32.8)	103 (24.6)	63 (15.1)	56 (13.4)
Vlog (e.g., YouTube channel) (n=718)	208 (29.0)	10 (4.8)	32 (15.4)	37 (17.8)	55 (26.4)	28 (13.5)	46 (22.1)
Invited expert comment on a podcast (n=722)	160 (22.2)	1 (0.6)	10 (6.3)	14 (8.8)	33 (20.6)	37 (23.1)	65 (40.6)
Print newsletter (n=719)	136 (18.9)	7 (5.2)	10 (7.4)	28 (20.6)	21 (15.4)	30 (22.1)	40 (29.4)
Regular segment on a podcast (n=720)	72 (10.0)	2 (2.8)	11 (15.3)	13 (18.1)	12 (16.7)	15 (20.8)	19 (26.4)
Information handouts							
Individualized handouts given directly to patients as part of the consultation (n=729)	616 (84.5)	334 (54.2)	150 (24.4)	60 (9.7)	39 (6.3)	13 (2.1)	20 (3.3)
Pre-prepared handouts given directly to patients as part of the consultation (n=722)	588 (81.4)	245 (41.7)	181 (30.8)	63 (10.7)	56 (9.5)	23 (3.9)	20 (3.4)
Information handouts in the clinic waiting room (n=729)	502 (68.9)	181 (36.1)	70 (13.9)	84 (16.7)	71 (14.1)	47 (9.4)	49 (9.8)
Information handouts available for download from your website (n=723)	285 (39.4)	93 (32.6)	36 (12.6)	57 (20.0)	46 (16.1)	20 (7.0)	33 (11.6)
Traditional media channels							
Invited expert comment for newspaper or magazine articles (n=721)	296 (41.1)	7 (2.4)	15 (5.1)	28 (9.5)	65 (22.0)	75 (25.3)	106 (35.8)
Regular column in newspaper or magazine (n=720)	135 (18.8)	4 (3.0)	8 (6.0)	30 (22.2)	23 (17.1)	19 (14.1)	51 (37.8)
Invited expert comment on a radio program (n=722)	209 (29.0)	2 (1.0)	11 (5.3)	16 (7.7)	30 (14.4)	45 (21.5)	105 (50.2)
Regular segment on a radio program (n=720)	87 (12.1)	4 (4.6)	11 (12.6)	10 (11.5)	15 (17.2)	15 (17.2)	32 (36.8)
Invited expert comment on a television program (n=723)	124 (17.2)	1 (0.8)	7 (5.7)	5 (4.0)	17 (13.7)	22 (17.7)	72 (58.1)
Regular segment on a television program (n=716)	38 (5.3)	2 (5.3)	5 (13.2)	3 (7.9)	9 (23.7)	4 (10.5)	15 (39.5)

The activities were mostly aimed at the general population (77.8%) although several participants also reported targeting populations based on sociodemographic factors such as life stage (infants and children [23.7%], elderly [21.3%]) or income level (low income [21.5%]). Community education activities were reported as being disease-specific by 22.7% of participants. The topic focus for these activities was most reported as endocrine (25.4%) and autoimmune or allergy conditions (21.1%). Most participants indicated that the health issues that individuals in their community said they need help with (79.5%) and expert advice and evidence about the health issues affecting the community (77.4%) were particularly important considerations when identifying the need for their community education activities.

Summary

An international survey of health promotion and community education behaviours of naturopaths/NDs indicates that the majority of naturopaths/naturopathic doctors engage in activities aimed at educating the community through diverse methods including talks and presentations, social and professional networks, information handouts and traditional media channels. The most common health promotion and community education activities reported were information sheets and handouts, social and professional network communications and information talks presented to the community. Naturopaths/naturopathic doctors most targeted their community education activities towards the general population and discussed naturopathic approaches to understanding health and effective ways to change health behaviours for improved health.

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13 Mobilization of Knowledge and Information in Naturopathic Clinical Practice

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HIGHLIGHTS

- Naturopaths/NDs use and share knowledge and information from diverse sources, including scientific journals, clinical textbooks, conferences, and patients.
- 76.2% of naturopaths/NDs report using information published in scientific journals to inform patient care.
- 70.1% of naturopaths/NDs report using information from laboratory, and pathology tests or radiological examinations to inform patient care.
- Naturopaths/NDs also use patient-provided information, particularly the patient's lived experience of their health condition, to inform their clinical decisions 64.6% of the time.
- Naturopaths/NDs demonstrate application of both evidence-based medicine and patient-centred care principles when they use and apply knowledge and information.

Evidence-based practice (EBP) is an important component of contemporary clinical decision making and is integral to the provision of quality health care. The contemporary EBP model acknowledges the importance of patient preferences, clinician experience and relevant scientific studies when applying evidence within a clinical setting [1]. Implicit within EBP is knowledge translation, a process whereby knowledge – primarily research evidence – is synthesized, exchanged and applied by relevant stakeholders [2] including, but not limited to, health practitioners. Knowledge mobilization acknowledges the complexities of knowledge translation by recognizing and respecting diversity in the types of knowledge, and realizing how such diversity can influence health care and health care choices [3].

In 2020 the World Naturopathic Federation (WNF) surveyed the international naturopathic profession with the aim of examining naturopathic practitioners' approach to sharing and using knowledge and information related to clinical practice. These results are an abridged version of a paper titled *Naturopaths' mobilisation of knowledge and information in clinical practice: an international cross-sectional survey,* published in *BMC Complementary Medicine and Therapies* [4].

Implications

The results of the survey presented in this chapter highlight the variety and complexity of information and knowledge sources naturopaths/naturopathic doctors use and share to inform their clinical practice. Previous qualitative research suggests that while naturopaths/naturopathic doctors might use evidence-based procedures in the same way as other professions, they may be less likely to refer to the concept of EBP [5]. The findings from this survey indicate that naturopaths/naturopathic doctors use an average of seven information sources to inform patient care means that the EBP framework – in which published evidence, clinical experience and patient preference are triangulated [1] – accounts for only a portion of the knowledge translation process taking place. Instead, consistent with knowledge mobilization [3], naturopaths/naturopathic doctors are drawing on and influenced by diverse information sources, including the patient experience.

Among the information sources used to inform care, information published in scientific journals was the most widely used. This finding departs from earlier research

reporting that complementary medicine practitioners prefer traditional knowledge and textbooks [6, 7]. The difference may reflect a change over time and higher uptake of EBP, or that naturopaths/naturopathic doctors are more likely to apply evidence from journals than other complementary medicine practitioners studied. However, further research is needed to understand how naturopaths/naturopathic doctors are engaging with journal publications and applying the information, given previous findings that many have limited access to full-text journals [8]. It is worth noting, however, that nearly a quarter of respondents do not use information from scientific journals to inform patient care, suggesting that the uptake of research findings may still be limited compared with what has been observed for other health professions [7, 9]. Previous research suggests the barriers to naturopaths/naturopathic doctors using published research to inform their clinical practice include poor transferability of new knowledge from research due to misalignment between the design of interventions and routine daily naturopathic practice [10] and poor access to full-text articles or limited research appraisal skills [8].

Conferences and professional events were frequently used as information sources. However other qualitative research suggests that information derived from these sources may be viewed with some wariness by the naturopaths/naturopathic doctors, particularly if they are provided by product manufacturers [8]. Information provided by product companies was among the least frequently used by naturopaths/naturopathic doctors [11]. Modern clinical textbooks were also an important resource for respondents. Previous research has found that naturopathic practitioners use modern clinical textbooks to locate specific information such as drug interactions and pathophysiology of health conditions [8]. Traditional textbooks were used less frequently but still used by a significant minority to inform clinical decisions and determine how a treatment might benefit a patient. It is also interesting to note that naturopathic practitioners frequently use laboratory test results to inform care.

Patients are a source of information for more than two-thirds of participants and the information source that was reported as used 'always' by the highest proportion of users. Prior qualitative research reports that naturopaths/naturopathic doctors see comprehensive case history-taking as crucial in understanding patients' experience of symptoms [5]. Our study supports this through the finding that patients' personal health histories are shared with most practitioners, always or most of the time. Over and above the patient's history, however, is the patient's perspective of living with the condition, which was the form of knowledge patients most often shared with practitioners in our study. The role of this less structured, more experiential knowledge has largely been excluded from formulations of EBP, where the patient perspective is typically reduced to the patient's preference among a set of discreet choices presented by the clinician [12]. While the clinician's experience is explicitly included in EBP, the patient's experience is not [1]. Indeed, in the evidence hierarchy, patients' individual experiences are framed as anecdotal, positioning them at the bottom [12]. In contrast, Greenhalgh et al. argue that 'the richness of narrative' – that is, listening to the patient's story – is essential information required to appropriately tailor research-based treatment to an individual case [12].

Methods

The online, international cross-sectional survey sampled naturopaths/naturopathic doctors that were either currently in clinical practice or had been in practice within the last 12 months. This included naturopaths/naturopathic doctors on temporary leave from practice due to government restrictions resulting from the COVID-19 pandemic (relevant based on the timing of the survey) or personal leave (e.g., parental leave), if the period of leave did not exceed 12 consecutive months. Participants were recruited via the WNF and its member organizations. The survey was administered in five languages (English, French, Portuguese, Spanish and German). The instrument included 122 core questions and an additional six adaptive questions, which were repeated up to nine times dependent on the number of items selected in one survey item ("Which of the following types of information sources do you employ when providing care to patients?").

Results

Of the 548 respondents, the average age was 45.9 years old with 73.2% being female. All WHO Regions were represented with the greatest proportion of respondents located in North America (36.8%) and Western Pacific (23.2%). Approximately half (49.8%) of participants reported that they had been in practice between 5 and 10 years and more than one-third (37.2%) reported practicing in a clinic by themselves as their primary location of practice. Participants most reported using information published in scientific journals by researchers (76.2%) to inform the care provided to their patients (see Table 13.1). Two-thirds (64.6%) of participants also indicated they used information provided by the patient and the majority (81.7%) of the participants that use patient-provided information indicated they 'always' do so. Information from conferences and other professional events (74.1%) and information published in modern naturopathic clinical textbooks (70.7%) were also selected by most participants, and most reported as being used 'sometimes' (conferences: 30.8%; modern naturopathic textbooks: 34.5%). Overall, participants reported using an average of seven (SD=2.6) information sources to inform patient care.

Table 13.1: Frequency of Information sources used by naturopathic practitioners to inform patient care

Information source used by naturopathic practitioner to inform patient care (n=478)	n (%)	Frequency of use				
		Always	Most of the time	About half the time	Sometimes	Never
Information published in scientific journals by researchers	364 (76.2)	68 (19.2)	157 (44.4)	66 (18.6)	62 (17.5)	1 (0.3)
Information gathered from conferences or other professional events	354 (74.1)	31 (10.2)	87 (28.5)	92 (30.2)	94 (30.8)	1 (0.3)
Information published in modern naturopathic clinical textbooks (published in the last 10 years)	338 (70.7)	27 (9.0)	95 (31.8)	71 (23.8)	103 (34.5)	3 (1.0)
Information from laboratory tests, pathology, or radiology tests	335 (70.1)	78 (27.7)	110 (39.0)	50 (17.7)	44 (15.6)	0 (0.0)
Information published in professional journals for clinicians	333 (69.7)	31 (9.9)	115 (36.9)	81 (26.0)	83 (26.6)	2 (0.6)
Information provided by the patient	309 (64.6)	205 (81.7)	26 (10.4)	9 (3.6)	11 (4.4)	0 (0.0)
Information published in general clinical textbooks	296 (61.9)	24 (8.9)	87 (32.1)	59 (21.8)	100 (36.9)	1 (0.4)
Information from clinical guidelines	248 (51.9)	24 (12.2)	85 (43.2)	31 (15.7)	54 (27.4)	3 (1.5)
Information provided by product companies	230 (48.1)	7 (3.5)	43 (21.5)	51 (25.5)	99 (49.5)	0 (0.0)
Information published in traditional naturopathic clinical textbooks (published more than 50 years ago)	193 (40.4)	6 (3.5)	46 (27.1)	24 (14.1)	87 (51.2)	7 (4.1)

The knowledge types reported by participants as used to inform patient care included knowledge developed through clinical experience (86.2%), initial clinical training (81.2%), continuing professional education delivered by an expert clinician (79.9%), consideration of the patient's unique needs (78.7%) and discussions with professional peers (75.7%) (see Table 13.2). Less common knowledge types used by participants were knowledge developed through continuing professional education delivered by a researcher (59.8%) and through discussions with a mentor or expert (55.4%). The patient's perspectives of living with their health condition (Always: 49.1%; Most of the time: 40.2%) and the patient's personal health history (Always: 44.9%; Most of the time: 34.1%) were most identified as frequently used knowledge or information sources shared by the patient. The patient's family health history and conventional medical examinations or tests were also commonly reported, although not as frequently.

Table 13.2: Frequency of source of knowledge and information shared by patients with naturopathic practitioners

Source of knowledge or information shared by patients with their naturopathic practitioner	Always	Most of the time	About half the time	Sometimes	Never
Patient's perspective of living with their condition (n=371)	182 (49.1)	149 (40.2)	27 (7.3)	13 (3.5)	0 (0.0)
Patient's personal health history (n=371)	166 (44.9)	126 (34.1)	47 (12.7)	29 (7.8)	2 (0.5)
Patient's family health history (n=371)	101 (27.2)	152 (41.0)	54 (14.5)	62 (16.7)	2 (0.5)
Conventional medical examinations or tests (n=371)	77 (20.8)	164 (44.2)	75 (20.2)	51 (13.8)	7 (1.1)
Functional examinations or tests (e.g., urine/salivary hormone tests (n=369)	48 (13.0)	77 (20.9)	78 (21.1)	154 (41.7)	12 (3.3)
General internet sources (e.g., blogs, social media) (n=370)	36 (9.7)	154 (41.6)	93 (25.2)	79 (21.4)	8 (2.2)
Other health professionals involved in their care (n=371)	21 (5.7)	107 (28.8)	115 (31.0)	125 (33.7)	3 (0.8)

Informal sources (e.g., family and friends) (n=371)	20 (5.4)	83 (22.4)	113 (30.5)	144 (38.8)	11 (3.0)
Books (n=371)	9 (2.4)	46 (12.4)	71 (19.2)	229 (61.7)	16 (4.3)
Broadcast media (e.g., TV, radio) (n=370)	12 (3.2)	63 (17.0)	64 (17.3)	196 (53.0)	35 (9.5)
Research organizations (n=368)	5 (1.4)	10 (2.7)	8 (2.2)	208 (56.5)	137 (37.2)
Patient advocacy or support groups (n=371)	4 (1.1)	13 (3.5)	32 (8.6)	219 (59.0)	103 (27.8)
Government agencies (n=369)	1 (0.3)	9 (2.4)	23 (6.2)	217 (58.8)	119 (32.3)
Published journal articles (n=371)	1 (0.3)	19 (15.1)	13 (3.5)	217 (58.5)	121 (32.6)

Summary

This study found naturopaths/naturopathic doctors draw knowledge from a diverse range of information sources. While published research evidence is prominent among them, they also draw on traditional knowledge, clinical experience, and patient expertise regarding their own health condition. Naturopaths/naturopathic doctors also appear to be active in sharing their knowledge with patients and the wider community. Based on these findings, it may be argued that naturopaths/naturopathic doctors practice knowledge mobilization, employing multiple forms and sources of knowledge, and mobilizing knowledge to – as well as from – others. This is further evident through the work of the global naturopathic community in synthesizing existing research evidence through systematic reviews and meta-analyses (see Chapters 16, Chapter 28, Chapter 40, and Appendix II). A notable example of such efforts can be seen through a series of rapid reviews focused on naturopathic treatments for acute upper respiratory viral infections, undertaken in response to the global COVID-19 pandemic by an international team of naturopathic researchers [13]. The knowledge produced through these reviews has reached community, research and policy audiences [14]. Given such examples of the naturopathic profession's active engagement in patient and community education, naturopaths/naturopathic doctors may be considered knowledge brokers – a role for which they are under-utilized at present.

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Section 4: Naturopathic Research

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HIGHLIGHTS

- The research paradigm employed to evaluate the effectiveness of naturopathy/ naturopathic medicine must be able to accommodate the complex and holistic nature of naturopathic practice if it is to provide accurate results that meaningfully inform policy and practice.
- Pragmatic clinical research methods apply a complex, person-centred approach to clinical trial design that may help determine fidelity to naturopathic practice.
- The naturopathic profession requires adequate infrastructure to further support research including research capacity building, consumer and practitioner engagement, and integration into health systems.
- The international naturopathic research community has demonstrated sustained commitment to codifying and synthesizing existing knowledge, generating new knowledge, and disseminating this knowledge to the wider clinical and research community.
- Naturopaths/NDs have published over 2000 peer-reviewed articles since 1987 with notable increases in the last 20 years.

Good research requires a balance between internal validity (i.e., appropriate study design to answer the research question) and external validity (i.e., relevance to the real world). As health research 'best practice' has evolved over time, methodological advancements aimed to improve internal validity have adversely impacted the external validity of the findings. This issue is particularly problematic in traditional and complementary medicine professions, such as naturopathy, due to its whole practice nature. Unlike the focus of popular clinical research designs, naturopaths/naturopathic doctors rarely treat a single health concern or set of symptoms in isolation. This creates a barrier for naturopaths/naturopathic doctors to applying new findings from such research within their clinical practice.

Despite these challenges, the naturopathic profession has a long tradition of generating new knowledge and naturopaths/naturopathic doctors have been described as early adopters of various forms of research while maintaining a strong connection to their naturopathic philosophies and principles. This commitment to, and interest in, research is also evidenced by the increasingly common incorporation of research departments within naturopathic educational institutions in many WHO Regions.

This overview is essential to understanding the research-based evidence associated with naturopathy/naturopathic medicine and the complexities of researching aspects of the naturopathic profession as a sophisticated and nuanced traditional system of medicine that combines modern research and traditional knowledge within a person-centred paradigm.

Researching Naturopathy as a Traditional System of Medicine (Chapter 14) overviews the contextual importance of recognizing naturopathy as a total system of traditional medicine when designing and conducting research investigating naturopathic treatments, therapies, and practices.

- Good research requires a balance between internal validity and external validity. This issue is particularly problematic in traditional and complementary medicine professions, such as naturopathy, due to its whole practice nature and has been identified by naturopaths/NDs as limiting the applicability to applying new research findings within their clinical practice.
- The naturopathic profession has a long tradition of generating new knowledge and naturopaths/NDs have been described as early adopters of various forms of research while maintaining a strong connection to their naturopathic philosophies and principles.

Challenges and Advancements for Naturopathic Clinical Research (Chapter 15) provides a closer exploration of the challenges and advancements that contemporary health research offers to naturopathic research, and the opportunities that naturopathic research can give to other areas of health research in return.

- Researching naturopathy/naturopathic medicine has historically presented several challenges due to the limitations of the randomized-controlled

trial design when evaluating complex interventions underpinned by philosophies and principles beyond the biomedical paradigm, but these challenges are being overcome by embracing widely accepted innovations in research design and methodology aimed at investigating person-centred interventions with multiple therapeutic elements.
- Pragmatic clinical research design allows for the inclusion of multi-modal interventions, real-world settings and flexibility in treatment delivery matching the approach taken in real-world naturopathic care.

Research Dissemination by the Global Naturopathic Research Community (Chapter 16) summarizes the peer-reviewed research article, *"Knowledge dissemination by the naturopathic profession: a bibliometric analysis of naturopath-authored, peer-reviewed publications"* and presents the results of the analysis conducted on naturopath-authored, peer-reviewed publications. The information from this analysis provides the foundation for the detailed summary of naturopathic clinical research presented in Sections 5 and 6 of this report.

- The international naturopathic research community has published peer-reviewed literature for over 30 years and has demonstrated sustained commitment to codifying existing knowledge, generating new knowledge, and disseminating this knowledge to the naturopathic and wider allied-health clinical and research communities.
- Naturopathic research is conducted in most of the educational institutions that have a naturopathic program, especially those in the United States of America, Canada, Australia, Germany, India, and New Zealand.

14 Researching Naturopathy as a Traditional System of Medicine

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HIGHLIGHTS

- Naturopathy/naturopathic medicine is a traditional system of medicine that is defined by philosophies and principles integrated with a biomedical understanding of health and disease.
- Naturopathy/naturopathic medicine embraces complexity in all levels of patient assessment, diagnosis, treatment, and management.
- The research paradigm employed to evaluate the effectiveness of naturopathy/ naturopathic medicine must be able to accommodate the complex and holistic nature of naturopathic practice if it is to provide accurate results that can meaningfully inform policy and practice.
- There are current research designs, such as pragmatic studies, that can accurately assess the effectiveness and efficacy of naturopathic practice.

According to the World Health Organization (WHO), a traditional system of medicine is characterized by a long history of practice and use [1]. Traditional systems of medicine encompass knowledge, skills, and therapeutics based on theories, beliefs and experiences indigenous to different cultures, and used in health maintenance, prevention, diagnosis, improvement or treatment of physical and mental illness [1]. Naturopathy is one such traditional system of medicine. Naturopathy/naturopathic medicine is a complete medical system of theory and practice indigenous to Europe that has evolved alongside and independent of biomedicine [2]. The naturopathic profession is defined by its philosophies *holism* and *vitalism* and is guided by seven principles as described in Chapter 2 *Naturopathic Philosophies and Principles* [3]. The naturopathic profession has evolved in response to the needs of modern communities, health care and health systems, whilst remaining consistent within its naturopathic philosophical foundations. This contemporary practice of naturopathy/naturopathic medicine draws on both traditional knowledge and modern scientific research [4, 5].

Naturopathic Research Considerations

Research examining naturopathic practice must account for the various components of its whole medicine system if it is to provide meaningful information for those within and outside of the profession. This need has also been raised in other areas of health research, such as public health [6] and primary care [7], where evidence-based medicine has been criticized for its poor applicability due primarily to its inability to account for complexity and nuance. In this section the implications of conducting clinical research that examines naturopathy/naturopathic medicine will be considered within the context of a naturopathic philosophical framework, within the context of naturopathy's guiding principles, naturopathy as a complex intervention and within the context of diverse knowledge sources.

Within the Context of a Naturopathic Philosophical Framework

As a traditional system of medicine, naturopathy/naturopathic medicine is defined by the application of its overarching philosophical frameworks in all aspects of naturopathic care, rather than its use of natural treatments and therapies [8, 9]. While the contemporary practice of naturopathy and naturopathic medicine has adapted to modern populations, health systems, and health conditions, the profession and its practice remains deeply grounded in its core philosophies and principles [3]. It is the integration of naturopathic philosophies and principles within a biomedical understanding of health and disease that defines naturopathic care.

Naturopathic researchers apply these philosophies and principles to the design of research studies examining the efficacy or effectiveness of naturopathic treatments. One such philosophy which has had an important influence on clinical research developed through the naturopathic lens is *holism*. Holism has enabled naturopathic researchers to be leaders in initiatives such as the development of whole practice research methodologies that are increasingly utilized in the evaluation of both traditional and complementary medical and conventional healthcare approaches [10]. While a belief of an ultimate connection in the natural world – a central feature of *holism* – was pivotal to the historical understanding of the natural world, from the 1600s the scientific gaze embraced the philosophies of reductionism and mechanism [11]. This shift served to simplify the world under investigation and enabled enormous growth in scientific knowledge. In this paradigm, complex systems were not investigated, instead, the smallest possible element was seen to provide answers to the problems of the whole [11, 12] and connections were viewed as linear causal chains [13]. Over time the limits of reductionism began to constrain scientific healthcare progress including the evolution in understanding biology and disease, and other topics specific to naturopathic practice that embraced complexity were similarly stifled [14, 15]. In response, science began to develop a transdisciplinary theory of complex systems in the 1900s – known as 'complexity science' – which is currently gathering momentum due partly to the availability of computer technology capable of handling large datasets. This interest is evident in health research as seen with the renewed recognition of the interrelatedness of physiological systems and organs, and the relevance of multi-modal interventions in healthcare [16].

The complexity science approach enables effective examination of naturopathic practice. Naturopathic case management – the assessment and treatment of individual patients – goes beyond specific and targeted interventions to encompass recognition of the human as a complex and adaptive system. Naturopathy/naturopathic medicine as a medical system is philosophically holistic and complex in nature and readily conceptualizes health and healing in a manner consistent with this complexity paradigm [17]. The naturopathic approach to case diagnosis, treatment and management is based on a view of integrated physiology [18]; of seeing the human organism as comprised of interacting organs and systems that, in combination, provide the functional capability of the organism and regulate health.

For this reason, the research paradigm employed to evaluate the effectiveness of naturopathy/ naturopathic medicine must be able to accommodate the complex and holistic nature of naturopathic practice if it is to provide accurate results that can meaningfully inform policy and practice. Whole systems research – as a clinical research methodology distinct from the science of researching specific, linear, and targeted interventions – is an important tool for a traditional system of medicine such as naturopathy/naturopathic medicine. A central focus of whole systems research is to address both the therapeutic and theoretical components of health care. Through the whole systems research approach, naturopathy/naturopathic medicine can be meaningfully explored in a way that accommodates the synergistic elements involved in naturopathic care and provides the flexibility needed to generate new knowledge that is reflective of traditional and contemporary practice [19]. Without full consideration of these frameworks, research evidence translates poorly to real-world contexts.

Within the Context of Naturopathy's Guiding Principles

Naturopathic practice is characterized by the application of care guided by overarching principles which views individualized treatments tailored to each patient through a person-centred approach [20]. When applied in clinical practice, naturopathic guiding principles have the capability to influence health care outcomes including reduced disease symptomology, improved patient health care experiences, satisfaction with care, and patient safety [18, 21]. This capability is already reflected in clinical research which reports that naturopathic care produces positive short- and long-term patient outcomes including increased patient empowerment leading to improved health behaviours and lifestyle choices [22]. These outcomes may be explained by the application of naturopathic principles that emphasize patient education (i.e., Doctor as Teacher), community education and preventive medicine (i.e., Health Promotion and Disease Prevention), and person-centred care (i.e., Treat the Whole Person) which may have a supportive role in the

management of non-communicable diseases [22]. Hence, naturopathic advancements within research also need to ensure that evaluation of naturopathic practice reflects the real-life practice of naturopathy/naturopathic medicine as guided by these principles. Yet, too often, the positive outcomes in naturopathic research have been assigned to the therapies themselves and not to the naturopathic approach to care, even when other professions have not been able to translate clinical research for therapies into successful outcomes for patients [23]. This perception has also led to resistance to the integration of naturopaths or naturopathic doctors within the biomedicine health systems, even when evidence shows clear and consistent benefit. However, these dual elements of naturopathic practice – the clinical approach and the therapies employed – cannot be easily separated and should instead be viewed as an interconnected whole medicine system.

Dominant research methodologies, and their limitations within the context of naturopathy [20], underscore the importance of identifying and applying emerging research paradigms and designs. These principles may not only guide practice, but also the naturopathic approach to conceptualizing, designing, and evaluating a clinical intervention. Naturopathic researchers have applied their commitment to see a fair balance between the internal study validity and the external validity of findings. In doing so, they have contributed to the innovation of research methodologies that, while still rigorous, may deviate from more common research practices to ensure the findings accurately reflect real-world naturopathic practice. Conversely, research conducted without consideration of naturopathic principles may have limited applicability to the realities of contemporary naturopathic care.

Naturopathy as a Complex Intervention

Naturopathy/naturopathic medicine is a system of health care with strong philosophical roots which continually evolves and adapts to population needs, regulatory context and health care settings [24]. As such, most naturopathic interventions are multifactorial in nature. Naturopaths/naturopathic doctors commonly employ an average of four different categories of treatments when providing care to their patients [25]. Furthermore, many of the treatments are themselves complex: herbal medicines, for example, are multifaceted compounds containing a mixture of active and synergistic ingredients; nutritional products often reflect a formulated combination of vitamins, minerals, and other nutrients or food- or plant-based ingredients. These layers of complexity – multiple, complex treatments prescribed in combination to achieve a variety of physiological, biochemical, or psychosocial outcomes – need to be carefully considered when evaluating the clinical effectiveness of naturopathic treatments.

The naturopathic therapeutic armamentarium has evolved over time through the inclusion of new therapeutic tools as they become available and the de-implementation of previous practices or treatments [24]. While informed by the continually growing body of health research, naturopaths'/naturopathic doctors' decisions to change the range of treatments they employ are also based on the degree to which the treatment aligns with naturopathic philosophies and principles. This contrasts with 'green allopathy' and functional medicine approaches which still apply the reductionist approach characterized by biomedicine but are defined largely by their use of natural substances instead of pharmaceutical or biomedicine agents in this model. However, green allopathy and functional medicine are also practiced without the support of the philosophical frameworks that are the core of naturopathic practice or the detailed knowledge of mechanism of action, nutritional biochemistry and herbal pharmacognosy that characterises naturopathic training. [26, 27]. Reductionism is still the dominant paradigm in contemporary health care, however, the World Health Organization's Declaration of Astana explicitly supports a transition away from the existing reductionist model and this bodes well for greater integration of naturopaths/naturopathic doctors into health systems globally, as they already focus on holistic, person-centred care [28]. There is also a growing area of research and scholarship that acknowledges complexity and a whole systems approach to health care is integral to critically evaluating the effectiveness of naturopathic care and producing new knowledge that can support evidence-based policy and health service delivery.

Within the Context of Diverse Knowledge Sources

Naturopaths/naturopathic doctors are trained to critically engage with naturopathic philosophical principles and frameworks to ensure optimal patient care while utilizing both traditional and contemporary evidence to inform clinical decisions. Research examining naturopathic practice must, therefore, also ensure it is informed by the knowledge and information sources that naturopaths/naturopathic doctors rely on when making clinical decisions. Such sources include traditional knowledge, contemporary education curriculum, research literature, and clinical wisdom and experience (see for more information Chapter 13 *Mobilization of Knowledge and Information in Naturopathic Clinical Practice*). Knowledge derived from traditional texts is valued by the naturopathic profession and can lead to the implementation or, in some instances, de-implementation of historical clinical practices [24]. Likewise, practice-informed research conducted within the whole system research framework

enables the generation of more pertinent, precise, and clinically relevant research questions that will improve patient and practice outcomes [29]. Without these aspects, the capability to reach the full potential of naturopathic research may be limited. As a traditional system of medicine, all elements of naturopathic philosophies, principles, practices, and knowledge must be considered when designing, examining, and interpreting naturopathic research.

Research Designs Relevant to Naturopathic Clinical Research

These important considerations notwithstanding, naturopathic clinical research can be conducted using commonly employed research designs. The most common of these is the randomized-clinical trial (RCT); a research design intended to help provide a clearer explanation of the clinical effect of a specific treatment. The RCT is accepted as the 'gold-standard' of clinical research through which a study population is carefully selected against pre-determined criteria and then randomly allocated to either receive an intervention, or a control. The control is most commonly an inactive substance, known as a *placebo*, but may also include the treatments that are usually provided for the condition, known as *standard care* or *usual care*, or a time delay in receiving the intervention during which time no intervention is provided, called a *waitlist control*. An RCT is designed to limit the variability between patients, setting and intervention and therefore provide a clear picture of the intervention's 'efficacy'. While RCTs have strong internal validity, the external validity of RCT research can be compromised. This differs from a *pragmatic clinical trial* which is more reflective of real-world practice including the characteristics of the patients and settings, as well as the variability in treatment prescription that can occur in routine clinical care. A pragmatic clinical trial provides evidence of 'effectiveness' and is commonly undertaken after evidence of efficacy has been shown through an RCT. These methods can be used to either research naturopathic care as a whole system or to investigate specific naturopathic treatments as complex or single interventions. Both RCTs and pragmatic clinical trials can also be employed to study treatments tailored to an individual's genetic or molecular characteristics, known as *precision-medicine*. However, not all clinical research compares the results of the intervention with a control group. Often, preliminary or pilot research involves only one study group who receives the intervention and, as such, is known as a *quasi-experimental* or *uncontrolled* trial. *Case reports* are also an important source of evidence for any health profession, and naturopathy is no different. Case reports can present the result of a single case, referred to as a *case study*, or multiple cases with a shared characteristic (e.g., presenting complaint, treatment used, etc.), known as a *case series*. Case reports provide a valuable mechanism for clinicians to document insights gathered from clinical practice to inform the wider research and health practitioner community [30, 31].

Other research methods are also relevant to naturopathic clinical research, even though they do not evaluate efficacy or effectiveness directly. Delphi studies, for example, are a research design aimed at gathering expert consensus on a topic, such as clinical treatment options which may be used to inform the design of an intervention for an RCT or pragmatic trial, based on the clinical expertise of naturopaths/naturopathic doctors with experience treating the condition of interest. Observational studies such as survey research may also be used to describe naturopaths'/naturopathic doctors' clinical experiences and observations and may serve to identify practice patterns and inform research priority areas. Even document analysis can be valuable as a research design for clinical research as it provides a robust method of critically engaging with traditional naturopathic texts to identify unexamined historical treatments and practices that warrant researcher attention. These are a few examples and, in line with complexity science principles, the accumulated value of all study designs in providing important insights into naturopathic clinical practice is greater than the contribution of any one study design on its own.

Summary

Naturopathy/naturopathic medicine is a traditional system of medicine that is defined by philosophies and principles, and embraces complexity in all levels of naturopathic assessment, case diagnosis, treatment, and management. Researchers must account for this complexity when designing and conducting research investigating naturopathy/naturopathic medicine. It is important that consumers have access to health services that meet their needs and are supported by quality evidence that reflects and is relevant to real-world context and practice. Policymakers and other stakeholders seeking to understand how best to optimize the health workforce and integrate naturopaths/naturopathic doctors into their policies, programs, and services for community benefit must consider research investigating naturopathic safety and effectiveness within the context of contemporary naturopathic practice.

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15 Challenges and Advancements for Naturopathic Clinical Research

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HIGHLIGHTS

- Contemporary health research and policy recognizes the importance of identifying the effectiveness and real-world outcomes of an intervention.
- Pragmatic clinical research methods apply a complex, person-centred approach to clinical trial design that may help determine fidelity to naturopathic practice.
- The naturopathic profession requires adequate infrastructure to further support research including research capacity building, consumer and practitioner engagement, and integration into health systems.
- Dedicated government funding for naturopathic research is needed to facilitate the naturopathic profession's interest and capability to conduct health quality research.

Respect for the dynamic interplay between a range of factors that shape health and wellbeing is inherent to the philosophy of naturopathy/naturopathic medicine as a whole system intervention and presents tensions, trade-offs, and challenges to effective application of the randomized controlled trial (RCT) design. Research pertinent to naturopathic practice begs adoption of other types of research methods appropriate for generating different types of evidence such as outcomes from real world practice, informed by clinical experience that is reflective of complex patients, conditions, and treatments [1-3]. This chapter is adapted from an article published in *The Journal of Alternative and Complementary Medicine's Special Focus Issue on Naturopathy* [4]. The goal of this chapter is to draw attention to key innovations in study design that are relevant to the future of naturopathic research. This chapter will explore what naturopathic research and researchers may offer the wider health research community and consider the advancements occurring within health research that are more aligned to the naturopathic approach to health care and hence will support future robust and rigorous naturopathic research.

Implications

There are several implications related to naturopathic research methodology that require careful consideration. One major challenge to conducting naturopathic research is the need for adequate infrastructure, which includes practitioner research capacity, consumer and practitioner engagement, and integration into health care systems, all of which are not fully developed within the naturopathic profession. The lack of integration of naturopathic health services in health care systems prevents access to resources to assist clinical research, such as health databases (e.g., e-health records) and practitioner databases (e.g., registration agencies). Creating practice-based research networks (PBRN) or academic networks [57] are potential solutions which enable researchers to access practitioners and their patients [58].

PBRNs will also help facilitate a research culture within naturopathy/naturopathic medicine by providing an opportunity for practitioners to participate in research within community-based practice [59]. Lack of clinician research capacity in many countries is a barrier

to conducting research such as pragmatic trials, translating research, codifying knowledge, and developing suitable research methods. Naturopaths/naturopathic doctors are, in some situations, adequately trained to adopt a researcher-practitioner model of practice in which research and clinical skills are equally valued. To enable naturopaths/naturopathic doctors to be involved in the research process there needs to be adequate educational infrastructure to increase research capacity. There is currently insufficient undergraduate, graduate, and postgraduate education in health and social science research methods for naturopathic practice [60]. This shortfall needs to be urgently addressed, otherwise lack of research skills will continue to be a significant barrier for naturopaths/naturopathic doctors to participate in and translate naturopathic research.

There is already a substantial volume of research examining naturopathic treatment and practices in a wide range of health conditions, but further research is still needed. Participatory community-based methods such as Delphi techniques could be used to engage naturopaths/naturopathic doctors and consumers to determine naturopathic research priorities [61, 62]. It is critical that naturopathic research is translatable to clinical practice and meaningful to health care consumers. Delphi techniques allow for clinician participation in design of the research process to ensure clinically meaningful outcomes and provide an opportunity to involve health consumers in research to ensure it is person-centered. Consensus methods such as Delphi techniques would also be suitable for identifying methods for research translation to both naturopathic practice and health care consumers. This participatory approach could be extended to assist with codifying knowledge, which includes developing clinical guidelines for naturopathic care. These methods could also facilitate the consolidation of traditional evidence into meaningful frameworks that are accessible to clinicians and the public. An example of this is described in an article that discusses the naturopathic approaches to irritable bowel syndrome [63].

Developing and evolving naturopathic research methodologies can be considered an iterative process that has the potential to influence health research more broadly. However, the advancements in health research methodologies more generally afford an opportunity for naturopathic research to align with established research designs while still answering clinically relevant and philosophically sensitive research questions. However, successful implementation of naturopathic research methodologies, and translation and dissemination of research will require a substantial paradigm shift in which naturopaths and naturopathic doctors adopt a greater level of responsibility for developing an evidence-base for naturopathic practice. Initiatives to support and evaluate knowledge mobilization [64] within the community of naturopathic medical research, education and practice may play a key, yet unexplored role [65]. Researchers in this field have an important leadership role to effectively facilitate this transformation, which will benefit health consumers, naturopathic practitioners, and the health care systems they serve. Naturopaths/naturopathic doctors who are not in the research field can also contribute by being part of research activities such as practice-based research networks; therefore, assisting in this paradigm shift and allowing the leaders in the field to move forward.

Similarly, government funding to support naturopathic research is also needed. In countries where naturopathic researchers have access to competitive government research funding, they are commonly achieving a greater degree of success than similar professions. For example, in Australia naturopaths have received more government funding from the National Health and Medical Research Council than any other TCIM profession, despite being the only TCIM profession not housed in a university for most of that time [66]. In the United States, naturopathic doctors have successfully attracted National Institute of Health funding for clinical research and capacity building, again surpassing the success of other TCIM professions with similar or greater integration into the health system. As such, the naturopathic research community shows the interest and capability to conduct high quality research that meets rigorous standards to which all health research is held when it has access to the required funding.

Contemporary Advances in Health Research

Clinical trials involving conventional healthcare interventions are generally centred around explanatory research utilizing the RCT model – historically, considered the highest recognized level of clinical evidence [5]. However, current opinions on explanatory research now recognize that although this type of research may ascertain causal relationships (efficacy) in an ideal or controlled situation, it does not accurately measure if the intervention is effective in an everyday healthcare setting (effectiveness) [6]. To be able to measure effectiveness, pragmatic trials need to be developed and implemented for translational science and application in real-world settings [5]. The spectrum between explanatory and pragmatic trials is not dichotomous but rather a continuum and the evidence generated by trials conducted according to each end of the continuum have value, with trials incorporating aspects of both in a variety of dimensions [7].

Recognition of the limitations of the RCT model has raised recognition of pragmatic research designs to evaluate the effectiveness of health care as it really occurs. The *Pragmatic-Explanatory Continuum Indicator Summary* (PRECIS-2) is an instrument that assists researchers in

developing trials for this particular purpose [8]. More importantly, the tool has been useful for articulating important aspects of design and intention, essentially framing what is sometimes a dynamic and disconnected process through the stages of research design, conduct, interpretation, and clinical application [9]. Being able to combine, develop and assess trials using the PRECIS-2 model supports researchers to develop trials that provide high level clinical evidence allowing for individualized clinical decision-making and the delivery of complex multi-modal interventions. In addition to the PRECIS-2, a *Template for Intervention Description and Replication* (TIDieR) checklist and guide was developed by an international team of experts to assist researchers to promote full and accurate descriptions of trial interventions [10].

Focusing on real world outcomes and effectiveness also increases the need for participatory/community-based involvement [11]. Equally, an observational or quasi-experimental (uncontrolled) trial may be advantageous when assessing application in a community-based setting. These types of research designs generally require a mixed methods approach that is person-centered rather than disease centered. Designing and implementing person-centered research has become more prominent in an era where policy-makers are emphasizing person-centered care [12]. Innovation in research methodology is a necessary response to these policy-driven demands. Fortunately, based on a recognition that clinical outcomes in clinical trials do not capture all important mediators and predictors of real-life clinical practice, several funding agencies including the National Institutes of Health (NIH) and the Patient-Centered Outcomes Research Institute (PCORI) in the USA have endorsed and led the development of research instruments and processes. This includes the Patient Reported Outcomes Measure Information System (PROMIS) [13] which is used to capture more holistic data on functional, social, emotional, and spiritual domains of health, and more directly involve patients in research.

Applying Health Research Advancements to Naturopathy

Certain aspects of naturopathic care are suited to clinical trials, however, the RCT model is not always applicable when assessing a naturopathic intervention due to the multifaceted approach to naturopathic care and the naturopathic focus on individuals as a complex system. Similar concerns about the emphasis on explanatory RCTs within the evidence-based medicine paradigm have been raised in other areas of health care, with criticisms and limitations described by medical doctors and allied health professionals [14-16]. The diversification of accepted health research methods to include pragmatic designs supporting assessment of complex person-centered interventions resulting from these concerns, provides important opportunities for naturopathic researchers focusing on real-world naturopathic practice. This type of research is important because patients who require a variety of different interventions due to complex disease status, are not normally included in certain trials since they do not fit the "optimal" requirements for that trial (e.g., too many potentially confounding health complications). In pragmatic trials, all patients who have the conditions of interest – regardless of their responsiveness, past compliance, and co-morbidities – can be enrolled [17]. Furthermore, the checklists and guidelines (e.g., PRECIS-2, TIDIER) that evolved in response to attempts by the health research community to better evaluate complex interventions, align well with the diverse practices inherent to naturopathic care.

Recent research evaluating treatments for low back pain provide excellent examples of multiple research methodologies applicable to naturopathic practice, including inclusion of education and self-care practices in randomized trials [18-21]; development and inclusion of multi-dimensional patient-reported outcome measures [22-24]; application of mixed-method designs to capture patients' experiences with the intervention [25, 26]; evaluating assessments of individual predictors of outcomes [27, 28] including experience of care [29, 30], inclusion of informed choice [31, 32], and expectations [33] as predictive factors for improved clinical outcomes. These research methodologies are richly aligned with naturopathic philosophy of *'holism'*, and principles of "Doctor as Teacher" *(docere)*, and "Treat the Whole Person" *(tolle totum)* and the naturopathic Therapeutic Order [34] because there is significant patient engagement, attention to education and self-reflection, as well as assessing aspects of the whole person as part of the intervention or outcome. Several of the approaches to data collection and outcome measurement described in this chapter have been applied to clinical research evaluating naturopathic practice. For example, a study in primary prevention of heart disease collecting data on the outcomes of highest priority to patients in addition to traditional Framingham risk scores [35]. Other examples include quasi-experimental research in type II diabetes collecting patient reported outcomes including self-efficacy and stress, in additional to clinical hemoglobin A1c changes [36], plus including qualitative elements in clinical trials to capture patients' experiences with care [37]. Other naturopathic research has been published that describes patients experiencing person-centered care when treated by a naturopath/naturopathic doctor [38]. For this reason, the person-centered research methods being developed within the broader health research community are particularly relevant to naturopathic research. In fact, instruments such as PROMIS and other patient-reported outcome measures afford researchers

an opportunity to capture changes to health status as experienced by the patients themselves.

The nature of naturopathic practice is complex to research in its totality. However, the pragmatic and person-centered research methods emerging from innovations in health research methods provide an approach to interrogate the complexity of practice while not requiring violation of fundamental naturopathic principles of practice allowing high external validity in the study design. In fact, these new research methods may help determine fidelity to complex naturopathic practices previously undervalued or overlooked in health research [39].

Strengthening Health Research Through the Naturopathic Approach

Not only do advances in health research methodology offer important opportunities to progress naturopathic research and benefit patients, but there are also areas where the unique characteristics of naturopathic philosophy and practice can impact on other areas of health research. The *tolle totem* principle of naturopathy – which focuses on treatment of all aspects of the individual – requires clinicians to acknowledge the complexity of disease etiology and pathophysiology [40, 41]. In doing so, naturopathic clinical understanding may open new avenues for researchers from other disciplines to explore. A recent example of this is the growing research interest in the clinical importance of gastrointestinal health in an array of health conditions [42-46] – a concept well-established within the naturopathic clinical approach [47]. There are undoubtedly many other areas where the insights and experience of naturopaths/naturopathic doctors may, once communicated to a wider audience through case reports and medical hypothesis articles, encourage more research breakthroughs that will benefit the community in ways yet unmeasured.

Such an opportunity to capture clinical insights as a basis for future research may not only assist the substantive topic in question, but it may also offer a practical method for recalibrating the balance within the evidence-based medicine triad; serving to bolster the attention given to clinical expertise and patient values through research [48-50]. As the naturopathic profession, both as clinicians and researchers, document and share their experience and clinical insights (both past and present), they will provide a model through which the 'clinician experience' pillar of evidence-based medicine can be operationalized [50]. This move to rebalancing the value placed on different types of knowledge has evolved globally in recent years, and scholars committed to mobilizing such knowledge between stakeholders have argued that this approach benefits all areas of society [51]. However, while building practitioner research capacity has demonstratable improvements in research quality and relevance [52], there remain barriers and challenges to fully engaging naturopaths/naturopathic doctors in this process, such as lack of access to clinician research support schemes available to other health professions.

Naturopaths/naturopathic doctors are well-placed to support new research by effectively and rapidly implementing practices developed through new areas of research such as precision or personalized medicine [53], thereby providing opportunities to better understand the real-world implications of the health technology as it develops. In fact, the emphasis on individualized treatments as a core philosophical element of naturopathic care [47] may mean that naturopaths/naturopathic doctors are more ideologically and logistically prepared to incorporate such personalized health care compared to other health professionals. However, despite a natural and opportune fit, issues with capacity, mentorship, training and support for naturopathic researchers and cross-disciplinary teams need to be addressed [54, 55].

There are gaps in the available health research methods and instruments which limit the robustness of some facets of naturopathic research. Current naturopathic researchers cannot meaningfully build the experience and knowledge of past (i.e., historical) naturopaths/naturopathic doctors into the design of research projects; without a rigorous framework to guide the analysis and appropriate use of traditional information sources (e.g., historical texts and ancestral or elder-based knowledge) [56]. They also need to develop instruments that measure the outcomes uniquely important in naturopathic clinical decision-making and treatment evaluation (e.g., vital force). In some instances, some relevant instruments may already exist that only require small modifications to capture nuances specific to naturopathic principles and practice. In other cases, the instruments will need to be developed in full.

Summary

Researching naturopathy/naturopathic medicine has historically presented several challenges due to the limitations of the randomized-controlled trial design when evaluating complex interventions underpinned by philosophies and principles beyond the biomedical paradigm, but these challenges are being overcome by embracing widely accepted innovations in research design and methodology aimed at investigating person-centred interventions with multiple therapeutic elements. This is evidenced in Section 5: *Effectiveness of Naturopathic Clinical Practice*, and Section 6: *Research in Naturopathic Therapeutics and Practices* where randomised-controlled trials have frequently been used by naturopathic researchers to evaluate naturopathy/naturopathic medicine and its treatments, but such trials commonly reflect

elements of pragmatic clinical research including multimodal interventions, real-world settings and flexibility in treatment delivery matching the approach taken in real-world care. The naturopathic research community is well positioned to contribute to the advancement of such designs and methodologies by applying their experience and perspective of complexity-based healthcare for the benefit of health research more generally.

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16 Research Dissemination by the Global Naturopathic Research Community

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HIGHLIGHTS

- The international naturopathic research community has demonstrated sustained commitment to codifying and synthesizing existing knowledge, generating new knowledge and disseminating this knowledge to the wider clinical and research community.
- Naturopaths/NDs have published over 2000 peer-reviewed articles since 1987 with notable increases in the last 20 years.
- The naturopathic profession has been increasingly engaged with evidence-based medicine since it was articulated in 1996.
- Naturopathic researchers have investigated a broad range of health conditions and a diverse array of naturopathic treatments.
- Naturopathic researchers utilize all types of research designs including randomized control trials, observational studies, reviews and case studies.
- Naturopathic researchers are publishing in high ranked journals in a range of subject areas.

The evolution and contemporary practice of the naturopathic profession occurs alongside substantial changes to the broader healthcare landscape. Most notable among these changes is prioritization of the best available evidence within clinical decision-making, described in 1994 as 'evidence-based medicine' (EBM) [1]. Key components to EBM are the generation of new knowledge and its dissemination and implementation within the clinical encounter [1, 2]. Historically, the primary platform for scientific knowledge dissemination favoured by EBM is through peer-reviewed academic journals. The peer-review process endeavours to ensure contributions to new knowledge are critically appraised by independent researchers prior to being shared with the wider community. While there are acknowledged limitations to the peer-review process [3, 4] and the translation of published articles to daily routine care [5], it is still a central component of knowledge generation and dissemination underpinning EBM.

This chapter presents the results of analysis from an article titled *"Knowledge dissemination by the naturopathic profession: a bibliometric analysis of naturopath-authored, peer-reviewed publications"* published in The Journal of Alternative and Complementary Medicine [6]. The information from this analysis provides the foundation for the detailed summary of naturopathic clinical research presented in Section 5: *Effectiveness of Naturopathic Clinical Practice* and Section 6: *Research in Naturopathic Therapeutics and Practices* of this Health Technology Assessment. This chapter adds to the evidence indicating exponential growth of the production of scientific content within traditional, complementary and integrative medicine (TCIM) journals [7] and for other TCIM professions [8], as it presents an examination of the published peer-reviewed journal articles authored by naturopathic researchers.

Implications

The evolution of knowledge generation and dissemination by naturopaths/naturopathic doctors globally has occurred organically for more than 30 years and the findings presented in this chapter provide insight into the implications for future research, policy, and practice for the naturopathic profession, as well as other health care professions, health care managers, policy- and decision-makers. The naturopathic profession has engaged philosophically [9-11] and practically [12-15] with EBM as evidenced by research centres having been established in naturopathic institutions; naturopaths/naturopathic doctors with research qualifications being housed in leading national and international research centres focused on naturopathy and related practices and professions (see Figure 16.1); and with the launch of an international leadership program for naturopathic researchers in 2015 [16]. The countries with substantive outputs of scholarly articles (USA, Australia, Canada, Germany and India) can be characterized by the presence of naturopathic institutions with some focus on research, or research centres that include naturopaths/naturopathic doctors with research qualifications.

To increase knowledge generation, evidence by publication of peer-reviewed articles, similar infrastructure and training should be made available to the naturopathic profession in other countries. Access to formal research qualifications may be limited in some countries due to variability in qualification level [17], however incorporating case report writing and other clinic-relevant research skills into the curriculum in those locations may still be achievable. However, the active participation of the naturopathic community in research where formal research qualifications are available to them suggests that government education and research agencies should consider broader incorporation of the naturopathic community in research and formal education initiatives.

The research active naturopathic community also needs to prioritize the attention given to specific topics to ensure it benefits the wider profession. The North American naturopathic community proposed a naturopathic research agenda in 2006 that recommended focusing on conditions with highest burden and significance, and those with the potential to advance patient care [13]. Given the transformation in the international landscape for the naturopathic profession in recent years, there may be value in revisiting this agenda with input from the global naturopathic research community.

Figure 16.1: Location of universities with naturopathic-focused research centers, chairs or departments, or naturopathic training institutions with research departments that have received government research funding

Methods

Literature search

A snowballing method was employed between June 2018 and July 2019 to identify research articles written by at least one naturopath/naturopathic doctor. Articles were included if: (1) at least one author held a naturopathic qualification recognized by the country where they were located; and (2) they were published in a peer-reviewed, indexed journal. Journals were defined as peer-reviewed and indexed if the journal's website outlined a peer-reviewing protocol within its publishing policy and if the journal was indexed in a scholarly database. No date restrictions were applied. Articles were excluded if the journal was indexed solely in broader databases that draw from non-scholarly sources, such as Google Scholar, or if the article was published before the author obtained naturopathic qualifications (e.g., the author was researching in another discipline before studying naturopathy).

The naturopathic researchers identified through referral were contacted and asked to provide a list of their publications to-date, along with other naturopathic practitioners who had also engaged in research. This process was repeated until no new referrals were received. In the event of no response after at least two attempts at contact, the naturopathic researcher's publications were searched for in PubMed, Google Scholar and ResearchGate. A request for publication lists was also sent by the World Naturopathic Federation (WNF) to naturopathic educational institutions.

Each publication list was systematically examined for articles meeting the eligibility criteria and citations for eligible articles were imported to an EndNote library, where duplicates were removed. The author lists of all eligible articles were examined for naturopathic qualifications and newly identified researchers were then contacted in the same snowballing method.

Data extraction

Data were extracted from the identified articles and input into an Excel spreadsheet.

Geography, affiliation and year of publication

Variables were created for the year the article was published, the WHO Region and country where the research was conducted, and the institutional affiliation and geographical location of each author. Where an article was written without reference to a specific geographic location (e.g., international reviews or commentary articles) the article was coded based on the primary affiliation of the lead author.

Article type or research design

Articles were also categorized based on the research design or article type (e.g., clinical trial/intervention study, editorial, case report). Observational studies were categorized either as a cluster of 'survey, interview, focus group or Delphi studies' or 'other observational/non-interventional studies. Studies reporting *in vivo, in vitro,* or *ex vivo* research were coded as 'basic science'.

Article topic

The primary topic focus of identified articles was determined by establishing which topic was most central to the article's aim or argument and broadly categorized as a: modality, treatment, speciality, condition, non-naturopathic treatment, public health/health services, basic science, education, or research methods/methodology. Any additional topics covered were separately coded as a secondary topic focus with binary variables for each of the above categories as well as health condition and treatment topic areas. Articles were also categorized based on whether they explicitly mentioned naturopathy.

Journal

The journals in which the identified articles were published were coded to individual variables.

Data analysis

Data were analysed in Stata 14.1 and initially explored via descriptive frequencies and percentages. Some data was then regrouped into new variables: (1) articles presenting original research (e.g., clinical trials, reviews/meta-analyses, observational studies, basic science, case reports, protocol papers) or other scholarly article types; (2) author affiliated with a naturopathic institution; and (3) 40 journals with the highest frequency of articles authored by naturopathic researchers.

The temporal changes in (1) original research compared to non-research articles; (2) study designs reported in original research articles; (3) original research published of researchers from different countries; and (4) articles published about the six most frequently reported health condition topics were examined descriptively. This temporal analysis excluded articles published in 2019 as our data did not cover the full year. Chi-square tests were used to interrogate associations between characteristics of articles published between 2006 and 2012, and between 2012 and 2018.

A backwards stepwise regression was conducted to identify the most parsimonious model of characteristics for five different article topics. These included the two most frequent health condition topics, the two most frequent treatment topics, and articles reporting a complex intervention. Unique baseline regression models were developed for each topic category. All the included variables were considered in this stage of analysis and

removed if appropriate as determined by a likelihood ratio test.

The Scimago Journal and Country Rank database (www.scimagojr.com) was used to identify the subject area of all journals in which the included articles were published. A binary variable was generated categorising each journal based on its allocation to the 'Complementary and Alternative Medicine' subject area or another subject area. The journal ranking for each subject area of the 40 journals most frequently identified as publishing articles authored by naturopathic researchers was also determined. Each of these 40 common journals was then coded according to whether it was in the first (Q1), second (Q2), third (Q3) or fourth (Q4) quartile of its allocated subject area. Where a journal was allocated to multiple subject areas, the highest quartile ranking was applied.

Results

Article characteristics

Naturopathic researchers from 22 countries published 2218 manuscripts in peer-reviewed indexed journals. The articles were published between 1987 and 2019 (median=2013) with 80.9% published in the last 10 years (since 2008). Table 16.1 reports the characteristics of included articles. Most articles were published by naturopathic researchers in the America (52.5%) and Western Pacific (28.3%) Regions with 37.2% of studies originating in the USA, 27.8% from Australia and 15.2% from Canada. At least one author identified an affiliation with a naturopathic institution in 32.4% of articles. The most common type of study design or article type were reviews and meta-analyses (23.2%), clinical trials or intervention studies (19.4%), observational studies (surveys, interviews, focus groups, Delphi studies) (17.9%) and commentary or opinion articles (15.6%).

Table 16.2 presents the topic areas of the identified articles. The article topics were predominantly a treatment or intervention (24.0%) a traditional medicine system such as naturopathy or traditional Chinese medicine (19.2%) or public health/health services research (15.8%). A range of health conditions were covered by the included articles. The most frequent health condition article topics were cancer and cancer-related conditions (14.3%) and mental health care and mental illness (12.3%). The most common treatment topic areas were botanical medicine (18.2%) and clinical nutrition (14.3%). Less than 10% explicitly identified naturopathy as related to the article topic (8.1%) or reported on a complex intervention (7.8%).

Temporal changes in the characteristics of published articles

Figure 16.2 presents temporal changes in a range of published article characteristics. Figure 16.2(a) shows an increase in the number of both original research articles and other non-research articles from 2004 onwards. This increase continues steadily through to 2018 for non-research articles but grows substantially for original research articles. Figure 16.2(b) demonstrates changes in the number of articles published about health conditions, focusing on the six most common health conditions identified through our analysis and representing 53.6% of the total included articles. A diversity of clinical topics has been the focus of the articles even in years where a relatively small number of articles were published. Articles about mental health and cancer have been published every year since 1998 and 1999 respectively. Neurological conditions have also been a topic of focus in articles as early as 1998. Female reproductive health has been discussed in articles since 1999 and gastrointestinal conditions since 1997.

The types of original research study designs reported in articles published between 1987 and 2018 indicate an increase in reviews and meta-analyses, and in survey, interview, focus group, and Delphi studies (see Figure 16.2(c)). Chi-square tests indicate a statistically significant difference (p=0.05) between the proportion of original research study designs published in 2006 compared with 2012, demonstrating a reduction in other observational/non-interventional studies (2006: 19.2%; 2012: 9.6%) and basic science (2006: 12.8%; 2012: 2.6%) and an increase in reviews and meta-analyses (2006: 25.5%; 2012: 34.8%). There was no statistically significant difference in original research study design types published in 2012 compared with 2018.

Figure 16.2(d) presents the proportional changes in the geographical location of naturopathic authors between 1987 and 2018. US-based authors published the most peer-reviewed articles between 1996 and 2006. Publications from Canada were identified from 2001 and increased in volume until 2008-9. Authors from India have articles published in 1997 but evidence of articles being published each year is not seen until 2006. Similarly, while there is some earlier publication of articles by Australia-based authors, regular article publication is not evident until 2002. Contributions from authors from Germany were not observed until 2010.

Chi-square tests indicate a statistically significant difference in the proportion of articles published by naturopathic researchers in 2006 compared with 2012 (p=0.006) whereby articles by authors from the USA and Canada increased in volume but reduced proportional

Table 16.1 (below): Characteristics of articles published by naturopathic researchers

Table 16.2 (right): Topic areas of articles published by naturopathic researchers

Characteristics	N	%
WHO Region		
African	8	0.4
Americas	1164	52.5
South-East Asia	204	9.2
European	195	8.8
Eastern Mediterranean	20	0.9
Western Pacific	627	28.3
Study location		
USA	825	37.2
Australia	616	27.8
Canada	338	15.2
India	203	9.2
Germany	185	8.3
Other	51	2.3
Naturopathic researcher location		
USA	823	37.1
Australia	647	29.2
Canada	389	17.5
Germany	204	9.2
India	194	8.8
New Zealand	6	0.3
South Africa	5	0.2
Argentina	1	0.05
Naturopathic institution affiliation	718	32.4
Study design or article type		
Reviews and meta-analyses	515	23.2
Clinical trial/interventional	431	19.4
Surveys, interviews and focus groups (includes Delphi)	396	17.9
Commentary and Opinion articles	347	15.6
Other observational/non-interventional	215	9.7
Letters to the Editor (and replies)	64	2.9
Basic sciences	57	2.6
Editorials	52	2.4
Study protocols	47	2.1
Monographs	15	0.7
Case reports and series	11	0.5
Medical hypotheses	11	0.5
Other	12	0.5

Article topics	N	%
Primary article topic		
Treatment or intervention	533	24.0
System of medicine (naturopathy, nutrition, homeopathy)	426	19.2
Public health/Health Services research	351	15.8
Research method/methodology	221	10.0
Medical speciality	114	5.1
Basic science	99	4.5
Conventional medicine treatment	34	1.5
Education	30	1.4
Health condition topic area		
Cancer and cancer-related condition	316	14.3
Mental health care and mental illness	273	12.3
Musculoskeletal condition	190	8.6
Neurological condition	151	6.8
Gastrointestinal condition	125	5.6
Female reproductive and sexual health	125	5.6
Cardiovascular condition	100	4.5
Endocrine condition	77	3.5
Infectious disease	71	3.2
Respiratory condition	59	2.7
Weight management	46	2.1
Dermatology condition	37	1.7
General wellness and preventive	32	1.4
Urogenital condition	24	1.1
Ageing and cognition-related disorders	20	0.9
Autoimmune condition	8	0.4
Treatment topic area		
Herbal/botanical medicine	403	18.2
Clinical nutrition inc. supplements/nutraceuticals	317	14.3
Explicitly focusing on naturopathy	179	8.1
Yoga	192	8.7
Counselling, Meditation and Mind-Body medicine	165	7.4
Applied nutrition inc. dietary prescription	106	4.8
Manual therapies	91	4.1
Lifestyle and behaviour changes	86	3.9
Acupuncture	53	2.4
Traditional Chinese medicine practices other than acupuncture	42	1.9
Laboratory, pathology or radiology testing	36	1.6
Hydrotherapy	16	0.7
Hormone prescribing	14	0.6
Homeopathy	11	0.5
Ayurvedic medicine other than yoga	11	0.5
Intravenous therapies	5	0.2
Wound care	2	0.1
Chelation therapy	1	0.05
Other naturopathic treatments	26	1.2

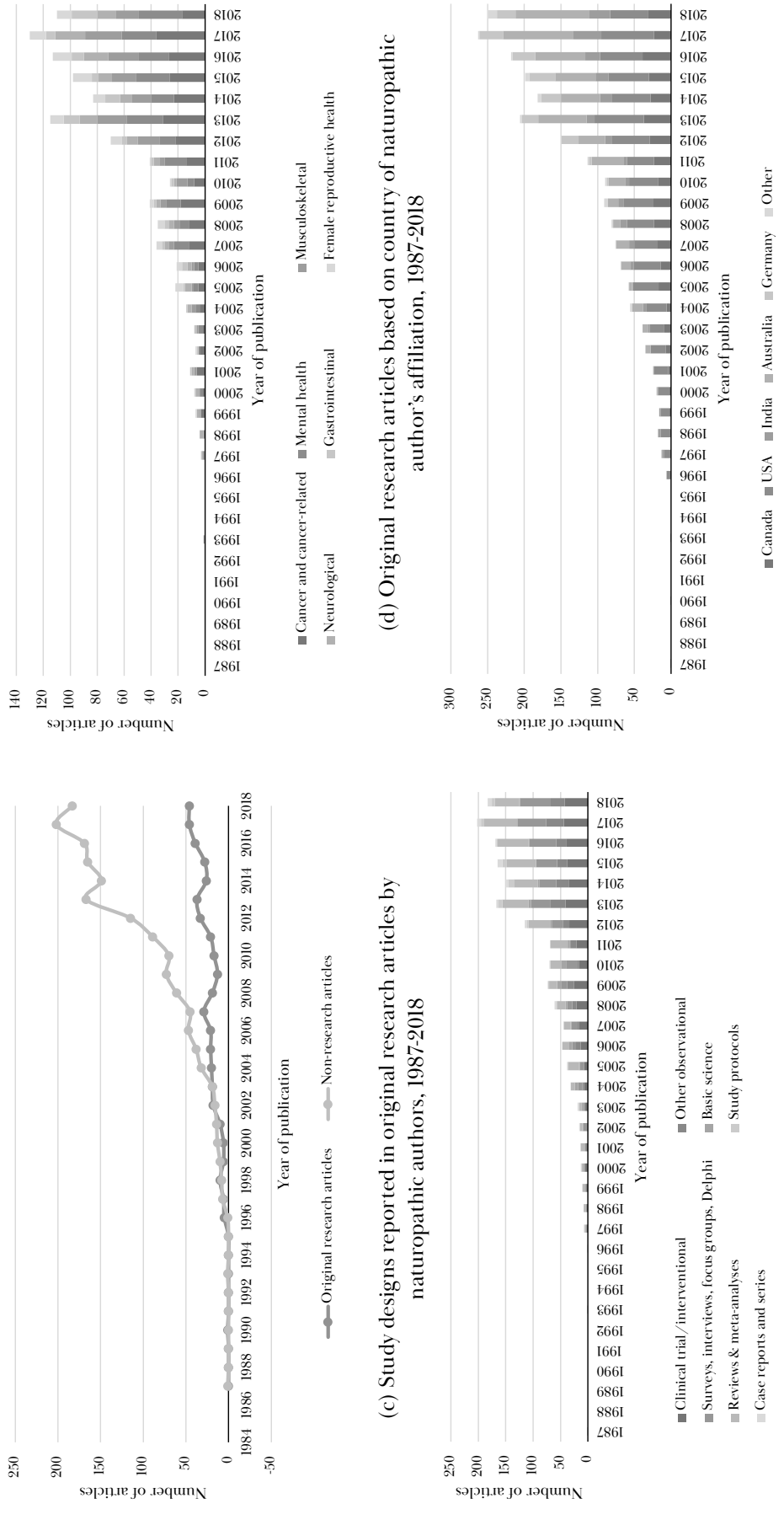

Figure 16.2: Changes in characteristics of peer-reviewed articles by naturopathic authors between 1987 and 2018

to the total number of articles published internationally due to an increase in articles published by authors from Germany and Australia. Between 2012 and 2018 the number of articles published by authors from India and Australia increased substantially while the number of articles published by authors in USA, Canada and Germany remained relatively constant resulting in a statistically significant change in proportional contribution to the total number of articles based on author's country ($p<0.001$).

Characteristics of articles focused on selected topic areas

The backwards stepwise logistic regression identified the characteristics most associated with articles focused on mental health, cancer, herbal medicine, clinical nutrition, and complex interventions (see Table 16.3). Articles focused on mental health were more likely to be conducted in Australia (OR 3.3) and focused on lifestyle behaviour (OR 2.5) or clinical nutrition (OR 1.6) and less likely to examine manual therapy (OR 0.3), be identified as naturopathic research (OR 0.4) or published by a researcher affiliated with a naturopathic institution (OR 0.6). Mental health articles reporting original research were less likely to report survey, interview, focus group or Delphi study research (OR 0.3), other observational or non-interventional research (OR 0.6) or reviews or meta-analyses (OR 0.7) compared to clinical trial or intervention studies.

Herbal medicine articles were more likely to be based empirically in Australia (OR 1.6) and less likely to come from Canada (OR 0.6) or Germany (OR 0.6). These articles were also more likely to cover skin complaints (OR 2.9) and included an author affiliated with a naturopathic institution (OR 2.3) but less likely to discuss neurological complaints (OR 0.5) or mention naturopathy in the manuscript (OR 0.2) compared to other articles. Herbal medicine articles were also more likely to report basic science (OR 5.3) and reviews or meta-analyses (OR 2.3) rather than clinical trials or interventional research but less likely to report surveys, interviews, focus groups and

Table 16.3: Characteristics of articles published by naturopathic researchers about selected topic areas

Research characteristic	Article topic focus				
	Mental health	Cancer	Herbal medicine	Clinical nutrition	Complex intervention
Research location	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Research located in Canada	–	–	0.6 (0.4-1.0)	–	4.9 (2.6-9.2)
Research located in Australia	3.3 (2.4-4.5)	0.1 (0.03-0.1)	1.6 (1.1-2.2)	–	–
Research located in Germany	–	0.5 (0.3-0.8)	0.4 (0.2-0.8)	0.2 (0.08-0.4)	–
Research located in India	–	–	–	0.1 (0.07-0.3)	–
Research located in New Zealand	–	–	–	–	11.2 (1.1-117.5)
Research topic or focus					
Lifestyle behaviour	2.5 (1.4-4.3)	2.0 (1.2-3.5)	–	–	–
Manual therapy	0.3 (0.1-0.9)	–	–	–	4.6 (1.8-11.7)
Clinical nutrition	1.6 (1.1-2.2)	–	–	–	–
Skin/Integumentary	–	–	2.9 (1.1-7.5)	–	–
Neurological	–	–	0.5 (0.3-1.0)	–	–
Musculoskeletal	–	–	–	0.4 (0.2-0.8)	–
Cancer	–	–	–	1.5 (1.0-2.1)	–
Ageing and cognition	–	–	–	4.6 (1.5-13.7)	–
Mental health	–	–	–	1.6 (1.1-2.3)	–
Naturopathic affiliation or recognition					
Researcher affiliated with a naturopathic institution	0.6 (0.4-0.8)	–	2.3 (1.7-3.1)	1.4 (1.0-1.9)	–
Identified as naturopathic research	0.4 (0.2-1.0)	0.4 (0.2-0.8)	0.2 (0.1-0.6)	–	133.8 (71.1-251.8)
Original research design					
Clinical trial/intervention study	Ref	Ref	Ref	Ref	Ref
Survey, interviews, focus groups and Delphi studies	0.3 (0.2-0.4)	–	0.5 (0.3-0.8)	0.2 (0.1-0.3)	4.2 (1.9-9.1)
Other observational/non-interventional study	0.6 (0.4-1.0)	2.0 (1.3-3.0)	0.4 (0.2-0.8)	0.5 (0.3-0.8)	3.3 (1.3-8.3)
Basic science	–	–	5.3 (2.9-10.0)	–	–
Reviews and meta-analysis	0.7 (0.5-1.0)	–	2.3 (1.6 -3.5)	0.7 (0.5-0.9)	–

Delphi studies (OR 0.3) or other observational/non-intervention studies (OR 0.4).

Compared to other articles, those focused on complex interventions were more likely to be located empirically in Canada (OR 4.9) or New Zealand (OR 11.2), to cover manual therapy (OR 4.6), and to explicitly mention naturopathy (OR 133.8). Articles about complex interventions were also more likely to be reporting survey, interview, focus group or Delphi studies (OR 4.2) or other observational or non-interventional research (OR 3.3) rather than clinical trials or intervention studies.

Journals publishing articles written by Naturopathic Practitioners

Almost half (48.4%; n=1074) of all included articles were published in 40 journals (see Table 16.4) and 56.9% of these were published in journals ranked Q1 for at least one subject area, with a further 16.1% published in Q2 journals (data not shown). The remaining one quarter were published in Q3 (22.9%) and Q4 (4.1%) journals.

The journals most frequently identified as publishing articles by naturopathic practitioners are included within the 'Complementary and Alternative Medicine' (CAM) subject area: *Alternative and Complementary Therapies* (n=141), *Journal of Alternative and Complementary Medicine* (n=127), *Advances in Integrative Medicine* (n=69) and *BMC Complementary and Alternative Medicine* (n=61). There was a significantly greater number of articles that explicitly mention naturopathy as a whole system published in journals within the 'CAM' subject area (75.9%) compared to journals from other subject areas (24.0%) (p<.001) (data not shown). Other journals publishing articles by naturopathic practitioners are Q1 for additional subject areas including: 'Medicine (miscellaneous)' (e.g., *PLoS* One [n=21], *The Cochrane Database of Systematic Reviews* [n=29], JAMA [n=11]); 'Oncology' and 'Cancer Research' (e.g., *Journal of Clinical Oncology* [n=29]); and 'Internal Medicine' (e.g., *Annals of Internal Medicine* [n=11]) among others.

Table 16.4: Most common 40 journals in which naturopathic researchers have published articles

Journal title		n	Journal ranking [Category (Quartile)]
1.	Alternative and Complementary Therapies	141	*Complementary and Alternative Medicine (Q3)*
2.	Journal of Alternative and Complementary Medicine	127	*Complementary and Alternative Medicine (Q1)*
3.	Australian Journal of Herbal and Naturopathic Medicine	70	*No data*
4.	Advances in Integrative Medicine	69	*Complementary and Alternative Medicine (Q3)*
5.	BMC Complementary and Alternative Medicine	61	*Complementary and Alternative Medicine (Q1)* *Medicine (miscellaneous) (Q2)*
6.	Complementary Therapies in Medicine	47	*Complementary and Alternative Medicine (Q1)* *Advanced and Specialized Nursing (Q1)* *Complementary and Manual Therapy (Q1)*
7.	Alternative Medicine Review	43	*Complementary and Alternative Medicine (Q1)*
8.	Journal of Clinical Epidemiology	33	*Epidemiology (Q1)*
9.	Evidence-based Complementary and Alternative Medicine	30	*Complementary and Alternative Medicine (Q1)*
10.	Integrative Cancer Therapies	29	*Complementary and Alternative Medicine (Q1)* *Oncology (Q2)*
11.	Journal of Clinical Oncology	29	*Cancer Research (Q1)* *Medicine (miscellaneous) (Q1)* *Oncology (Q1)*
12.	European Journal of Integrative Medicine	27	*Complementary and Alternative Medicine (Q2)*
13.	Alternative Therapies in Health and Medicine	26	*Complementary and Alternative Medicine (Q2)* *Medicine (miscellaneous) (Q3)*
14.	Explore	24	*Complementary and Alternative Medicine (Q2)* *Nursing (miscellaneous) (Q2)* *Chiropractics (Q2)* *Medicine (miscellaneous) (Q3)*
15.	PLoS One	21	*Medicine (miscellaneous) (Q1)* *Agricultural and biological science (miscellaneous) (Q1)* *Biochemistry, genetics and molecular biology (miscellaneous) (Q1)*
16.	International Journal of Yoga	19	*Medicine (miscellaneous) (Q4)*

17.	Complementary Therapies in Clinical Practice	20	*Complementary and Alternative Medicine (Q1)*
18.	The Cochrane Database of Systematic Reviews	17	*Medicine (miscellaneous) (Q1)* *Pharmacology (miscellaneous) (Q1)*
19.	Medical Journal of Australia	15	*Medicine (miscellaneous) (Q2)*
20.	Phytotherapy Research	15	*Pharmacology (Q2)*
21.	BMJ Open	13	*Medicine (miscellaneous) (Q1)*
22.	Journal of Complementary and Integrative Medicine	13	*Complementary and Alternative Medicine (Q2)* *Medicine (miscellaneous) (Q3)*
23.	Focus on Alternative and Complementary Therapies	12	*Complementary and Alternative Medicine (Q4)*
24.	Annals of Internal Medicine	11	*Internal medicine (Q1)* *Medicine (miscellaneous) (Q1)*
25.	Global Advances in Health and Medicine	11	*Medicine (miscellaneous) (Q2)*
26.	JAMA	11	*Medicine (miscellaneous) (Q1)*
27.	Cancer Research	10	*Cancer Research (Q1)* *Oncology (Q1)*
28.	FASEB Journal	10	*Biochemistry (Q1)* *Biotechnology (Q1)* *Genetics (Q1)* *Medicine (miscellaneous) (Q1)* *Molecular biology (Q1)*
29.	Indian Journal of Physiology and Pharmacology	10	*Pharmacology (Q4)* *Physiology (Q4)* *Physiology (medical) (Q4)*
30.	Journal of Evidence-based Complementary and Alternative Medicine	10	*Complementary and Alternative Medicine (Q2)*
31.	Orthopaedic Journal of Sports Medicine	10	*Orthopaedic and sports medicine (Q1)*
32.	Supportive Care in Cancer	10	*Oncology (Q2)*
33.	Systematic Reviews	10	*Medicine (miscellaneous) (Q1)*
34.	Trials	10	*Medicine (miscellaneous) (Q1)* *Physiology (medical) (Q1)*
35.	Canadian Journal of Clinical Pharmacology	9	*Medicine (miscellaneous) (Q2)* *Pharmacology (Q2)* *Physiology (Q3)* *Physiology (medical (Q3)*
36.	Indian Journal of Palliative Care	9	*Health policy (Q3)* *Public Health, Environmental and Occupational Health (Q3)*
37.	Integrative Medicine Research	9	*Complementary and Alternative Medicine (Q3)*
38.	Breast Cancer Research and Treatment	8	*Cancer Research (Q1)* *Oncology (Q1)*
39.	Pediatrics	8	*Pediatrics, Perinatology and Child Health (Q1)*
40.	Planta Medica	8	*Complementary and Alternative Medicine (Q1)* *Analytical chemistry (Q2)* *Drug discovery (Q2)* *Organic chemistry (Q2)* *Pharmaceutical science (Q2)* *Molecular medicine (Q3)* *Pharmacology (Q3)*

Discussion

This study presents the first bibliometric analysis of peer-reviewed articles indexed in journals and published by naturopathic researchers. It indicates naturopaths/naturopathic doctors have published over 2000 peer-reviewed articles since 1987 with notable increases in the last 20 years. This suggests the naturopathic profession has been increasingly engaging with EBM since it was articulated in 1996 [1]. Over the last 25 years there has been a proportional increase in observational study designs and case reports, a nominal increase in clinical trials and systematic reviews, and a decrease in basic science research. This change may reflect a shift in the health research community generally towards pragmatic, real-world evidence to inform practice and policy [12], though other factors such as funding agency priorities should also be considered. However, the analysis also found only 1 in 10 of these publications explicitly mention 'naturopathy'; a finding which may cause external stakeholders to erroneously perceive that there is limited research examining naturopathy/naturopathic medicine [18].

Naturopathic research is published in high ranked journals

Our data also shows naturopathic researchers are publishing in high ranked journals in a range of subject areas but most frequently publishing in journals within the 'CAM' subject area, particularly for articles explicitly mentioning naturopathy/naturopathic medicine. The reason behind this trend is unclear but may suggest a bias around publishing articles about naturopathy/naturopathic medicine within journals in other subject areas. While the scientific community has directed efforts to ameliorating publication bias – whereby delays or omissions in publishing study results skew the shared knowledge on a topic among the scientific and general community [3] – our data reflects challenges faced by authors attempting to publish articles in journals from diverse fields and may instead indicate confirmation bias on behalf of editors and peer-reviewers [4]. For this reason, naturopathic researchers writing articles explicitly about naturopathy/naturopathic medicine may only be successful in publishing within CAM-specific journals.

The correlation between naturopathic practice and naturopathic research

The articles in our study were frequently focused on cancer and cancer-related health conditions and mental health. These topic areas deviate somewhat from the practice characteristics of the international naturopathic community [19]. Based on a survey of 14 countries, patients most commonly seek naturopathic care for musculoskeletal (18.5%) and gastrointestinal (12.2%) conditions, although mental health concerns are also common (11.0%). In contrast, cancer was only reported as a primary concern in 4.6% of cases [19], however it is also worth noting that this previous survey only included naturopaths/naturopathic doctors providing generalist services and excluded naturopaths/naturopathic doctors that had a special clinical interest or focus on specific illness populations. As such, this difference may reflect the fact that naturopaths/naturopathic doctors providing care to individuals with cancer are more likely to provide specialised services for that population. Our analysis also identified a focus by naturopathic researchers on herbal medicine and clinical nutrition. While these treatments are commonly used by naturopaths/naturopathic doctors in clinical practice, the frequency that lifestyle behaviour and dietary changes are prescribed is the same [19] yet have not received the same attention in peer-reviewed articles by naturopathic researchers. This variation may be due to the naturopathic research community prioritising knowledge generation in areas unique to their profession rather than practices widely acknowledged as beneficial to public health, such as diet and lifestyle changes. It also may reflect the focus placed on herbal and nutritional prescription within naturopathic curricula in the countries producing the majority of the articles (Canada, USA, Australia) [20]. It may also reflect external influences on research funding decisions – for example research agency priority setting – which may not necessarily align with clinical areas of focus.

Limitations

This paper offers essential insight to a previously unexamined topic, yet limitations must be considered. While our methodology examines the research undertaken by authors with naturopathic qualifications, its scope does not include naturopathic research conducted by authors from other professions or disciplines, so cannot be considered a comprehensive collation of research relating to naturopathy. Equally, this research should be viewed in context of the 15 000 articles published in naturopathic journals recognized by naturopathic organizations as only one of those journals is indexed on a scholarly database and therefore met the inclusion criteria for this study [21]. As such, this study reports a very focused perspective on the naturopathic professions' commitment to knowledge generation and dissemination. Likewise, some of the authors included in our study have authored works not directly related to the naturopathic profession which were not excluded from our analyses. The snowballing method employed to identify relevant researchers relies on intra-professional networks which may have failed to identify some authors, however, the assistance of the WNF in contacting naturopathic institutions and other

international contacts was intended to ameliorate this substantially. Additionally, it was not within the scope of this paper to assess the level of evidence for naturopathic practice contained within this body of literature, which should be considered an important priority for further investigation.

Summary

The international naturopathic research community has produced peer-reviewed literature for over 30 years and has demonstrated sustained commitment to codifying and synthesising existing knowledge, generating new knowledge, and disseminating this knowledge to the wider clinical and research community. The diversity of topics covered in these publications is noteworthy, and reflects the varied treatments used, conditions managed, and populations supported by naturopathic care globally. In the last 20 years, the volume of peer-reviewed literature authored by naturopaths/naturopathic doctors has grown exponentially and much of this output is produced by naturopathic researchers affiliated with naturopathic educational institutions and research facilities. As the profession continues to mature within countries and internationally, the skills, experience and infrastructure offered by this history of research activity has the potential to significantly impact practice and policy if it is applied in a manner that meets the needs of the wider profession and healthcare more generally.

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Section 5: Effectiveness of Naturopathic Clinical Practice

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HIGHLIGHTS

- Naturopathic researchers have conducted original clinical research involving over 80 different illness populations.
- 81.1% of the studies on the effectiveness of naturopathic clinical practice identified a positive response to at least one primary or secondary outcome measure.
- Naturopathic cancer care includes managing primary symptoms of cancer and secondary symptoms associated with living with cancer, and/or adjunctive care during conventional cancer treatment.
- The risk of non-communicable diseases is strongly associated with modifiable risk factors – lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, dietary choices and environmental exposures – all of which are addressed as part of naturopathic care.
- The naturopathic individualized patient-centred approach to healthcare using a diverse range of therapies and practices is well suited in the prevention, treatment and management of a diverse range of conditions.
- Naturopaths/NDs have been instrumental in the development of integrative oncology, nutritional psychiatry and as fore-runners in recognizing the importance of gastrointestinal health in broader health issues.
- This section includes 235 original clinical research papers, yet due to the variety of complex interventions used by naturopaths/NDs further research is required on the effectiveness of naturopathic care.

Naturopaths/naturopathic doctors treat diverse physical and psychological health concerns throughout the full range of a patient's life. The majority of naturopathic visits focus on chronic diseases, but naturopathic clinicians also treat acute conditions and support patients in palliative care and those seeking advice for preventive medicine.

The chapters in this Section highlight the effectiveness of naturopathic care for conditions researched by the naturopathic profession and commonly treated by naturopaths/naturopathic doctors. While there are variations across topic areas, overall, 81.1% of the studies investigating the effectiveness of naturopathic treatments identified a positive response to at least one primary or secondary outcome measure. The clinical research presented in this section is based on work undertaken by naturopathic researchers across five WHO Regions. However, it is important to note that this is not the summation of research investigating clinical management of health conditions that is accessed and used by the naturopathic workforce. The diversity of knowledge and information used, shared and produced by naturopaths/NDs is described in more detail in Chapters 13 and 16.

The chapter on **Cancer and Cancer-related Conditions (Chapter 17)** describes the clinical research conducted by naturopaths investigating treatments for cancer and cancer-related conditions. Patients seeking naturopathic care for cancer support most commonly present with breast, colorectal, prostate and cervical cancer, but also include cancer survivors and individuals requiring palliative care. This section provides an overview of 53 clinical research papers investigating naturopathic treatments for cancer and cancer-related conditions, with 93.2% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on cancer is supplemented by over 100 observational studies and more than 60 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The conditions and populations investigated in these studies include:

- Breast Cancer
- Colorectal Cancer
- Prostate Cancer
- Other Cancers including lung and large B-cell lymphoma, hepatocellular carcinoma, endometrial and cervical cancer.
- Cancer patients requiring palliative care
- Cancer survivors

The chapter on **Cardiovascular Conditions (Chapter 18)** outlines the significant role that naturopaths/NDs

can have in the management of non-communicable diseases. This section provides an overview of 12 clinical research papers investigating naturopathic treatments for cardiovascular conditions, with 91% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on cardiovascular conditions is supplemented by over 20 observational studies and more than 20 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The cardiovascular conditions investigated in these clinical studies include:

- Hypertension
- Cardiovascular disease
- Post-cardiac surgery
- Other cardiovascular conditions including heart failure, venous leg ulcers and anemia

The chapter on **Complex Immune Conditions (Chapter 19)** outlines how the naturopathic approach of viewing the management of conditions through a lens of complexity, addressing multiple causative factors and physiological systems concurrently is beneficial for patients with complex immune conditions. This section provides an overview of 14 clinical research papers investigating interventions for complex immune conditions, including:

- HIV and AIDS
- Multiple sclerosis
- Chronic fatigue syndrome

The chapter on **Endocrine Conditions (Chapter 20)** describes the valuable current and future potential contribution of naturopaths/NDs assist with the treatment and prevention of endocrine conditions due in part, but not limited to, their specific training and focus on patient-centred lifestyle counselling. This section provides an overview of 23 clinical research papers investigating naturopathic treatments for endocrine conditions, with 91% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research investigating endocrine conditions is supplemented by 15 observational studies and 17 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The endocrine conditions include:

- Type II diabetes mellitus
- Metabolic syndrome
- Other endocrine conditions including pre-diabetes and obesity, hypothyroidism and hyperprolactinemia.

The chapter on **Gastrointestinal Conditions (Chapter 21)** describes gastrointestinal conditions as among the top reason patients seek naturopathic care. Naturopaths/NDs place a high importance on gastrointestinal health and recognize that it is linked to many other conditions. This section provides an overview of 17 clinical research papers investigating naturopathic treatments for gastrointestinal conditions, with 82.4% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on gastrointestinal conditions is supplemented by 13 observational studies and 39 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The gastrointestinal conditions investigated in these clinical studies include:

- Irritable bowel syndrome and functional gastrointestinal disorders
- Inflammatory bowel disease and coeliac disease
- Hepatobiliary and pancreatic conditions
- Other gastrointestinal conditions including gastrointestinal infections and dyspepsia.

The chapter on **Mental Health Conditions (Chapter 22)** highlights the value of the naturopathic broad-spectrum approach to health and disease and application of the naturopathic principle *Treat the Whole Person* when providing care to patients with mental health disorders by acknowledging the significance of a person's mental status when treating any condition. This section provides an overview of 34 clinical research papers investigating naturopathic treatments for mental health conditions, with 64.7% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research investigating mental health conditions is supplemented by over 50 observational studies and more than 80 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The research in mental health has focused on several naturopathic interventions with herbal medicines, nutraceuticals and yoga having the most notable clinical effects. The mental health conditions investigated in these clinical studies include:

- Depression
- Anxiety
- Other mental health conditions such as obsessive-compulsive disorders, schizophrenia and psychotic disorders.

The chapter on **Musculoskeletal Conditions (Chapter 23)** outlines naturopaths/NDs broad treatment approach with musculoskeletal conditions, which are among the primary complaints of patients consulting with naturopaths/ND. This section provides an overview of 30 clinical research papers investigating naturopathic treatments for musculoskeletal conditions, with 89.3% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on MSK conditions is supplemented by over 50 observational studies and more than 50 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The musculoskeletal conditions include:

- Chronic neck pain
- Low back pain

- Osteoarthritis
- Fibromyalgia
- Other musculoskeletal conditions including heel pain, temporomandibular joint pain and rotator cuff tendonitis.

The chapter on **Neurological Conditions (Chapter 24)** describes the diverse treatment approach used by naturopaths/NDs in the treatment of neurological conditions. It also provides an overview of 21 clinical research papers investigating interventions for neurological conditions, with 66.7% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on neurological conditions is supplemented by more than 40 observational studies and 25 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. The neurological conditions investigated in these clinical studies include:

- Migraines and chronic headaches
- Parkinson's disease
- Other neurological conditions including ADHD, Alzheimer's disease, Autism spectrum disorders, traumatic brain injuries and trasverser myelitis.

The chapter on **Skin Conditions (Chapter 25)** outlines the importance that naturopaths/NDs place on the appropriate management of skin conditions as naturopathic theory identifies the skin as the largest detoxification of the body and as a representation of internal health. This chapter provides an overview of eight clinical research papers investigating naturopathic treatments for skin conditions, with 62.5% reporting a positive outcome in at least one primary or secondary outcome. The skin conditions investigated in these clincal studies include:

- Acne vulgaris
- Psoriasis
- Vitiligo vulgaris
- Other skin conditions such as dermatitis and plantar warts

The chapter on **Women's Health Conditions (Chapter 26)** describes the central role of effective management of women's health conditions, with over 70% of the patients seeking naturopathic care being female. It provides an overview of 11 clinical research papers investigating naturopathic treatments for women's health conditions, 81.8% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research is supplemented by over 40 observational studies and more than 30 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28. To date the research has primarily focused on herbal and dietary interventions with herbal treatments having the most notable clinical effects. The women's health conditions investigated in these clinical studies include:

- Menopausal symptoms
- Menstrual disorders
- Polycystic Ovarian Syndrome
- Other women's health conditions including recurrent pregnancy loss, vaginal candidiasis and interstitial candidiasis.

The chapter on **Other Conditions (Chapter 27)** overviews 14 clinical research papers investigating naturopathic treatments for a range of other conditions, with 85.7% reporting a positive outcome in at least one primary or secondary outcome. The other conditions investigated in these clinical studies include:

- Overweight or obesity
- Respiratory conditions including pulmonary tuberculosis, asthma, chronic rhinosinusitis, common cold
- Genitourinary conditions including sexual dysfunction, urinary incontinence

The chapter on **Other Research Publications Related to Health Conditions (Chapter 28)** presents a summary of over 1,456 health condition-related non-clinical research articles published by naturopathic researchers in indexed peer-reviewed journals. Approximately half of these articles are reviews and meta-analyses (n=357; 24.5%) or observational studies (n=363; 24.9%). These types of articles present an important contribution to the understanding of health, illness, and its management. This reinforces the knowledge translation behaviours of naturopaths/NDs (outlined in Chapter 13) through which research from many areas of health and medicine may be used by naturopaths/NDs to inform clinical decisions.

Overall, this Section:

- Presents the results of 235 original clinical research articles including randomized-controlled trials (n=145), uncontrolled trials (n=34), case reports (n=34), cohort studies (n=9), secondary analyses (n=5) and non-randomized controlled studies (n=4).
- Features clinical studies that commonly employ pragmatic elements such as multi-modal interventions, flexibility in administration, and real-world settings.
- Demonstrates investigation by the naturopathic workforce of a full range of naturopathic therapeutic modalities and practices including clinical nutrition (n=58), herbal medicines (n=44), yoga (n=36), acupuncture and cupping (n=30), applied nutrition (n=29), complex naturopathic interventions (n=22), lifestyle modifications (n=17), hydrotherapy (n=13), mind-body medicine (n=9), naturopathic physical medicine (n=9), homeopathy (n=5) and a range of other inventions (n=12).

17 Cancer and Cancer-related Conditions

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HIGHLIGHTS

- Individuals with cancer who consult with a naturopath/naturopathic doctor most commonly present with breast, colorectal, prostate or cervical cancer. As well as providing direct support during cancer treatment, these individuals may also seek assistance with recovery from cancer or palliative care.
- Naturopathic care for individuals with cancer includes managing primary symptoms of cancer and secondary symptoms associated with living with cancer, and/or adjunctive care during conventional cancer treatment.
- The risk of cancer is strongly associated with modifiable risk factors – lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, dietary choices and environmental exposures – all which are addressed as part of naturopathic care.
- The naturopathic individualized patient-centred approach to healthcare using a diverse range of therapies and practices is well suited in the prevention, treatment and management of cancer.
- 93.2% of the clinical research investigating naturopathic interventions for cancer and cancer-related conditions reported a positive outcome in at least one primary or secondary outcome measure

Globally, cancer accounts for an estimated 10 million deaths in 2020, and is one of the top leading causes of premature death in 134 of 183 countries [1, 2]. The World Health Organization (WHO) defines cancer as a large group of diseases that can start in almost any organ or tissue when abnormal cells grow uncontrollably, go beyond their usual boundaries to invade adjoining parts of the body and/or spread to other organs [1].

Risk factors associated with cancer development can be categorized as modifiable and non-modifiable. The latter are factors that are intrinsic and immutable such as age, sex and certain genetic considerations [3]. Modifiable risks have the benefit of typically being at least somewhat influenced by individual variability and within cultures. In many ways the modifiable risk factors are similar to those associated with other non-communicable diseases (NCDs) and include: lifestyle-related activities that can lead to prolonged ultra-violet exposure; diet and nutrition choices; alcohol consumption; sedentary behaviour and obesity; tobacco use; and environmental exposure to pollutants (heavy metals and chemicals), contaminated air, water, soil and food; ionizing radiation and infectious or hazardous agents [2, 4, 5].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=47; published in 53 papers) naturopathic researchers have conducted involving populations with cancer or those at risk of cancer. This research includes a total of 5,879 participants and was conducted in the United States of America (USA) (n=33), India (n=13), Germany (n=3), Australia (n=2) and New Zealand (n=2). The research designs used in these studies include randomized controlled trials (n=35), cohort studies (n=6), uncontrolled trials (n=4), case reports (n=2) and secondary analysis (n=6). The study interventions featured a range of therapeutics including clinical nutrition (n=11), yoga (n=10), applied nutrition (n=8), herbal medicines (n=7), acupuncture/acupressure (n=7), exercise/lifestyle (n=6), mind-body medicine or psychological counselling (n=5), homeopathy (n=1), and conventional medicine practices including a triage coding system for palliative care (n=1).

The conditions examined included breast cancer (n=24), colorectal cancer (n=5), prostate cancer (n=3), cervical cancer (n=1) and other cancers (n=3), as well

as studies on palliative care (n=1) and cancer survivors (n=17). Of all the naturopathic clinical studies examining cancer populations, 93.2% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 17.1: Clinical research investigating cancer conducted by naturopathic researchers*. This body of naturopathic research on cancer is also supported by over 100 observational studies and more than 60 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Naturopathy/naturopathic medicine is supported by evidence to provide multiple interventions in an integrative model to support the whole person on the cancer continuum while considering the type of cancer, and all stages of the disease including prevention. To date, naturopathic research has primarily focused on breast cancer which is likely an outcome of the high prevalence of breast cancer worldwide and the high prevenance of female patients that seek naturopathic services [6]. The main interventions that have been examined by naturopathic researchers in the cancer continuum include yoga, applied nutrition (diet), clinical nutrition and acupuncture/acupressure.

Naturopaths/naturopathic doctor are well suited for cancer-related care as they are trained to support individuals to make meaningful and beneficial changes to modifiable risk factors. Cancer support is among the top ten conditions for which patients seek naturopathic care, with the majority seeking assistance for supportive care during cancer treatment, naturopathic care during recovery, and primary prevention of cancer or its recurrence [7].

Naturopathy/naturopathic medicine is a system of healthcare that is an exemplar of the type of care applied within the burgeoning field of integrative oncology – *"a patient-centered, evidence-informed field of cancer care that utilizes mind and body practices, natural products, and/or lifestyle modifications from different traditions alongside conventional cancer treatments. Integrative oncology aims to optimize health, quality of life, and clinical outcomes across the cancer care continuum and to empower people to prevent cancer and become active participants before, during, and beyond cancer treatment"* [8]. When working with a patient undergoing cancer care, and in line with the philosophy of holism, naturopaths/naturopathic doctors aim to assess and manage the whole person throughout the cancer care continuum. This includes managing the primary symptoms of cancer, and potential secondary symptoms that are often associated with living with cancer and/or the negative side effects of conventional cancer treatment [9, 10].

Naturopaths/naturopathic doctors are actively involved in, and have led in the establishment of, the Society of Integrative Oncology (SIO) – a multidisciplinary international group of health professionals committed to integrative cancer-related care. A substantive proportion of contributions by naturopathic clinicians and researchers in this field has come from Canada and the United States. The Oncology Association of Naturopathic Physicians (OncANP), dedicated to the growth and development of naturopathic oncology, have developed a comprehensive overview of naturopathic guidelines related to supportive cancer care [11]. The guidelines outline principles of integrative oncology that are based on sound ethical and evidence-informed approaches for naturopaths/naturopathic doctors who provide care to patients diagnosed with cancer. These principles are designed, in part, to increase interprofessional dialogue and encourage a more integrative approach to care for those living with cancer [12].

Cancer is a complex condition in which each cancer type, subtype and ultimately, each person requires an individual treatment approach. The naturopathic principle of treating the whole person effectively models the naturopathic person-centered care that can improve patient outcomes and quality of life. The naturopathic approach considers the psychosocial state, a patient's mental and emotional wellbeing, and quality of life measures. It also takes into consideration symptoms commonly associated with cancer care including, but not limited to nausea and vomiting, gastrointestinal dysfunctions, mucositis, xerostomia, dysgeusia, neuropathy, insomnia, iatrogenic menopause, pain, fatigue, impacts to mobility and functional changes, immune compromise and cytopenia all of which can be an outcome of the cancer, or negative effects from conventional treatment [10, 13]. Although further research is required, evidence points to a promising role of naturopaths/naturopathic doctors as integral members of integrative oncology teams. As cancer moves towards the number one NCD, research highlights the role naturopaths/naturopathic doctors can have within the medical system towards providing more holistic and comprehensive cancer care and strategies for prevention.

Studies investigating specific conditions:

Breast Cancer

The predominant type of cancer that naturopathic researchers have studied is breast cancer. The 21 studies (25 published papers) [14-38] mostly examined interventions involving non-metastatic breast cancer populations undergoing conventional adjuvant treatment (chemotherapy and/or radiation) (n=18: 22 published papers)

[14-29, 31-34, 36, 37] , and one study investigated breast cancer risk [15]. Only two trials included participants with metastatic disease [30, 35]. Yoga was the most common researched intervention (n=9; 12 published papers) [14, 24-30, 33-36], followed by clinical nutrition (n=5; 7 published papers) [18, 20-22, 31, 32, 38], acupuncture/acupressure (n=4) [16, 17, 19, 23] and herbal medicine (n=1) [37].

Clinical finding

Integrated yoga practice may reduce the side effects of chemotherapy, increase quality of life and reduce post-surgical hospital stays in individuals with breast cancer.

A randomized controlled trial conducted in India [24] investigated the outcomes of an integrated yoga practice (including *asanas*, *pranayama*, and meditation and relaxation techniques) concurrent to 4-6 cycles of chemotherapy among individuals with stage II and III operable breast cancer experiencing chemotherapy-induced nausea and vomiting (n=62). The intervention was compared with a psychotherapy technique. Compared to the control group, participants in the yoga group reported reduced nausea frequency (-0.9, p=0.01) and intensity (-1.1, p<0.001) and reduced vomiting frequency (-0.6; p=0.06) and intensity (-0.6; p=0.05). They also reported reduced levels of anxiety (State Trait Anxiety Inventory [STAI]: -8.3; p<0.01) and increased quality of life (Functional Living Index for Cancer – Overall quality of life: +30.4, p<0.001). After the fourth cycle of chemotherapy, the yoga group also reported reduced number (-3.3; p=0.002) and severity (-9.7; p<0.001) of symptoms compared to the control group, as well as reduced symptom-associated distress (-13.3; p<0.001) and reduced chemotherapy toxicity (-3.8; p<0.001).

A second randomized controlled trial conducted in India [27] also investigated a yoga intervention compared with supportive counselling and postoperative exercise rehabilitation for four weeks (one week before surgery and three weeks post-surgery) for individuals with stage II and III breast cancer (n=69). The study found participants in the yoga arm had a greater reduction in anxiety (STAI-state: -10.2, p<0.04; STAI-trait: -9.4, p<0.01) and depression (Beck's Depression Inventory: p=0.08), and an increased quality of life (Functional Living Index of Cancer: p=0.01), compared to the control group. The control group also had an increase in levels of Immunoglobulin A (+0.64, p=0.001) and a reduction in lymphocytes (CD4+: -3.5, p=0.002; CD8+: -3.7, p=0.001; CD56+: -4.3, p=0.001) indicating weaker immune status, compared to the participants in the yoga group. Secondary analysis from this study [26] further found the yoga group were in the hospital (-1.3; p=0.003) fewer days, had a reduction in drain retention post-surgery (-1.74; p=0.001) and decreased number of days needed to wait for suture removal (-2.4; p=0.031). Further analysis also reported reduced depression post-surgery (p<0.01) as well as during and after radiotherapy (p<0.001) and chemotherapy (p<0.001) [28].

A randomized placebo-controlled trial conducted in the USA investigated omega-3 fatty acids (3.3g per day) over 24 weeks for the treatment of joint pain among women with breast cancer (n=249) [21, 22]. Primary data analysis [21] found no difference in the primary or secondary outcomes (i.e., Brief Pain Inventory [BPI], Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC], modified score for the Assessment and Quantification of Chronic Rheumatoid Affections of the Hands [AQCRAH], Functional Assessment of Cancer Therapy – Endocrine [FACT-E]), except for reduced serum triglyceride levels in the intervention group (-22.1 vs -10.3, p=0.01). However, the research team conducted sub-analyses [22] based on participant body mass index (BMI) and found that participants with a BMI ⩾30 had improvements at the end of the study period on several domains of the BPI including reduced worst pain (p=0.02), reduced average pain (p=0.002), and reduced pain interference (p=0.05) when taking omega-3 fatty acids compared to placebo. These reductions in pain were also supported by reduced end-of-study scores for WOMAC (p=0.01) and AQCRAH (p=0.04).

Colorectal Cancer

The colorectal cancer studies were conducted in the USA [39-43] (n=5) and Germany [44] (n=1). The studies investigated *Zingiber officinale* (ginger) (n=4) [39-42], dietary and physical activity counselling (n=1) [43] and yoga (n=1) [44].

Clinical finding

Ginger *(Zingiber officinale)* may reduce the risk of colorectal cancer.

One randomized placebo-controlled trial conducted in the USA investigated the effects of 1000mg twice per day of *Zingiber officinale* (standardized to 5% gingerols) for 28 days on otherwise healthy adults with identified colorectal cancer risk (n=21) [39]. The study found no difference in surrogate markers for apoptosis or differentiation, however, proliferation markers were reduced (whole crypts: -41.2%, p=0.05; differentiation zone: -47.9%, p=0.04) and there was evidence of increased apoptosis relative to proliferation (+25.6%, p=0.05). A second placebo-controlled randomized trial conducted in the USA (n=50) examined 2000 mg of *Zingiber officinale*

daily for 28 days among individuals with either normal or high risk of colorectal cancer. Participants with high risk scores were found to have reduced COX-1 protein levels that are associated with early event of colorectal cancer by 23.8% among the *Zingiber officinale* group versus 18.9% in the placebo arm (p=0.03) [40].

One uncontrolled trial conducted in Germany (n=54) [44] found that 90 minute weekly classes of yoga for 10 weeks improved participants' emotional well-being (+1.59, p=0.019), as measured by the Functional Assessment of Cancer Therapy – Colorectal (FACT-C), but not other FACT-C domains. The study participants also reported reduced anxiety (Hospital Anxiety and Depression Scale [HADS]: -1.14, p=0.034) and depression (HADS: -1.34, p=0.038) at the end of the intervention period, and reduced sleep disturbance (Pittsburgh Sleep Quality Index: -1.08, p=0.043) at Week 12.

Prostate Cancer

Three studies from New Zealand (n=1) [45], USA (n=1) [46] and Australia (n=1) [32], one of which included secondary analyses [47], investigated naturopathic treatment interventions for patients with prostate cancer. The studies investigated interventions involving clinical nutrition (n=2) [32, 46] and applied nutrition (n=1) [45, 47].

An uncontrolled study conducted in New Zealand examined the effect of the Mediterranean diet on 20 men with prostate cancer over a period of 3 months [45]. The main outcomes were a bloodspot fatty acid profile and alkaline single-cell gel electrophoresis pre- and post-intervention. The fatty acid profile found reduced saturated fatty acids and increased omega-3 fatty acids both as true values and in relation to each other (total saturated fatty acid (SFA) level: 34.7% vs 33.7% (p=0.002); 18:0 stearic acid 10.5% vs 10%, p=0.002; 2:5 omega-3 docosohexanoic acid [DHA] 3.0% vs. 3.5%, p=0.01; eicosapentanoic acid [EPA]:DHA ratio 4.4% vs. 5.0%, p=0.042; omega-3 index 6.1% vs. 7.0%, p=0.043; omega-6 polyunsaturated fatty acids [PUFA]:omega-3 PUFA 5.2% vs. 4.7%, p=0.019; and arachidonic acid [AA]:EPA 8.58% vs 6.9%, p=0.030. Based on the alkaline single-cell gel assay, DNA damage was inversely correlated with dietary adherence (p=0.013), whole blood monounsaturated fatty acids (p=0.009) and oleic acid (p=0.020). DNA damage correlated with the intake of dairy products (p=0.043), red meat (p=0.007) and whole blood omega-6 PUFA (p=0.015) [45]. Follow up analysis from this study, published in a second paper [47], included testing for prostate-specific antigen (PSA), C-reactive protein (CRP) and additional outcomes assessed by the alkaline single-cell gel assay. In this, no correlation was seen between adherence to a Mediterranean diet and PSA or CRP. From the alkaline single-cell gel assay, a significant reduction in DNA damage was found in men who adhered to the diet (p=0.013) or had high levels of folate intake (p=0.023), vitamin C (p=0.007), legumes (p=0.004) and green tea (p=0.002). Similarly, the authors reported an inverse relationship in DNA damage with both higher red meat (p=0.003) and dairy consumption (p=0.008) intake [47].

A retrospective cohort study conducted in the United States also sampled patients with prostate cancer (n=139) of whom 69 participants had received 24 months of naturopathic care which most commonly consisted of supplementation with green tea extract, melatonin, vitamin C and vitamin E. Participants' PSA was evaluated 6-8 weeks after receiving radiation therapy with curative intent and found no change (including no increases) to their PSA compared to participants receiving usual care [46].

Other Cancers

Other cancers, including: lung and large B-cell lymphoma [32], hepatocellular carcinoma [48], endometrial [32] and cervical cancer [49] were studied by naturopathic researchers. One study included six different cancer populations in the same study [32].

Clinical finding

B vitamins may lower chemotherapy-induced peripheral neuropathy in individuals with cancer undergoing chemotherapy treatment.

This latter study was a randomized controlled trial conducted in Australia which examined the effects of a B-group vitamin complex on the development of chemotherapy-induced peripheral neuropathy [32]. The study participants (n=71) were diagnosed with a range of primary cancers (i.e., breast, lymphoma, lung, colon, prostate, and endometrial) and were undergoing chemotherapy. They were administered the intervention or a placebo one week before chemotherapy and continued for 12 weeks after chemotherapy was completed. While the primary outcome of the study – total neuropathy score – was not significantly different between groups, participants in the intervention group did have lower sensory neuropathy scores compared to placebo at different time points in the study (Wk 2: p=0.03, Wk 24: p=0.005; Wk 36: p=0.021). The lymphoma patients enrolled in this trial (n=20) found that 1000mcg of vitamin B12 during treatment and three months post-chemotherapy prevented the onset and severity of vincristine-induced peripheral neuropathy. This regime was found to be most beneficial with a chemotherapy combination of cyclophosphamide, doxorubicin, vincristine and rituximab (R-CHOP) every 3 weeks for 8 cycles. Vitamin B12 was found to be safe and efficacious when used concurrently with R-CHOP in large B-cell lymphoma patients [32].

Palliative care

One cohort study conducted in India involving palliative care patients (n=506) assessed a triage-based coding system for home based palliative care [50]. They used a multidisciplinary team inclusive of a palliative care physician and a naturopathic clinician, who assessed and managed pain, physical symptoms, and psychosocial issues. Of the 506 patients, 32 (6.32%) were considered high priority, 105 (20.75%) medium priority and 369 (72.92%) low priority. In both high and medium priority patients, comparison of Edmonton Symptom Assessment Scale (ESAS) scores during the first and second home visits found significant improvements in pain (high: -6; medium: -3; p<0.001), fatigue (high: -4; medium: -5; p<0.001), nausea and vomiting (high: -3; medium: -5; p<0.001), loss of sleep (high: -2; medium: NS; p<0.001), breathlessness (high: -2; medium: -7; p<0.001), loss of appetite (high: -3; medium: -5; p<0.05), and loss of well-being (high: -7; medium: -5; p<0.001). The improved pain and symptom control for these patients assisted in avoiding hospital deaths; time taken for intervention triaging and was a significant predictor of survival [50].

Cancer survivors

Twelve studies involved cancer survivors [43, 51-61] with five publishing additional analyses of their results [62-66]. The studied interventions included applied nutrition and/or lifestyle (n=5; 8 published papers) [43, 54, 56, 57, 60, 63, 64, 66], clinical nutrition (n=2; 3 published papers) [52, 55, 62], acupuncture (n=2; 3 published papers) [59, 61, 65], yoga (n=1) [51], mind-body medicine (n=1) [53], and homeopathy (n=1) [58].

A randomized controlled trial conducted in the USA [54, 66] provided nine sessions of nutrition education, cooking classes and food shopping field trips for Hispanic breast cancer survivors (n=70) over 12 weeks. Participants in the control arm of the study received written dietary recommendations. The study found, compared to the control, participants in the intervention group had a greater increase in intake of target fruit and vegetables after the intervention period (fruit: +2.0 vs 0.0, p=0.004; vegetable: +1.2 vs -0.2, p=0.001) and at three months follow up (fruit: +2.7 vs +0.5, p=0.002; vegetable: +1.8 vs +0.6, p=0.02), and similar results for total fruit (Mth 3: +1.1 vs -0.3, p=0.05; Mth 6: +2.0 vs -0.1, p=0.002) and vegetable (Mth 3: +1.1 vs -0.4, p=0.004; Mth 6: +1.8 vs +0.2, p=0.005) intake. Participants in the intervention arm also reported reduced caloric intake compared to control (Mth 3: -672.9 vs -92.4, p<0.0001; Mth 6: -562.9 vs +61.6, p<0.001) over the study period and reduced waist circumference after the intervention (-1.6 vs +1.7, p=0.05), but not at the end of the follow up period.

A cohort study conducted in Germany investigated a mindfulness-based stress reduction program that incorporated the Mediterranean diet and naturopathic interventions including poultice use, phytotherapy, massage and hydrotherapy for adult cancer survivors (n=117) [53]. Six hourly sessions were given weekly for 11 weeks with a three month follow up. The researchers found that participants' quality of life increased significantly in the domains of general health (+8.73, p=0.001), cognitive function (+7.42, p=0.001), and social function (+13.11, p=0.001). In addition, the intervention program improved role function (+14.07, p<0.001) and emotional function (+13.22, p<0.001) while reducing fatigue (-9.63, p=0.009), pain (-9.38, p=0.033), constipation (-5.02, p=0.033), and insomnia (-17.13, p<0.001). It also reduced anxiety (-2.31, p<0.001) and depression (-1.94, p<0.001) and had significantly increased life satisfaction (-3.04, p<0.001), health satisfaction (+1.95 p<0.001) and mindfulness (+4.29, p<0.001).

A randomized control trial from the USA assessed the impact of acupuncture among 43 adult survivors of cancer with symptoms of persistent cancer-related fatigue 12 weeks post cancer treatment [59]. The intervention compared three different acupuncture treatments: high-dose stimulatory acupuncture (HIS), low-dose stimulatory acupuncture (LIS) and relaxation acupuncture (RA). Based on the Brief Fatigue Inventory scale all groups experienced a reduction in fatigue severity, but the greatest improvement was in the relaxation groups (HIS: -2.2; LIS: -2.7; RA: -4.0) compared to other groups (p=0.027).

Table 17.1 Clinical research investigating cancer and cancer-related conditions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Banerjee, et al. (2007) [India, SEARO] [14]	Randomized controlled trial	Breast cancer (undergoing radiotherapy or adjuvant chemotherapy or radiotherapy)	Yoga (guided meditation, *asanas*, *pranyama*, *nidra* chanting)	6 weeks (90 min, progressive sessions)	Supportive counselling and light exercise	68 (35/33)	Hospital Anxiety and Depression Scale [BL to Wk 6, pre and post radiation]	**Reduced anxiety** Yoga (-4.4, p<0.001) Control (+2.3, p<0.001) **Reduced depression** Yoga (-4.6, p<0.001) Control (+1.9, p<0.001)
							Perceived Stress Scale [BL to Wk 6, pre and post radiation]	**Reduced stress** Yoga (-5.5, p<0.001) Control (+1.4, p<0.001)
							Radiation-induced DNA damage – Alkaline Single-Cell Gel Electrophoresis (Comet) Assay [BL to Wk 6, pre and post radiation]	**Reduced DNA damage** Yoga (+21.7, p<0.001) Control (+26, p<0.001) Between groups difference 14.5% (p<0.001)
Bishop, et al. (2015) [New Zealand, WPRO] [45]	Uncontrolled trial	Prostate cancer	Mediterranean style diet. Light to moderate exercise was encouraged	3 months (30 – 50 g seeds and nuts daily; ⩾15 mL or more of extra virgin olive oil; ⩽1 portion dairy daily; substitute butter/margarine with olive oil-based spread; ⩽400g/wk red meat, substitute with oily fish and white meat; avoid processed meats; eat oily fish ⩾ once/wk)	Nil	20	Holman Bloodspot fatty acid profiles [pre and post intervention]	**Reduced saturated fatty acids** Mean total SFA (-1.0, p=0.002) 18:0 stearic acid (-0.5, p=0.002) n6PUFA:n3PUFA (-0.6, p=0.019) AA: EPA (-1.6, p=0.030) **Increased omega-3 fatty acids** 22:5 n3 DHA (+0.5, p=0.01) EPA / DHA (+0.6, p=0.042) Modified WBS n3 index (+0.9, p=0.043)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
Erdrich, et al. (2015) [New Zealand, WPRO] [47]	Secondary analysis						Alkaline Single-Cell Gel Electrophoresis (Comet) Assay [pre and post intervention]	**Reduced DNA damage** DNA damage inverse correlation with dietary adherence (p=0.013) whole blood monounsaturated fatty acids (p=0.009) and oleic acid (p=0.020) DNA damage positive correlation with intake of dairy products (p=0.043) red meat (p=0.007) and whole blood n6PUFA (p=0.015)
							Body weight (kg) [BL to 3 Mths]	**Reduced body weight** -2.3 kg, (p=0.0007)
							BMI [BL to 3 Mths]	**Reduced BMI** -0.85kg/m^2, (p<0.001) BMI was inversely correlated to blood n3PUFA (p=0.046). Reduced BMI associated with increased blood PUFA (p=0.031) and LA (p=0.040).
							Changes in the sources of dietary fat [BL to 3 Mths]	**Increased dietary fat** olive oil (+14.2, p=0.0008) nuts (+2.9, p=0.0003) fish (+1.8, p=0.0005) Reduced dairy (-2.9, p=0.0025) and red meat (-2.0, p=0.0005)
							Holman Bloodspot fatty acid profiles (mean %) [BL to 3 Mths]	**Reduced saturated fatty acids** Mean total SFA (-1.0, p=0.002) 18:0 stearic acid (-0.5, p=0.002) n6PUFA:n3PUFA (-0.6, p=0.019) AA: EPA

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								(-1.6, p=0.030) **Increased omega-3 fatty acids** 22:5 n3 DHA (+0.5, p=0.01) EPA / DHA (+0.6, p=0.042) Modified WBS n3 index (+0.9, p=0.043)
							C reactive protein [BL to 3 Mth, relative to Dietary Adherence Questionnaire]	NS
							Prostate-specific antigen [BL to 3 Mth, relative to Dietary Adherence Questionnaire]	NS
Bowen, et al. (2006) [USA, AMRO] [15]	Randomized controlled trial	Breast cancer risk	Group psychological counselling	4 weeks (2-hour sessions, follow up 6 months and 24 months)	Waitlist control	150 (81/69)	Breast cancer screening – mammography [BL to Mth 24]	**Increased screening** Mth 24 ⩾40yo: +12% (p<0.05)
							Breast cancer screening – (breast self-exam) [BL to Mth 6, Mth 24]	**Increased screening** Mth 6: +17% (p<0.01) Mth 24: +13% (p<0.05)
							Perception of lifetime personal breast cancer risk [BL to 6mth, 24mth]	**Reduced perception of risk** Mth 6: -20%; Mth 24: -21% Over time: p<0.001 Between group: p<0.001
							Cancer Worry Scale [BL to 6mth, 24mth]	**Reduced worry** Mth 6: -0.7; Mth 24: -0.7% Over time: p<0.001 Between group: p<0.001
							Short Form-36 Health Survey [BL to 6mth, 24mth]	**Increased quality of life** Mth 6: +4.6; Mth 24: +5.1 Over time: p<0.001 Between group: p<0.01

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Braun, et al. (2013) [USA, AMRO] [46]	Cohort study (retrospective investigation)	Prostate cancer (post-treatment of 6-8 wks radiation therapy with curative intent)	Individualized naturopathic and nutritional antioxidant supplementation (self-selected for naturopathic care)	24 months (most frequently given: green tea extract 750 BD, melatonin 20mg bedtime, vitamin C 500-1000mg TD, vitamin E 200-400IU TD)	Usual care control (self-selected for no naturopathic care)	134 (69/65)	Mean PSA (non hormonal ablation) [⩾ 24 mths post-radiation]	NS
							Mean PSA (hormonal ablation) [⩾ 24 mths post-radiation]	NS
Citronberg, et al. (2013) [USA, AMRO] [39]	Randomized controlled trial	Colorectal cancer risk (otherwise healthy adults)	*Zingiber officinale* (radix) standardized 5% ginergols	28 days (four 250mg cap twice per day)	Placebo	21 (10/11)	Apoptosis markers (Bax and Bcl-2 expression) [BL to Wk 4]	Apoptosis promotion (Bax): NS Apoptosis inhibition (Bcl-2): NS Bax:Bcl-2 ratio: NS
							Differentiation marker (p21) [BL to Wk 4]	NS
							Proliferation markers (hTERT and MIB-1 expression) [BL to Wk 4]	**Reduced proliferation** hTERT Whole crypts: -41.2% (p=0.05) Differentiation zone: -47.9% (p=0.04) Proliferation zone: NS MIB-1: NS
							Relative effects (ratio of p21:hTERT, p21:MIB-1, Bax:hTERT, Bax:MIB-1) [BL to wk 4]	**Increased apoptosis relative to proliferation** Bax:hTERT: +25.6% (p=0.05) Bax:MIB: NS Differentiation relative to proliferation: NS
Cramer, et al. (2015) [Germany, EURO] [51]	Randomized controlled trial (open label)	Menopausal symptoms (breast cancer survivors)	Hatha yoga and Tibetan Buddhist meditation	12 weeks (90 min, weekly)	Usual care control	40 (19/21)	Menopausal Rating Scale (MRS) – Total score [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -5.6 (p=0.004) Wk 24: -4.5 (p=0.023)
							MRS – Somatovegetative symptoms [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -1.8 (p=0.035) Wk 24: -1.9 (p=0.028)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							MRS – Psychological symptoms [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -2.4 (p=0.012) Wk 24: NS
							MRS – Urogenital symptoms [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -1.5 (p=0.025) Wk 24: -1.3 (p=0.025)
							Functional Assessment of Cancer Therapy – Breast (FACT-B) – Total score [BL to Wk 12, 24]	**Increased function** Wk 12: +12.5 (p=0.002) Wk 24: +12.6 (p=0.004)
							FACT-B – Physical function [BL to Wk 12, 24]	**Increased function** Wk 12: NS Wk 24: +3.6 (p=0.01)
							FACT-B – Social function [BL to Wk 12, 24]	**Increased function** Wk 12: +2.4 (p=0.24) Wk 24: +2.6 (p=0.16)
							FACT-B – Emotional function [BL to Wk 12, 24]	**Increased function** Wk 12: +2.8 (p=0.005) Wk 24: +1.6 (p=0.036)
							FACT-B – Functional [BL to Wk 12, 24]	**Increased function** Wk 12: +3.3 (p=0.024) Wk 24: NS
							FACT-B – Breast cancer-specific [BL to Wk 12, 24]	NS
							Functional Assessment of Chronic Illness Therapy – Fatigue [BL to Wk 12, 24]	**Increased energy** Wk 12: +6.0 (p=0.10) Wk 24: (7.3, p=0.012)
							Hospital Anxiety and Depression Scale [BL to Wk 12, 24]	Anxiety: NS Depression: NS
Cramer, et al. (2016) [Germany, EURO] [44]	Randomized controlled trial (open label)	Colorectal cancer (stage I-III)	Hatha yoga, *pranayama* breathing, meditation, *yoga nidra*	10 weeks (90 min weekly class)	Waitlist control	54 (27/27)	Functional Assessment of Cancer Therapy – Colorectal [BL to Wk 10, 22]	**Increased emotional wellbeing** Wk 10: NS Wk 22: Emotional: +1.59 (p=0.019) Physical: NS Social: NS Functional: NS Colorectal cancer-specific: NS Total: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							Functional Assessment of Chronic Illness Therapy [BL to Wk 10, 22]	Fatigue: NS Spiritual wellbeing: NS
							Sleep disturbance – Pittsburgh Sleep Quality Index [BL to Wk 10, 22]	**Reduced sleep disturbance** Wk 10: NS Wk 12: -1.08 (p=0.043)
							Hospital Anxiety and Depression Scale [BL to Wk 10, 22]	**Reduced** Wk 10: Anxiety: -1.14 (p=0.034) Depression: -1.34 (p=0.038) Wk 22: NS
							Bodily awareness and dissociation – Scale of Body Connection [BL to Wk 10, 22]	NS
							Treatment expectancy – Body-Efficacy Expectation Scale [BL to Wk 10, 22]	NS
Crew, et al. (2007) [USA, AMRO] [16]	Randomized controlled trial (crossover)	Breast cancer stage I-IIIa hormone receptor positive – joint pain associated with adjuvant aromatase inhibitor therapy	Acupuncture on TW5, GB41, GB34, LI4, ST41, KD3, auricular acupuncture, and joint-specific protocols for shoulder, wrist, fingers, lumbar, hip, and knee (30 min, twice per wk for 6 wks)	6 weeks (30 min, twice per week)	Observation with non-narcotic, non-steroidal pain medications as needed	19	Brief Pain Inventory – short form [BL to Wk 6]	**Reduced** Pain scores: -3.1 (p=0.01) Pain severity: -2.7 (p=0.02) Functional interference: -1.4 (p=0.02)
							Western Ontario and McMaster Universities Osteoarthritis index [BL to Wk 6]	**Reduced impact on quality of life** Total score: -33.6 (p=0.04) Impact on function: -165.2 (p=0.02) Pain, stiffness: NS
							Functional Assessment of Cancer Therapy – General [BL to Wk 6]	**Increased wellbeing** Physical: +3.5 (p=0.03) Social/family, emotional and functional: NS
							Inflammatory markers (TNF-α, IL-1β) [BL to Wk 6]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Crew, et al. (2010) [USA, AMRO] [17]	Randomized controlled trial	Breast cancer stage I-IIIa hormone receptor positive – aromatase inhibitor induced joint pain	Standardized full body and auricular acupuncture	6 weeks (30 min, twice per week)	Sham acupuncture control (superficial needle insertion at body locations not recognised as true acupoints)	38 (20/18)	Brief Pain Inventory – short form (0-10 scale) [BL to Wk 6]	**Reduced worst pain** Acupuncture: -3.7, Sham: -0.11 Between group: p=0.002 **Reduced pain severity** Acupuncture: -3.34, Sham: +0.10 Between group: p<0.001 **Reduced interference** Acupuncture: -1.99, Sham: -0.02 Between group: p=0.002
							Western Ontario and McMaster Universities Osteoarthritis index [BL to Wk 6]	**Reduced total score** Acupuncture: -96, Sham: +3 Between group: p<0.01 **Reduced pain** Acupuncture: -160, Sham: -14 Between group: p<0.01 **Reduced stiffness** Acupuncture: -69, Sham: +12 Between group: p<0.01 **Reduced functional impact** Acupuncture: -506, Sham: -149 Between group: p=0.01
							Modified Score for the Assessment of Chronic Rheumatoid Affections of the hand (MS-ACRAH) [BL to Wk 6]	**Reduced total score** Acupuncture: -87, Sham:-28 Between group: p<0.01 **Reduced pain** Acupuncture: -59, Sham: -13 Between group: p<0.01 **Reduced stiffness** Acupuncture: -55, Sham: -40 Between group: p=0.01 **Reduced functional impact** Acupuncture: -213, Sham: -31 Between group: p=0.02

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							Functional Assessment of Cancer Therapy – General [BL to Wk 6]	**Increased physical wellbeing** Acupuncture: +5.7, Sham: -0.7 Between group: p=0.03
Crew, et al. (2012) [USA, AMRO] [52]	Randomized controlled trial	Breast cancer stage I-III hormone receptor negative, completed adjuvant treatment (survivors)	Oral Green tea (Poly E) – Sinecatechins, a combination of four catechin flavonoids from *Camellia sinensis*	6 months (dose escalation: 400mg, 600mg, 800mg, twice per day)	Placebo	34 (26/8)	Dose-limiting toxicity	1 at 400mg (grade III rectal bleeding) 3 at 600mg (grade II weight gain, grade III indigestion and insomnia) 1 at 800mg (grade III liver functional abnormality)
							Maximum tolerated dose	600mg twice daily (BID)
Crew, et al. (2015) [USA, AMRO] [62]	Secondary analysis			Archived blood and urine from women collected in 6 month dose escalation trial			Hepatocyte growth factor (HGF) [BL to Mth 2, 4 and 6]	**Reduced hepatocyte growth factor** Poly E 2mths: 12.7% compared to placebo, 6.3% (p=0.04) 4 Mths and 6 mths (NS)
							Vascular endothethial growth factor (VEGF) [BL to Mth 2, 4 and 6]	NS
							Lipids [BL to Mth 2, 4 and 6]	NS
							Oxidative damage [BL to Mth 2, 4 and 6]	NS
							Inflammatory biomarkers [BL to Mth 2, 4 and 6]	NS
Dhiliwal, et al. (2016) [India, SEARO] [50]	Cohort study	Palliative care patients (requiring homecare services)	Triaging coding system for home-based palliative care based on Edmonton System Assessment Scale (High, Medium, and Low priority). Multi-disciplinary team assessed and managed pain, physical symptoms, and psychosocial issues.	Two visits	Nil	506 (32/105/369)	Timing of home visits (time taken in days) [point of referral to first home visit]	High priority: 2.63 ± 0.75 Medium priority: 7.00 ± 1.5 Low priority: 10.54 ± 2.7
							Edmonton System Assessment Scale (ESAS) [initial triaging to first and second home visit]	**Reduced Pain** High: -6 ($p<0.05$), Medium: -3 ($p<0.05$) Between group: $p<0.001$ **Reduced fatigue** High: -4 ($p<0.05$), Medium: -5 ($p<0.05$) Between group: $p<0.001$

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								Reduced nausea/vomiting High: -3 ($p<0.05$), Medium: -5 ($p<0.05$) Between group: $p<0.001$ **Reduced depression** High: NS, Medium: – 4 ($p<0.05$) Between group: NS **Reduced anxiety** High: -1 ($p<0.05$), Medium: -3 ($p<0.05$) Between group: NS **Reduced sleep loss** High: -2 ($p<0.05$), Medium: NS Between group: $p<0.001$ **Reduced breathlessness** High: -2 ($p<0.05$), Medium: -7 ($p<0.05$) Between group: <0.001 **Reduced appetite loss** High: -3 ($p<0.05$), Medium: -5 ($p<0.05$) Between group: $p<0.05$ **Reduced wellbeing loss** High: -7 ($p<0.05$), Medium: -16 ($p<0.05$) Between group: $p<0.001$
Dobos, et al. (2015) [Germany, EURO] [53]	Cohort study	Cancer survivors (adults)	Mindfulness based stress reduction program alongside relaxation techniques, exercise, cognitive restructuring, dietary interventions, social support, and naturopathic methods of self-regulation and self-care.	11 weeks (6 hours per week with 3 mth follow up)	Nil	117	European Organization for the Research and Treatment of Cancer – Quality of Life [BL to Wk 8 to 3 Mth follow-up]	**Increased quality of life** General health: +8.73 ($p=0.001$) Physical function: +6.3 ($p=0.01$) Role function: +14.07 ($p<0.001$) Emotional function: +13.22 ($p<0.001$) Cognitive function: +7.42 ($p=0.001$)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								Social function: +13.11 (p=0.001) Fatigue: -9.63 (p=0.009) Pain: -9.38 (p=0.33) Insomnia: -17.13 (p<0.001) Constipation: -5.02 (p=0.033) Nausea and vomiting: NS Dyspnea: NS Appetite: NS Diarrhea: NS Financial difficulties: NS
							Hospital and Anxiety Depression Scale [BL to Wk 8 to 3 Mth follow-up]	**Reduced anxiety and depression** Anxiety: -2.31 (p<0.001) Depression: -1.94 (p<0.001)
							Brief multidimenional Life Satisfaction Scale (BMLSS) [BL to Wk 8 to 3 Mth follow-up]	**Increased satisfaction** Life satisfaction: +3.04 (p<0.001) Health satisfaction: +1.95 (p<0.001)
							Freiburg Mindfulness Inventory [BL to Wk 8 to 3 Mth follow-up]	**Increase in mindfulness** +4.29 (p<0.001)
							Adaptive Coping with Disease Questionnaire (AKU) [BL to Wk 8 to 3 Mth follow-up]	**Increased coping** Conscious living: +8.93 (p<0.001) Positive attitudes: +12.21 (p=0.001) Trust in medical help: +5.56 (p=0.007) Trust in divine help: +5.6 (p=0.017) Search for information: +6.77 (p=0.003) Reappraisal of illness: +7.02 (p=0.012)
							Spiritual and religious attitudes in dealing with illness questionnaire [BL to Wk 8 to 3 Mth follow-up]	**Increased** Search: +5.46 (p=0.004) Trust: +5.04 (p=0.031) Reflection: +3.4 (p=0.002)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							Interpretation of Illness Questionnaire IIQ [BL to Wk 8 to 3 Mth follow-up]	**Increased interpretation of value** Something of value: +0.48 (p=0.001) **Reduced interpretation of punishment** Punishment: -0.22 (p=0.005) Challenge: NS Threat/enemy: NS Adverse interruption: NS Weakness: NS Relieving break: NS Call for help: NS
Greenlee, et al. (2012) [USA, AMRO] [55]	Cohort study (analysis of LACE cohort, PMID: 15986109)	Breast cancer survivors (stage I-III)	Antioxidant supplements (vitamin C, vitamin E, zinc, selenium, carotenoid, beta-carotene, lycopene, multivitamins)	Observational study of supplement use (frequency of use in days per week)	Antioxidant supplement non-users	2264	All cause mortality (hazard ratio = HR) [association between use and death]	**Reduced mortality risk** Vitamin E, frequent use: HR 0.75 (p=0.02) Increased mortality risk Combination carotenoids, frequent use: HR 1.63 (p=0.03) Multivitamins, Vitamin C, Beta-carotene, Lycopene, Selenium, Zinc: NS
							Deaths from breast cancer (HR) [association between use and death]	**Increased mortality risk** Combination carotenoids, frequent use: HR 1.93 (p=0.02) Multivitamins, vitamin C, vitamin E, beta-carotene, lycopene, selenium, zinc: NS
							Breast cancer recurrence (HR) [association between use and recurrence]	**Reduced risk of recurrence** Vitamin C, frequent user: HR 0.71 (p=0.01) Vitamin E, frequent use: HR 0.7 (p<0.01) Multivitamins, combination carotenoids, beta-carotene, lycopene, selenium, zinc: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Greenlee, et al. (2013) [USA, AMRO] [56]	Randomized controlled trial	Breast cancer survivors (stage 0-IIIa – Minority groups)	Curves program (IA) (30 min exercise circuit, a high vegetable, low fat, calorie-restricted diet)	12 months (6 mths intervention with 90 min exercise per week, calorie-restriction for 1-2 wks, 6 mths observation)	Wait list control arm (WCA): 6 mth observation and 6 mth curves program	42 (22/20)	Weight loss (% change) [BL to Mth 6, Mth 12]	**Reduced weight** Mth 6: IA, -3.3%; WCA, 1.8% (p=0.04) Mth 12: regained some but not all of weight lost during first 6 months (p=0.02)
							Retainment	90.5% were retained for the full 12 months
Delgado-Cruzata, et al. (2015) [USA, AMRO] [63]	Selected cohort sub-analysis				Nil	24	Anthropometric measures (mean change, %) [BL to Mth 6 and 12]	**Reduced weight** Mth 6: -1.9 (p=0.01), Mth 12: -2.1 (p=0.01) **Reduced waist circumference** Mth 6: -2.7 (p<0.01), Mth 12: -2.7 (p=0.01) **Reduced body fat** Mth 6: -2.4% (p=0.03), Mth 12: unavailable Hip circumference: NS Waist-to-hip ratio: NS
							Plasma insulin and HOMA-IR [BL to Mth 6 and 12]	**Reduced insulin resistance** Mth 12: Insulin, -10.6% (p<0.01) HOMA-IR, -11.4% (p<0.01)
							Adaption of Kaiser Physical Activity Survey [BL to Mth 6 and 12]	**Increased physical activity** Mth 6: +1.1 (p<0.001) Mth 12: +0.7 (p<0.001)
							DNA methylation biomarkers [BL to Mth 6 and 12]	**Increase methylation** Mth 6: +4.2%; Mth 12: +3% (p<0.0001)
							Associations between changes in anthropometric measures, metabolic markers, diet, and physical activity and changes in markers of DNA methylation [BL to Mth 6 and 12]	**Increased diet quality** Weight loss: NS 10% body fat decrease: NS 10% caloric intake: -0.48% (CI:0.10-0.86) Physical activity: NS 10% increase in fruit and vege and protein: +0.85% (CI: 0.12-0.70)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Greenlee, et al. (2013) [USA, AMRO] [18]	Cohort study (open label)	Breast cancer (stage I-III) – aromatase inhibitor associated joint pain	Glucosamine sulfate (1,500mg/day) and chondroitin (1,200mg/day)	24 weeks	Nil	39	Outcome Measure in Rheumatology Clinical Trials and Osteoarthritis Research Society International [BL to Wk 12 and 24]	**Reduced joint symptoms** Wk 24: 46% (18/39) of patients met criteria for improvement
							Western Ontario and McMaster Universities Osteoarthritis (WOMAC) Index (0/100 scale) [BL to Wk 12 and 24]	**Reduced pain** Wk 12: -9.6 (p=0.03), Wk 24: -10.7 (p=0.02) **Increased function** Wk 12: -10.7 (p=0.01), Wk 24 -13.2 (p<0.01)
							Modified score for Assessment and Quantification of Chronic Rheumatoid Affections of the hands and wrrist (0/100 scale) [BL to Wk 12 and 24]	**Reduced pain** Wk 12: -14.4 (p<0.001), Wk 24: -13.8 (p<0.001) **Reduced stiffness** Wk 12: -11.3 (p=0.03), Wk 24: NS **Increased function** Wk 12: -9.2 (p=0.03), Wk 24: -8.5 (p=0.02)
							Brief Pain Inventory (0/100 scale) [BL to Wk 12 and 24]	**Reduced pain severity** Wk 12 -0.7 (p=0.05), Wk 24: NS **Reduced pain interference** Wk 12: NS, Wk 24: -1.0 (p<0.001) **Reduced worst pain** Wk 12: -0.9 (p=0.02), Wk 24: -1.2 (p=0.02)
Greenlee, et al. (2015) [USA, AMRO] [54]	Randomized controlled trial	Breast cancer survivors (stage 0-III)	Culturally based dietary interventions for Hispanic women *"¡Cocinar Para Su Salud!"* (nine sessions on nutrition, education, cooking classes and food shopping field trips) (24 hours total over 12 weeks)	6 months	Control (written dietary recommendations)	70 (34/36)	Daily targeted fruit and vegetable intake (servings) [BL to Mth 3, Mth 6]	**Increased targeted fruit and vegetable intake** Fruit: Mth 3, 2.0 vs 0.0 (p=0.004) Mth 6, 2.7 vs 0.5 (p=0.002) Vegetables: Mth 3, 1.2 vs -0.2 (p=0.001) Mth 6, 1.8 vs 0.6 (p=0.02)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
Greenlee, et al. (2016) [USA, AMRO] [66]	Secondary analysis						Daily total fruit and vegetable intake (servings) [BL to Mth 3, Mth 6]	**Increased total fruit and vegetable intake** Fruit: Mth 3: 1.1 vs -0.3 (p=0.05) Mth 6: 2.0 vs -0.1 (p=0.005) Vegetables Mth 3: 1.1 vs -0.4 (p=0.004) Mth 6: 1.8 vs 0.2 (p=0.005)
							Daily total caloric intake (kcal) [BL to Mth 3, Mth 6]	**Reduced calorie intake** Mth 3: -672.9 vs -92.4 (p<0.0001) Mth 6: -562.9 vs 61.6 (p<0.001)
							Calories from total fat (%) [BL to Mth 3, Mth 6]	NS
							Anthropometric data [BL to 3 Mths and 6 Mths]	**Reduced waist circumference** Waist circumference Mth 3: -1.6 vs +1.7 (p=0.05); Mth 6: NS Weight, BMI, hip circumference and waist hip ratio (NS)
							Daily targeted fruit and vegetable intake daily (servings) [BL to 12 Mths]	**Maintained increase targeted fruit and vegetable intake** Fruit: +2.3 vs.- 0.1 (p<0.01) Vegetables: 1.6 vs 0.1 (p<0.01)
							Daily total fruit and vegetable intake (servings) [BL to 12 Mths]	**Maintained increase total fruit and vegetable intake** Fruit: +2.0 vs.- 0.4 (p<0.01) Vegetables: 1.6 vs -0.2 (p<0.01)
							Fruit intake (subcategories) [BL to Mth 12]	**Reduced fruit juice intake** Fruit juice excluding citrus: -0.1 vs +0.3 (p=0.05) **Increased citrus fruit intake** Citrus fruit: -0.1 vs -0.2 (p=0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								Fruit, excluding citrus; Avocado and similar; Fried fruits NS
							Vegetable intake (subcategories) [BL to Mth 12]	**Increased dark green vegetables** Dark green +0.5 vs -0.1 ($p<0.01$) Deep yellow; Tomato; White potatoes; Other starchy vegetables; Legumes and Other vegetables NS
							Daily total caloric intake (kcal) [BL to 12 Mths]	NS
							Calories from total fat (%) [BL to 12 Mths]	NS
							Inflammatory markers [BL to 12 Mths]	NS
							Anthropometric data [BL to 12 Mths]	NS
Greenlee, et al. (2016) [USA, AMRO] [19]	Randomized controlled trial (pilot)	Breast cancer (stage I-III, prevention of chemotherapy-induced peripheral neuropathy)	Electroacupuncture (EA) on GB34, St36, LI4, LI10, Huatuojiaji (L3, L5, C5, C7), Bafeng, Baxie (within 2 days of weekly chemotherapy infusion)	12 weeks (weekly)	Sham acupuncture control	63 (31/32)	Brief Pain Inventory – short form [BL to Wk 6, 12, 16]	**Increased pain** Wk 6, Wk 12: NS Wk 16, between group: p=0.03
							Functional Assessment of Cancer Therapy [BL to Wk 6, 12, 16]	NS
							Neuropathic Pain Scale [BL to Wk 6, 12, 16]	**Increased pain** Wk 6, Wk 12: NS Wk 16, between group: p=0.03
Greenlee, et al. (2018) [USA, AMRO] [43]	Uncontrolled trial (feasibility study)	Breast and colorectal cancer survivors, (females with body mass index ⩾25 kg/m^2)	Weight loss intervention via individualized telephone-based behavioral counselling, community-situated physical activity (via fitness centre membership) and dietary modification	12 months (150 mins per week moderate to vigorous exercise, fourteen 40 min counselling sessions, 500 kcal/d decrease in energy intake)	Nil	48	Changes in dietary intake (daily average) [BL to Mth 6 and 12]	**Reduced caloric intake** Breast cancer cohort Mth 6: -555 ($p<0.001$), Mth 12: -502 ($p<0.001$) Colorectal cancer cohort Mth 6: NS, Mth 12: -452 ($p=0.002$) **Increased total fruits and vegetables** Breast cancer cohort Mth 6: +1.1 ($p=0.04$)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
								Mth 12: +1.5 (p=0.04) Colorectal cancer cohort: NS Servings of fruit: NS Servings of vegetables: NS Fibre intake: NS
							Changes in physical activity (min, weekly average) [BL to Mth 6 and 12]	**Increased moderate activity** Breast cancer cohort Mth 6: +162 (p=0.003), Mth 12: +178 (p<0.001) Colorectal cancer cohort: NS Hard activity: NS **Increased strength-based activity** Breast cancer cohort Mth 6: +23 (p=0.02), Mth 12: +39 (p=0.02) Colorectal cancer cohort: NS **Increased flexibility-based activity** Breast cancer cohort Mth 6: +7.2 (p=0.03), Mth 12: NS Colorectal cancer cohort: NS **Increased total activity** Breast cancer cohort Mth 6: +199 (p=0.001), Mth 12: +242 (p<0.001) Colorectal cancer cohort Mth 6: +110 (p=0.009), Mth 12: NS
							Anthropometric markers (weight, kg; body mass index, kg/m^2; waist and hip circumference, cm) [BL to Mth 6 and 12]	**Reduced weight (kg)** Breast cancer cohort Mth 6: -5.5 (p<0.01), Mth 12: -7.8 (p<0.01) Colorectal cancer cohort Mth 6: -2.5 (p<0.01), Mth 12: -2.1 (p=0.05) **Reduced body mass index** Breast cancer cohort

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								Mth 6: -1.8 ($p<0.01$), Mth 12: -2.7 ($p<0.01$) Colorectal cancer cohort Mth 6: -0.9 ($p<0.01$), Mth 12: NS **Reduced waist circumference** Breast cancer cohort Mth 6: -5.6 ($p<0.01$), Mth 12: -6.3 ($p<0.01$) Colorectal cancer cohort: NS **Reduced hip circumference** Breast cancer cohort Mth 6: -4 ($p<0.01$), Mth 12: -7.7 ($p<0.01$) Colorectal cancer cohort Mth 6: -2.4 ($p=0.02$), Mth 12: NS
							Metabolic markers (HbA1c, %; fasting glucose, mg/dL; fasting insulin, mIU/L) [BL to Mth 6 and 12]	HbA1c: NS Fasting glucose: NS Fasting insulin: NS
Hershman, et al. (2013) [USA, AMRO] [57]	Randomized controlled trial	Breast cancer survivors (stage 0-III within 6 weeks of completion of initial adjuvant treatment)	Personalised lifestyle recommendations for nutrition and physical activity from a nutritionist (1 hour), and surveillance recommendations from a nurse (1 hour), alongside 'Facing Forward: Life after cancer treatment' (National Cancer Institute printed guide for cancer survivors)	6 months	Facing Forward: Life after cancer treatment' (National Cancer Institute printed guide for cancer survivors)	126 (66/60)	Functional Assessment of Chronic Illness Therapy Satisfaction [BL to Mth 3 and 6]	NS
							Functional Assessment of Cancer Therapy [BL to Mth 3 and 6]	NS
							Impact of Cancer Scale [BL to Mth 3 and 6]	**Reduced existential negative outlook** Mth 3: Intervention -0.2, Control +0.8 Between group: $p=0.04$ Mth 6: NS All other domains: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
							Assessment of Survivor Concerns questionnaire [BL to Mth 3 and 6]	**Reduced health worry** Mth 3: Intervention -0.16, Control +0.31 Between group: p=0.01 Mth 6: NS **Reduced total health worry subscale** Mth 3: Intervention -0.21, Control: +0.18 Between group: p=0.02 Mth 6: NS All other domains: NS
							Center for Epidemiologic Studies Depression measure [BL to Mth 3 and 6]	NS
							Outcomes by ethnicity (Between group: Hispanic/Non-Hispanic) [BL to 3 and 6 mths]	**Associations with Hispanic ethnicity** Increased trust in medical care Mth 3: p=0.03, Mth 6: NS Increased positive self-evaluation Mth 3: p<0.01, Mth 6: p<0.01 Increased existential positive outlook Mth 3: p<0.01, Mth 6: p=0.02 Increased social life interference Mth 3: p=0.02, Mth 6: p<0.01 Increased social value of relationships Mth 3: p<0.01, Mth 6: p=0.04 Increased meaning of cancer Mth 3: p<0.01, Mth 6: p<0.01 Increased health worry Mth 3: p<0.001 Increased higher order positive scales Mth 3: p<0.01, Mth 6: p=0.02

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Greenlee, et al. (2016) [USA, AMRO] [64]	Secondary analysis							Increased physical wellbeing Mth 3: p<0.01, Mth 6: p<0.01 Increased functional wellbeing Mth 3: p<0.01, Mth 6: p<0.01
							Attitudes towards lifestyle behaviors – general health [BL to Mth 3 and 6]	NS
							Attitudes towards lifestyle behaviors – preventing breast cancer recurrence (1-5 scale) [BL to Mth 3 and 6]	**Increased healthy diet attitude** Mth 3, between group: p=0.03 Mth 6, between group: NS Physical activity attitude: NS Dietary supplement attitude: NS
							Knowledge of lifestyle behaviors [BL to Mth 3 and 6]	NS
							Frequency of lifestyle behaviors [BL to Mths 3 and 6]	**Reduced alcohol consumption** Mth 3, between group: p=0.03 Mth 6, between group: NS Red meat consumption: NS Vegetable and fruit consumption: NS Low fat diet: NS Recreational physical activity: NS Tobacco smoking: NS
Hershman, et al. (2013) [USA, AMRO] [20]	Randomized controlled trial	Breast cancer (stage I-III, prevention of chemo-therapy-induced peripheral neuropathy (CIPN))	Acetyl-L-carnitine (ALC)	24 weeks (3000 mg per day)	Placebo	409 (208/201)	Functional Assessment of Cancer Therapy (FACT) – NTX (Taxane neurotoxicity) [BL to Wk 12 and 24]	**Reduced function (increased CIPN)** Wk 12: NS Wk 24: ALC -5.1, Placebo -3.8 Between group: p=0.01

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
Hershman, et al. (2018) [USA, AMRO] [38]	Follow up 2-years post-intervention						FACT – Taxane trial Outcome Index (functional status) [BL to Wk 12 and 24]	**Reduced functional status** Wk 12: NS Wk 24: ALC -4.8, Placebo: -1.4 Between group: p=0.03
							FACT – Fatigue [BL to Wk 12 and 24]	NS
							Adverse events	NS
							FACT-NTX [BL to Wk 36, 52, and 104]	**Reduced function (increased CIPN)** Both groups, over time: p<0.001 Between group average: ALC -1.39 (p=0.01) Between group Wk 12: NS Between group Wk 24: ALC -1.68 (p=0.02) Between group Wk 36: ALC -1.37 (p=0.04) Between group Wk 52: ALC -1.83 (p=0.02) Between group Wk 104: NS
							FACIT Functional Assessment of Chronic Illness Therapy [BL to Wk 36, 52, and 104]	NS
							FACT-Taxane Trial Outcome Index [BL to Wk 36, 52, and 104]	NS
							Predictors of persistence CIPN	**Increased risk** Women <60 Wk 52: p=0.02, Wk 104: p=0.04 Weight (% per 5kg) Wk 52: p=0.001, Wk 104: p=0.001

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Hershman, et al. (2015) [USA, AMRO] [21]	Randomized controlled trial	Breast cancer (stage I-III) – aromatase inhibitor-induced musculoskeletal pain (post-menopausal women)	Omega-3 fatty acid	24 weeks (3.3 g per day: 560mg eicosapentanoic acid plus docosahexaenoic acid in a 40:20 ratio)	Placebo (corn and soybean oil, matched for colour and taste)	249 (122/127)	Brief Pain Inventory – Short form [BL to Wks 6, 12 and 24]	NS
							Western Ontario and McMaster Universities Osteoarthritis Index [BL to Wks 6, 12 and 24]	NS
							Modified Score for the Assessment and Quantification of Chronic Rheumatoid Affections of the Hands [BL to Wks 6, 12 and 24]	NS
							Functional Assessment of Cancer Therapy – Endocrine [BL to Wks 6, 12 and 24]	NS
							Lipid Profile (mg/dL) (Fasting serum) [BL to Wks 6, 12 and 24]	**Reduced triglycerides** Intervention: -22.1, Placebo: -10.3 Between group: p=0.01 Cholesterol: NS C-reactive protein: NS High density lipoprotein: NS Low density lipoprotein: NS
							Adverse events	NS
Shen, et al. (2018) [USA, AMRO] [22]	Secondary analysis	Breast cancer (stage I-III) – aromatase inhibitor-induced musculoskeletal pain (analysis of participants with and without obesity)					Brief Pain Inventory – short form [BL to Wk 6, 12 and 24]	**Reduced worst pain** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.02 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction: NS **Reduced average pain** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.002 BMI <30, treatment

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
								compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.005 **Reduced pain interference** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.009 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.01
							Global Ratings of Change questionnaire [BL to Wk 6, 12 and 24]	**Reduced joint stiffness** BMI ⩾30, treatment compared to placebo Wk 12: p=0.02, Wk 24: NS BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction: NS Joint pain: NS
							Modified Score for the Assessment and Quantification of Chronic Rheumatoid Affections of the Hands [BL to Wk 6, 12 and 24]	**Reduced pain** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.04 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction: NS
							Western Ontario and McMaster Universities Osteoarthritis Index [BL to Wk 6, 12 and 24]	**Reduced pain** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.01 BMI <30, treatment compared to placebo

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								Wk 12: NS, Wk 24: NS BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.02
							Lipid Profile (Fasting serum) [BL to Wk 6, 12 and 24]	**Increased high density lipoprotein** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.002 BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.003 **Reduced triglycerides** BMI ⩾30, treatment compared to placebo Wk 12: p=0.02, Wk 24: NS BMI <30, treatment compared to placebo Wk 12: p=0.02, Wk 24: NS BMI-treatment group interaction Wk 12: p=0.01,Wk 24: NS
Hershman, et al. (2018) [USA, AMRO] [23]	Randomized controlled trial	Breast cancer (Stage I-III hormone receptor positive – aromatase inhibitor induced joint pain)	Acupuncture joint specific protocol (Acu)	6 weeks (30-45 min, twice per week)	Sham acupuncture, Waitlist (WL) control	226 (110/59/57)	Brief Pain Inventory – Short Form [BL to Wk 6, Wk 12]	**Reduced worst pain** Wk 6 Acu: -2.05, Sham: -1.07, WL: -0.99 Between group: Sham p=0.01, WL p=0.01 Wk 12 Acu: -2.31, Sham: -1.51, Waitlist: -0.19 Between group: Sham NS, Waitlist p<0.001 **Reduced average pain** Wk 6 Acu: -1.45, Sham: -0.76,

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								WL: -0.81 Between group: Sham p=0.04, WL p=0.01 Wk 12 Acu: -1.95, Sham: -1.07, WL: -0.62 Between group: Sham p=0.02, WL: p<0.001 **Reduced pain interference** Wk 6 Acu: -1.69, Sham: -0.82, WL: -0.94 Between group: Sham p=0.02, Waitlist NS Wk 12 Acu: -1.8, Sham: -1.45, WL: -0.7 Between group: Sham NS, Waitlist p=0.003 **Reduced pain severity** Wk 6 Acu: -1.5, Sham: -1.00, WL: -0.82 Between group: Sham p=0.05, WL p=0.01 Wk 12 Acu: -1.82, Sham: -1.34, WL: -0.39 Between group: Sham NS, Waitlist p<0.001
Hudson (1991) [USA, AMRO] [49]	Case reports	Cervical cancer (Class IV)	Escharotic treatment to the cervix: bromelain powder applied to the cervix for 15 min followed removal with *Calendula officinalis* succus, *Sanguinaria canadensis* tincture 75% and zinc chloride 90 g/60 ml sterile water 25% applied to cervix for 1 min then removed with *Calendula officinalis* succus, vaginal suppositories containing	9 weeks (Powder, succus, tincture, vaginal suppositories, and douche. Repeated twice weekly for five weeks. Capsules 2 – 6 each daily. Emulsion on tampon were applied each night, then	Nil	7	Pap smear [BL to Wk 10, Mth 3, 6 and 12]	**Reduced pap smear** BL: class IV (7) Wk 10: class I (4), class II (1), class IV (2 – 1 regression of dysplasia on ectocervix to class I) Mth 3: class I continued remission (1-4), regression of endocervix in subject 6 to class II, class II (subject 5), class IV (subject 7 – continue to show regression of dysplasia on ectocervix to complete remission)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
			magnesium, iron, *Hydrastis canadensis*, vitamin A, *Melaleuca alternifolia* volatile oil, *Citrus x aurantium* volatile oil, an*d Thuja occidentalis* volatile oil placed for 24 hours, then vinegar vaginal douche. Oral supplements: vitamin C 6 – 10 g, beta-carotene 120,000–180,000 IU, selenium 400 mcg, *Taraxacum officinal*e root and *Arctium lappa* root, vegan diet, constitutional homeopathic remedy. After treatment: vitamin A emulsion on a tampon (one week) or *Ulmus rubra* suppositories (one week)	rotated again for two more weeks)				Mth 6: complete remission (1-4), class II (subject 5) class IV (subject 6 despite cryosurgery) class I complete remission (subject after conization) Mth 12: remission (1-4), partial relapse class II-III (Subject 5). Complete remission (subjects 6-7)
Jacobs, et al. (2005) [USA AMRO] [58]	Randomized controlled trial	Breast cancer survivors (menopausal symptoms)	Homeopathy – individualized single remedy, or combination medicine	1 year (given every 2 months)	Placebo	83 (26/30/27)	Hot flash frequency, severity [BL to Mths 1, 2, 3, 6, 9 and 12]	NS
							Kupperman menopausal index [BL to Mths 1, 2, 3, 6, 9 and 12]	NS
							Short Form-36 health survey [BL to Mths 1, 2, 3, 6, 9 and 12]	**Increased general health** Between group (compared to placebo) Single: p=0.02, Combination: p=0.03 All other domains: NS
							Follicle-stimulating hormone [BL to Mths 1, 2, 3, 6, 9, 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Jiang et al. (2013) [USA AMRO] [40]	Randomized controlled trial	Colorectal cancer (adults, Normal or High risk)	*Zingiber officinalis (radix)*	28 days(250 mg capsules, total of 2 g per day)	Placebo	50 (normal risk 30 (14/16) increased risk 20 (10/10))	Colonic COX-1 protein level [BL to day 28]	**Risk reduced in high-risk patients** Ginger, -23.8%; Placebo, 18.9%, (p=0.03) Normal risk CRC (NS)
							15-PGDH protein level [BL to day 28]	NS
Raghavendra, et al. (2007) [India, SEARO] [24]	Randomized controlled trial	Breast cancer (stage II and III operable) with chemotherapy-induced nausea and emesis	Yoga: *asana* postures, *pranayama* breathing, meditation and yogic relaxation techniques with imagery (taught by instructor, then practiced from home, plus a supervised session once in 10 days), alongside 4-6 chemotherapy cycles and standard anti-emetic medications	4 chemotherapy cycles (60 min, 6 days per week, during chemotherapy)	Control (psychodynamic supportive – expressive therapy with coping preparation)	62 (28/34)	Nausea frequency and intensity – Morrow Assessment of Nausea and Emesis (MANE) [after 4th cycle of chemotherapy (CT)]	**Reduced nausea** Post-CT frequency Between group: Yoga -0.9 (p=0.01) Post-CT intensity: Between group: Yoga -1.1 (p<0.001) Anticipatory frequency: Between group: Yoga -0.6 (p=0.06) Anticipatory intensity: Between group: Yoga -1.1 (p=0.003)
							Emesis frequency and intensity – MANE [after 4th cycle of CT]	**Reduced emesis** Post-CT frequency: Between group: Yoga -0.6 (p=0.06) Post-CT intensity: Between group: Yoga -0.6 (p=0.05) Anticipatory frequency: NS Anticipatory intensity: Between group: Yoga -0.57 (p=0.04)
							State Trait Anxiety Inventory (STAI) [after 4th cycle of CT]	**Reduced anxiety** Between group: Yoga -8.3 (p<0.001)
							Beck's Depression Inventory [after 4th cycle of CT]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							Distressful treatment-related symptoms (number of) [after 4th cycle of CT]	**Reduced no. symptoms** Between group: Yoga -3.3 (p=0.002)
							Severity of treatment-related symptoms [after 4th cycle of CT]	**Reduced severity** Between group: Yoga -9.7 (p<0.001)
							Symptom distress experienced [after 4th cycle of CT]	**Reduced distress** Between group: Yoga -13.3 (p<0.001)
							Functional Living Index for Cancer – Overall quality of life [after 4th cycle of CT]	**Increased quality of life** Between group: Yoga +30.4 (p<0.001)
							Total chemotherapy toxicity score [after 4th cycle of CT]	**Reduced toxicity** Between group: Yoga -3.8 (p<0.001)
Rao, et al. (2008) [India, SEARO] [27]	Randomized controlled trial	Breast cancer (stage II and III, mood states, quality of life and immune outcomes following surgery)	Integrated yoga program: *pranayama* breathing and yogic relaxation techniques	4 weeks (60 min session pre-operative, 30 min daily at home for 3 weeks post-surgery)	Control (supportive counselling sessions and postoperative exercise rehabilitation) (30 min, daily, at home, for 3 wks)	69 (33/36)	State Trait Anxiety Inventory [BL to Wk 4 post surgery]	**Reduced anxiety state** Yoga: -10.2 (p<0.01); Control: NS Between group: p=0.04 **Reduced anxiety trait** Yoga: -9.4 (p<0.01); Control: NS Between group: p=0.002
							Beck's Depression Inventory [BL to Wk 4 post surgery]	**Reduced depression** Yoga: NS; Control: NS Between group: p=0.008
							Functional Living Index of Cancer [BL to Wk 4 post surgery]	**Increased quality of life** Yoga: NS; Control: NS Between group: p=0.01
							Distressful treatment-related symptoms (number of) [BL to Wk 4 post surgery]	NS
							Severity of treatment-related symptoms [BL to Wk 4 post surgery]	**Reduced severity of symptoms** Yoga: NS; Control: NS Between group: p<0.01

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Rao, et al. (2008) [India, SEARO] [26]		Postoperative outcomes and wound healing					Symptom distress experienced [BL to Wk 4 post surgery]	**Reduced symptom distress** Yoga: -2.9 (p=0.05); Control: NS Between group: p<0.01
							Immune assays – immunoglobulins (serum IgA, IgG, IgM in g/L) [BL to Wk 4 post surgery]	**Increased IgA in control** IgA: Yoga, NS; Control, +0.64 (p=0.005) Between group: p=0.001 IgM: NS IgG: NS
							Immune assays – lymphocytes (CD4+, CD8+, CD56+ counts in %) [BL to Wk 4 post surgery]	**Reduced lymphocytes in control** CD4+:Yoga, NS; Control, -3.5 (p=0.002) Between group: NS CD8+: Yoga, NS; Control, -3.7 (p=0.001) Between group: NS CD56+: Yoga, NS; Control, -4.3 (p=0.001) Between group: p=0.019
							Drain retention following surgery (days) [BL to wk 4]	**Reduced drain retention** Yoga -1.74 (p=0.001)
							Duration of hospital stay (days) [BL to wk 4]	**Reduced duration of hospital stay** Yoga: -1.3 (p=0.003)
							Postoperative duration (days) [BL to wk 4]	NS
							Interval for suture removal (days) [BL to wk 4]	**Reduced interval for suture removal** Yoga: -2.4 (p=0.031)
							Postoperative complications (% yes/no) [BL to wk 4]	NS
							Plasma cytokines (TNF-alpha) [BL to wk 4]	**Reduced plasma cytokines** Yoga: -6.8 (p<0.001)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Rao, et al. (2015) [India, SEARO] [28]		Depression (changes during and post treatment)					Beck Depression Inventory [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced depression** Post-surgery: $p<0.01$ During RT: $p<0.001$ Post-RT: $p<0.001$ During CT: $p<0.001$ Post-CT: $p<0.01$ Positive correlation between depression scores with symptom severity and distress post surgery, mid RT and mid CT ($p<0.001$)
Rao, et al. (2009) [India, SEARO] [25]	Randomized controlled trial	Breast cancer (stage II and III, anxiety related to cancer and associated treatment)	Integrated yoga program: *pranayama* breathing, meditation and yogic relaxation techniques	Full radiotherapy/chemotherapy cycle (60 min, 3 sessions per week during treatment, 4 sessions pre- and post-operatively)	Control (supportive therapy as part of routine care)	38 (18/20)	State Trait Anxiety Inventory [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced anxiety state** Post-surgery: $p<0.05$ During and post-RT: $p<0.05$ During and post-CT: $p<0.001$ **Reduced anxiety trait** Post surgery: $p<0.001$ Post-RT: $p<0.01$ Post-CT: $p<0.001$
							Symptom distress [BL to post-surgery, BL to during RT, post-RT, BL to during CT, post-CT]	**Reduced distress** Post surgery: $p<0.001$ During and post-RT: $p<0.001$ During CT: $p<0.001$ Post-CT: $p<0.05$
Rao, et al. (2017) [India, SEARO] [29]	Randomized controlled trial	Breast cancer (stage II and II, mood states, quality of life and toxicity related to cancer and associated treatment)	Integrated yoga program: *pranayama* breathing, meditation and yogic relaxation techniques (60 min, 4 sessions pre- and post-operatively, 3 sessions per wk during 6-wk radiotherapy, during each chemotherapy session, home practice 6 days per wk)	24 weeks: (60 min, 3 sessions per week during radiotherapy, one session at each chemotherapy treatment, home practice 6 days per week)	Control: supportive counselling sessions (60 min initial session, 15 min session during subsequent hospital visits, additional as required)	69 (33/36)	State Trait Anxiety Inventory [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced anxiety state** Post-surgery: $p=0.04$ Pre-RT: $p=0.005$ During RT: $p=0.009$ Post-RT: $p<0.001$ During CT: $p<0.001$ Post-CT: $p<0.05$
							Beck's Depression Inventory [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced depression** Post-surgery: $p=0.01$ Pre-RT: $p=0.007$ During RT: $p=0.001$ Post-RT: $p<0.001$ Pre-CT: $p=0.02$ During CT: $p<0.001$ Post CT $p<0.002$

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							Subjective symptoms – no. of symptoms, severity, total distress [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced no. symptoms** During RT: p=0.009 During and Post-CT: p=0.003 **Reduced severity** Post-surgery: p<0.001 During RT: p<0.001 During CT: p<0.001 Post-CT: p=0.002 **Reduced distress** Post-surgery: p<0.001 During RT: p<0.001 During CT and Post-CT: p<0.001
							Functional Living Index of Cancer [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Increased quality of life** Between group: Post-surgery: p=0.01 During RT: p<0.001 During CT: p<0.001
							Chemotherapy-related toxicity – WHO toxicity criteria [during CT]	**Reduced overall toxicity** Between group: p=0.01
Rao, et al. (2017) [India, SEARO] [30]	Randomized controlled trial	Breast cancer (stage IV, related sleep quality)	Integrated yoga-based stress-reduction program: didactic lectures, *pranayama* breathing, meditation and yogic relaxation techniques	12 weeks (60 min, at least twice per week)	Control (education and supportive therapy sessions)	91 (45/46)	Pittsburgh Insomnia Rating Scale [Between group – BL to Wk 12]	**Reduced insomnia** Symptom distress: p<0.001 Insomnia parameters: p=0.02 Impact on quality of life: p=0.001 Total score: p=0.001
							Diurnal salivary cortisol [mean of 3 consecutive days at 0600h, 0900h, 2100h, overall mean [BL to Wk 12]	Reduced at 0600h Yoga: p=0.31 Control: NS
							Natural killer cells (NK) [BL to Wk 12]	**Increased NK cells** Between group: p=0.03
							Absolute lymphocyte count [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Schloss, et al. (2015) [Australia, WPRO] [31]	Case study	Breast cancer (chemotherapy-induced peripheral neuropathy (CIPN) and vitamin B12 deficiency)	Vitamin B12 (intramuscular injection) and B-group vitamin complex (oral)	2 months (B12 injection: 1000 mcg, single dose; Oral complex: equivalent 1000 mcg B12, daily)	Nil	1	Blood pathology (vitamins B12, B1, B2, B6, red cell folate) [BL to post-chemo, post-chemo to Mth 2 post-intervention]	**Reduced B12 post-chemotherapy** B12: -78 (deficiency) B1: no change B2: +30 (healthy range) B6: -5 (healthy range) Red cell folate: -86 (healthy range) **Increased B12 post-intervention** B12: +77 (healthy range) B1: +40 (healthy range) B2: -80 (healthy range) B6: +160 (healthy range) Red cell folate: +7 (healthy range)
							CIPN (Patient neurotoxicity questionnaire) [BL to post-chemo, post-chemo to Mth 2 post-intervention]	**Increased CIPN post-chemotherapy** Total neuropathy: +8 (grades 2-3) **Reduced CIPN post-intervention** Total neuropathy: -4 (grade 1)
Schloss, et al. (2017) [Australia, WPRO] [32]	Randomized controlled trial	Newly diagnosed cancer (breast (n=36), lymphoma (n=20) lung n=9), colon (n=4), prostate (n=1) and endometrial (n=1), undergoing chemotherapy)	B-group vitamin complex, initiated 1 week pre-chemotherapy, continued for 12 weeks post-chemotherapy	36 weeks (B1 50 mg, B2 20 mg, B3 100 mg, P5 164 mg, B6 30 mg, folate 500 mcg, B12 500 mcg, biotin 500 mcg, choline 100 mg, inositol 500 mcg)	Placebo	71 (38/33)	Total Neuropathy Score [BL to Wk 12, 24 and 36]	NS
							MD Anderson Brief Pain Inventory [BL to Wk 12, 24 and 36]	NS
							European Organization for the Research and Treatment of Cancer – Quality of Life [BL to Wk 12, 24 and 36]	NS
							Patient Neurotoxicity Questionnaires – sensory, motor or other neuropathy [BL to Wk 12, 24 and 36]	**Reduced sensory neuropathy** Intervention: Wk 2: p=0.03 Wk 24: p=0.005 Wk 36: p=0.021 Placebo: NS Motor and other: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
Siegel, et al. (2014) [USA, AMRO] [48]	Uncontrolled trial (phase I)	Hepatocellular carcinoma (advanced, males)	Silybin phosphatidylcholine (1:2 *Silybum marianum* to phosphatidycholine)	12 weeks (escalating from 2 g to 12 g daily, in 3 divided doses)	Nil	3	Plasma silibinin and silibinin glucorinide [BL to Wk 1, 3, 6 and 9, until death]	**Increased silbinin** Wk 1: n=2, Wk 3: n=2 **Increased silibinin glucuronide** Wk 1: n=3, Wk 3: n=1, Wk 6: n=1
							Liver function test [BL to Wk 1, 3, 6 and 9, until death]	**Reduced bilirubin** Wk 3: n=1, Wk 6: n=1, Wk 9: n=1 **Maintained liver enzymes** Wk 1: n=1, Wk 3: n=1, Wk 9: n=1 **Reduced α-fetoprotein** Wk 9: n=1
							Inflammatory biomarkers [BL to Wk 1, 3, 6 and 9, until death]	No clear changes
Torkelson, et al. (2012) [USA, AMRO] [37]	Uncontrolled trial (phase I, dose finding)	Breast cancer (stage I, II or III, pre-radiation therapy)	*Trametes versicolor* (freeze dried mushroom powder)	6 weeks (500 mg per capsule, escalating doses beginning at 3 g, 6 g, or 9 g daily)	Observational group	23 (3/3/ 3/14)	Common Terminology Criteria for Adverse Events V3.0 [BL to Wk 6]	Total adverse events: 9 Mild: 7, Moderate: 1, Severe: 1 Possibly related to intervention: 3 Mild: 2, Severe: 1 All doses well tolerated
							Immune response (red blood cell parameters, white blood cell parameters, immune-phenotyping peripheral blood mononuclear cells) [BL to post-radiation to Wk 2, 4 and 6]	**Increased lymphocytes** Wk 2: 6 g and 9 g ($p=0.042$) **Increased CD8+ and CD19+ T cells** Wk 6: 9 g ($p<0.001$) **Increased CD19+ B cells** Wk 6: 6 g ($p=0.033$) Red blood cell: NS Absolute white cell count: NS Neutrophils: NS Natural killer cells: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control)	Measure of Outcome	Outcome
Vadiraja, et al. (2009) [India, SEARO] [33]	Randomized controlled trial	Breast cancer (stage II-III, adjuvant radiotherapy) symptom management	Integrated yoga program: *asana* postures, *pranayama* breathing, meditation, yogic relaxation (home practice encouraged)	6 weeks (60 min, at least 3 times per week)	Control: brief supportive therapy with education (15 min, 3 – 4 sessions over 6 wks)	88 (44/44)	Hospital Anxiety and Depression Scale [BL to wk 6]	**Reduced anxiety** Yoga: -3.17 ($p<0.001$); Control: -1.23 ($p<0.05$) Between group -3.34 ($p<0.001$) **Reduced depression** Yoga: -3.43 ($p<0.01$); Control: -1.47 ($p<0.01$) Between group: -2.39 ($p<0.01$)
							Perceived Stress Scale [BL to wk 6]	**Reduced stress** Yoga: -5.61 ($p<0.001$); Control: NS Between groups -4.96 ($p<0.001$)
							Diurnal salivary cortisol [collected 6am, 9am, 9pm for 3 consecutive days, BL to Wk 6]	**Reduced salivery cortisol** Between group: 6am, $p=0.009$; 9am, NS; 9pm, NS Pooled mean: $p=0.03$
Vadiraja, et al. (2009) [India, SEARO] [36]							Rotterdam Symptom Check list – psychological, physical, activity level [pre- and post-radiotherapy]	**Reduced psychological distress** Yoga: -2.5 ($p<0.001$); Control: NS Between group: $p<0.001$ **Reduced physical distress** Yoga: -3.23 ($p<0.01$); Control: NS Between group: NS Activity level: NS
							European Organization for the Research and Treatment of Cancer – Quality of Life (EORTC QoL C30 questionnaire V1) [pre- and post-radiotherapy]	**Reduced fatigue** Yoga: -12.22 ($p<0.001$); Control: NS Between group: $p=0.001$ **Reduced pain** Yoga: -9.63 ($p<0.01$); Control: NS Between group: $p<0.01$ **Reduced insomnia** Yoga: -23.71 ($p<0.001$);

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Vadiraja,et al. (2009) [India, SEARO] [34]								Control: NS Between group: p=0.04 **Reduced appetite loss** Yoga: NS; Control: +9.89 (p=0.005) Between group: p=0.002 Dyspnea: NS Nausea and vomiting: NS Diarrhea: NS Constipation: NS
							Positive and Negative Affect Schedule [BL to Wk 6]	**Increased positive affect** Yoga: +3.8 (p<0.001); Control: NS Between group: p=0.007 **Reduced negative affect** Yoga: -9.24 (p<0.001); Control: -3.37 (p=0.02) Between group: p<0.001
							European Organization for the Research and Treatment of Cancer – Quality of Life [BL to Wk 6]	**Increased physical function** Yoga: NS; Control: +6.24 (p=0.03) Between group: NS **Increased emotional function** Yoga: +18.67 (p<0.001); Control: +7.65 (p=0.009) Between group: p=0.001 **Increased cognitive function** Yoga: +5.28 (p=0.05); Control: NS Between group: p=0.03 Role function: NS Social function: NS
Vadiraja, et al. (2017) [India, SEARO] [35]	Randomized controlled trial	Breast cancer associated fatigue	Integrated yoga program: *asana* postures, *pranayama* breathing, meditation, yogic relaxation, chanting, self-appraisal and counselling (individual sessions)	12 weeks (at least 2 sessions per week)	Control (supportive counselling sessions)	91 (46/45)	Percieved Stress Scale [BL to Wk 12]	**Reduced stress** Yoga: -32.6% (p=0.01); Control: NS Between group: p<0.001

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
							Fatigue Symptom Inventory – severity, frequency, interference, diurnal variation [BL to Wk 12]	**Reduced severity** Yoga: -61.15% (p<0.001); Control: NS Between group: p<0.001 **Reduced frequency** Yoga: -52.64% (p<0.001); Control: NS Between group: p<0.001 **Reduced interference** Yoga: -72.6% (p<0.001); Control: NS Between group: p<0.001 **Reduced diurnal variation** Yoga: -52.33% (p<0.001); Control: NS Between group: p<0.001
Zick, et al. (2011) [USA, AMRO] [41]	Randomized controlled trial	Colorectal cancer, normal risk (colonic inflammation)	*Zingiber officinalis* (radix) 250 mg capsule (f 5% gingerols)	28 days (8 capsules per day, total 2000 mg daily)	Placebo	33 (16/17)	Eicosanoid levels in normal mucosa, normalized to protein (pg/ug) [BL to Dy 28]	NS
							Eicosanoid levels in normal mucosa, normalized to arachidonic acid (% change) [BL to Dy 28]	**Reduced inflammatory markers** PGE2: Ginger -28.0%, Placebo +26.4% Between group p=0.05 5-HETE: NS 12-HETE: NS 15-HETE: Ginger -15.8%, Placebo +26.7% Between group p=0.04 13-HODE: NS
Zick, et al. (2011) [USA, AMRO] [59]	Randomized controlled trial	Cancer survivors (persistent cancer-related fatigue – adults, >12wks post cancer-related treatment)	Stimulatory acupressure on CV6, GV20 and bilaterally on ST36, SP6, KI13, LI3: High dose (HIS) or Low dose (LIS); Relaxation acupressure (RA) on Yin Tang and bilaterally on Anmian, HT7, LV3, SP6	12 weeks (30 min, HIS and RA: twice per day, LIS: 3 times per week)	Nil	43 (15/14/14)	Brief Fatigue Inventory [BL to Wk 12]	**Reduced Fatigue severity** HIS: -2.2 LIS: -2.7 RA: -4.0 Between group: p=0.027 Adjusted: p=0.013

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Zick, et al. (2015) [USA, AMRO] [42]	Randomized controlled trial	Colorectal cancer, increased risk (colonic inflammation)	*Zingiber officinalis* (radix) 250 mg capsule (standardized 5% gingerols)	28 days (8 capsules per day, total 2000 mg daily)	Placebo	20 (10/10)	Eicosanoid levels in normal mucosa, normalized to protein (pg/ug) [BL to Dy 28]	**Reduced inflammatory markers** Arachidonic acid: Ginger -44%, Placebo +229.4% Between group: p=0.05 **Increased inflammatory markers** Leukotriene B4: Ginger +54.0%, Placebo -4.7% Between group: p=0.04
							Eicosanoid levels in normal mucosa, normalized to arachidonic acid (% change) [BL to Dy 28]	NS
Zick, et al. (2016) [USA, AMRO] [61]	Randomized controlled trial	Breast cancer stage 0-IIII – persistent cancer-related fatigue (female survivors, >12 mths post cancer treatment)	Relaxing acupressure (RA) on Yin Tang and bilaterally on Anmian, HT7, SP6, LV3; Stimulating acupressure (SA) on Du20, CV6 and bilaterally on LI4, ST36, SP6, KI3 (self-administered, 30 min training session)	6 weeks, plus 4 week follow up (3 min each point, daily)	Usual care control	270 (94/90/86)	Brief Fatigue Inventory [BL to Wk 6, Wk 10]	**Reduced fatigue** Wk 6 RA: -2.6, SA: -2.0, Control -1.1 Between group: p<0.001 Wk 10 RA: -2.3, SA: -2.0, Control: -1.0 Between group: p<0.001 BFI score <4 (Wk 6) RA: 66.2%; SA: 60.9%, Control: 31.3% Between group: p<0.001
							Pittsburg Sleep Quality Index [BL to Wk 6, Wk 10]	**Reduced sleep problems** Wk 6 RA: -2.0, SA: -1.4, Control: 0.6 Between group: p<0.05 Wk 10: NS
							Long-Term Quality of Life (LTQL) Instrument – Somatic [BL to Wk 6, Wk 10]	**Increased somatic function** Wk 6 RA: +3.3, SA: +2.0, Control: +0.2 Between group: p<0.05 Wk 10 RA: +3.5, SA: +1.2, Control: +0.6 Between group: p<0.05

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
Harris, et al. (2017) [USA, AMRO] [65]	Secondary analysis				Nil	19 (9 RA/10 SA)	LTQL – Fitness [BL to Wk 6, Wk 10]	**Increased Fitness** Wk 6 RA: +1.4, SA: +0.5, Control: -0.1 Between group: p<0.05 Wk 10 RA: +2.2, SA: +0.9, Control: +0.4 Between group: p<0.05
							LTQL – Social support [BL to Wk 6, Wk 10]	**Increased social support** Wk 6 RA: +0.1, SA: -0.4, Control: -0.8 Between group: p<0.05 Wk 10 RA: 0.0, SA: -0.8, Control: -0.7 Between group: p<0.05
							LTQL – Spiritual and Philosophical [BL to Wk 6, Wk 10]	NS
							Adverse events	**Non-serious** 6 cases of mild bruising at acupressure sites
							Brief Fatigue Inventory [BL to Wk 6]	**Reduced fatigue** Whole sample: -1.81 (p=0.001) Between group: NS **Reduced sleep problems** Whole sample: -2.17 (p=0.014)
							Neurobiological metabolites: (glutamate + glutamine (Glx) and creatine to total creatine (Cr/tCr) levels [BL to Wk 6]	Changes post-treatment: NS Glx associated with improvements in sleep RA: p=0.02, SA: p=0.01 Cr/rCt associations: NS Associations with fatigue: NS
							Brain functional connectivity (between right posterior insula seed and left dorsolateral prefronal cortex) [BL to Wk 6]	**Reduced functional connectivity** RA: -0.16 **Increased functional connectivity**

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control)	Measure of Outcome	Outcome
								SA: +0.13 Between group: p<0.001 **Reduction associated with increased sleep quality** RA: p=0.03, SA: NS Associations with fatigue: NS
Zick, et al. (2017) [USA, AMRO] [60]	Randomized controlled trial	Breast cancer survivors (stage 0-IIIa), fatigue	Fatigue reduction diet (rich in fruit, vegetables, whole grains, and omega-3 fatty acid-rich foods) with individualized counselling	3 months (counselling weekly for 4 weeks, then every other week)	Control (general health curriculum with individualized counselling matched for time)	30 (15/15)	Brief fatigue Inventory (%) [BL to Mth 3]	**Reduced fatigue** -2.4 vs -0.77, (p=0.001)
							Pittsburgh Sleep Quality Index [BL to Mth 3]	**Increased sleep** -2.5 vs +0.9, (p=0.03)
							Serum fatty acids (%) [BL to Mth 3]	**Improved fatty acid profile** Reduced saturated fatty acid (p=0.04); Increased omega-3 (p<0.01), 3:6 omega (p=0.02)
							Serum nutrient concentrations [BL to Mth 3]	**Increased carotenoid levels** Increase in FRD for total carotenoids (p<0.01), β-cryptoxanthin (p=0.02), lutein (p=0.05), zeaxanthin (p=0.01), lycopene (p=0.05). Control: increase γ-tocopherol (p=0.03)

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18 Cardiovascular Conditions

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HIGHLIGHTS

- Cardiovascular conditions are listed in the top 10 reasons patients seek naturopathic care.
- Naturopaths/NDs work with patients with a history of cardiovascular disease (CVD), to decrease cardiovascular risk, in the treatment and management of hypertension and high cholesterol and in supporting pre- and post-cardiovascular surgery.
- The risk of many cardiovascular conditions is strongly associated with modifiable risk factors – lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, dietary choices and environmental exposures – all which are addressed as part of naturopathic care.
- The individualized and multi-modal naturopathic approach serves as a model of holistic preventive cardiovascular care and management or treatment of cardiovascular conditions.
- 91% of the clinical research investigating naturopathic interventions for cardiovascular conditions indicated a positive outcome in at least one primary or secondary outcome measures.

Globally, cardiovascular disease is the number one leading cause of death with low- and middle-income countries suffering the most, according to the WHO [1]. Cardiovascular diseases can be grouped into generalized cardiovascular disorders (e.g., hypertension, hypotension), diseases of the heart (e.g., congestive heart failure, angina pectoris, myocardial infarct, arrythmia), peripheral vascular diseases (e.g., arteriosclerosis, atherosclerosis, hemorrhoids, intermittent claudication, Raynaud's Syndrome/Disease, stroke, transient ischemic attack, varicose veins) and blood disorders (e.g., anemia, hemorrhage, polycythemia) [2]. Most cardiovascular diseases are considered non-communicable diseases (NCDs) and are strongly correlated with lifestyle and environmental factors. Like other NCDs, there are non-modifiable and modifiable risk factors for cardiovascular diseases. The non-modifiable risk factors include sex, race/ethnicity, age, genetic contribution, and some environmental exposures [3]. Modifiable risk factors have the greatest impact on cardiovascular health and include: lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, tobacco use, dietary choices, stress management, and exposure to environmental pollutants [4, 5].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=11; published in 12 papers) conducted by naturopathic researchers to investigate treatments for cardiovascular disease. This research sampled a total of 1816 participants and was conducted in Australia (n=5), the United States of America (USA) (n=4), India (n=2) and Canada (n=1). The study designs include randomized controlled trials (n=6), uncontrolled trials (n=2), case reports (n=2), a retrospective observational study (n=1) and a secondary analysis (n=1). The studied interventions evaluated either single or combination therapies that involved complex naturopathic interventions which included a combination of lifestyle, dietary (applied nutrition), exercise, herbal, yoga and/or clinical nutrition (n=3), herbal medicines (n=3), clinical nutrition (n=2), massage (n=2), lifestyle recommendations (n=1), acupuncture (n=1), and hydrotherapy (n=1).

The cardiovascular conditions examined include hypertension (n=4), cardiovascular disease risk (n=3), history of cardiovascular disease (n=2), post-surgery cardiovascular support (n=2), venous leg ulcers (n=2) and anemia (n=1). Of all the naturopathic clinical studies examining cardiovascular disease populations, 72.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are

available in *Table 18.1: Clinical research investigating cardiovascular conditions conducted by naturopathic researchers*. This body of naturopathic research on cardiovascular disease is also supported by over 20 observational studies and more than 20 reviews or meta-analysis, as outlined in Chapter 28.

Implications

Naturopathic practice serves as a model of holistic preventive cardiovascular care. Naturopaths/naturopathic doctors support patients with a range of cardiovascular concerns ranging from general cardiovascular risk factors and history of cardiovascular disease, high cholesterol and hypertension to heart failure support and pre- and post-cardiovascular surgery support [6]. Current empirical research indicates that select naturopathic practices, and especially multi-modal naturopathic interventions, hold merit in the treatment of various cardiovascular conditions.

The holistic, patient-centered and preventive approach of naturopathic treatment is conducive to an advanced role in cardiovascular care that aligns with public health aims [7]. Consultation with naturopaths/naturopathic doctors is already known to be associated with positive health behaviours that are known to be important modifiers of cardiovascular disease [8], and the naturopathic community has been able to achieve successful results in NCDs even in the absence of conventional drug treatment [9]. The increasing burden of chronic NCDs associated with modifiable risk factors including unhealthy lifestyles demand identification of novel approaches that can reduce reliance on pharmaceutical management and invasive treatments. Naturopathic practice models offer potential benefit in diverse clinical populations to achieve these aims, both as a stand-alone treatment intervention as well as integrated naturopathic care within standard primary care and cardiology practices. Further attention on developing and evaluating integration of naturopathic practices on clinical outcomes of various cardiovascular diseases is warranted.

Studies investigating specific conditions:

Hypertension

Three naturopathic studies, two from the USA [10, 11] and one from India [12] with a total of 152 participants with hypertension were evaluated. A single-arm, open label study conducted in the USA involving 30 participants with prehypertension or stage 1 hypertension defined as 120-139 mmHg systolic blood pressure and 80-99 mmHg diastolic blood pressure were prescribed a multi-ingredient dietary supplement which containing reserpine-free *Rauwolfia serpentina* [11]. Participants took 1 tablet per day. The 6-month study resulted in a decrease of systolic (-13.6 mmHg, $p<0.0001$) and diastolic (-9.4 mmHg, $p<0.0001$) blood pressure by the end of the study with a concomitant increase in serum potassium at Month 3 (+0.12, $p=0.04$) but not continuing through to Month 6. There were no other significant changes to biological markers. Laboratory results support renal, hepatic and cardiac safety based on the lack of adverse changes in estimated glomerular filtration rate, liver enzymes, and biomarkers of cardiac inflammation and contractility. Nine participants withdrew from the study due to mild-to-moderate adverse effects including nasal congestion, fatigue, and lightheadedness, with some symptoms deemed as pre-existing prior to the study [11].

A randomized controlled trial conducted in India investigating a naturopathic intervention involving manual acupuncture compared with a yogic breathing intervention (i.e., *pranayama*) and resulted in significant reductions in blood pressure [12]. Subjects with hypertension (n=37) (aged 35-60) and no previous exposure to acupuncture were subject to either 20 minutes of breathing or acupuncture. The breathing intervention group completed various breathing patterns led by a naturopathic physician with qualified yoga experience. The acupuncture group received four acupuncture needles that are understood to be anti-hypertensive. A pre- and post- blood pressure measure was taken for all participants. A significant decrease in systolic blood pressure was measured in the breathing intervention group ($p<0.007$), as well as a significant decrease in diastolic blood pressure was observed in the acupuncture group ($p<0.02$), concluding yogic breathing may reduce systolic blood pressure and acupuncture may significantly reduce diastolic blood pressure [12].

A retrospective observation study conducted in the USA investigated the outcome of adjunctive or primary naturopathic care with 85 participants with hypertension over a six month period of time [10]. Analysis of the characteristics of the naturopathic care provided to participants found 76.5% received adjunctive naturopathic care, of which 97.6% received dietary advice, 68.2% exercise advice, 56.5% preventive advice regarding alcohol, 47.1% preventive advice regarding tobacco, 100% were recommended dietary supplementation including omega-3 oil from fish, magnesium, coenzyme Q10, vitamin B6, resveratrol, potassium, herbal medicines including *Rauwolfia serpentina*, *Terminalia arjuna*, *Convolvulus pluricaulis*, *Tribulus terrestris*, *Crataegus oxycanta*, *Allium sativa*, *Taraxacum officinalis*, *Leonurus cardiaca*, *Passiflora incarnata*. The study found that 34.1% ($p=0.038$) had a systolic blood pressure <140mmHg, 26% ($p=0.026$) and a diastolic blood pressure <90mmHg with 29.3% ($p=0.033$) resulting in both systolic and diastolic blood pressure improvement.

Cardiovascular Disease

One uncontrolled trial conducted in Australia and involving 56 patients examined the impact of a natural health product containing omega-3 fatty acids on cardiovascular disease patients or those with cardiovascular risk factors [13]. The study tested omega-3 polyunsaturated fatty acids 260 mg docosahexaenoic acid (DHA) and 120 mg eicosapentaenoic acid (EPA) prescribed at 1 capsule twice a day for 4 weeks and demonstrated a significant reduction in platelet aggregation in healthy volunteers compared to subjects with CVD [13]. A dose of 640 mg/day of omega-3 PUFA was tested in 40 healthy subjects and 16 subjects with CVD. Participants took 520 mg DHA and 120 mg EPA once a day for 4 weeks. Participants with CVD remained on all medications for the study including anti-coagulation and cholesterol lowering medications. Adenosine diphosphate (ADP)-induced and adrenaline-induced platelet aggregation velocity decreased after 4 weeks in healthy volunteers (p=0.014, p=0.013 respectively). Comparatively, these measurements, ADP (p=0.776) and adrenaline (p=0.476) aggregation velocity, in subjects with CVD were not significant. However, the velocity of platelet aggregation decreased in response to arachidonic acid (p=0.009) and lag time to platelet aggregation increased with thromboxane mimetic U46619 (p=0.018) were significant in subjects with CVD.

Clinical finding

Naturopathic care involving lifestyle modification, herbal medicine prescription and a dietary plan over 12-months may significantly reduce 10-year CVD risk and the prevalence of composite metabolic syndrome in patients at high risk for CVD.

A randomized, controlled trial in Canada determined treating patients at high risk for cardiovascular disease with a whole practice naturopathic care intervention reduced event risk over the next ten years [14]. Postal workers (n= 246, aged 25-65) from three different areas of Canada were randomized to a control group or a naturopathic intervention group. Naturopathic intervention included initiation of a lifestyle, botanical, and nutritional care plan at an initial visit plus four additional 30-minute appointments over the course of 1 year. Changes in the naturopathic group included a significant reduction in average 10-year CVD event risk of -3.1 % (p=0.002) compared to standard of care. The prevalence of composite metabolic syndrome was also reduced by 16.9% (p=0.002).

Post-Cardiac Surgery

Three studies from Australia involving 269 patients examined the impact of naturopathic interventions pre- and post- cardiovascular surgeries [15-17]. One investigated the impact of multi-faceted naturopathic support including lifestyle, dietary recommendations, physical activity, stress management and the prescribing of nutritional supplements (CoQ10, magnesium orotate, alpha-lipoic acid and omega-3) [16], one the effect of lifestyle interventions including light exercise and mental stress reduction [17], and the third measured the effect of massage [15].

Clinical finding

Individualised naturopathic care involving dietary and lifestyle advice, and supplementation with Coenzyme Q10, magnesium, alpha lipoic acid and omega 3 fatty acids for between 3 and 7 days may reduce the need for inotropic drugs in individuals post-cardiac surgery.

In a 2014 study conducted at the Integrative Cardiac Wellness Program run at the Royal Alfred Hospital in Australia, 337 patients underwent whole practice naturopathic interventions post coronary artery bypass graft or cardiac valve surgery [16]. The naturopathic interventions were conducted 3-7 days post-operation and involved individualized, in-hospital naturopathic interventions including dietary and lifestyle advice and supplementation with CoQ10 (225 milligrams, mg), magnesium orotate (1500 mg), alpha lipoic acid (225 mg), and EPA/DHA (900 mg/600 mg). The treatment group receiving naturopathic care demonstrated a reduction in need for inotropic drugs by about 41% compared to control. Between groups there were no significant differences in need of blood transfusion or return to surgery for bleeding, suggesting no short-term increase in anti-coagulation due to EPA/DHA supplementation. This study also assessed the interest of participants to take part in the study and demonstrated 98% of patients would choose to take part in the study if given the option to access these therapies. Forty-eight patients were surveyed 6 months after their surgery and 97% rated the Integrative Cardiac Wellness Program as excellent and 73% claimed the program improved their time at the hospital.

A randomized controlled trial conducted in Australia involving 146 participants with 75 receiving massage treatment post coronary artery bypass graft surgery indicated an amelioration in patient symptoms compared to a usual care control group [15]. Massage therapy

was delivered over two time points post-surgery for 20 minutes per session. The control groups received usual rest care. Assessments were completed via visual analog scales. The massage therapy significantly decreased anxiety ($p<0.0001$), muscular tension ($p=0.002$), and pain ($p=0.001$) while improving relaxation for patients six days post-surgery. Two focus groups completed after the study noted easy implementation of the program to their daily routine [15].

Other Cardiovascular Conditions

Other cardiovascular conditions studied included, heart failure [18, 19], venous leg ulcers [20, 21] and anemia [22]. A prospective triple blind randomized placebo-controlled trial conducted in Australia tested the efficacy of horsechestnut seed extract *(Aesculus hippocastanum)* on venous leg ulcers [20]. Twenty-seven individuals with venous leg ulcerations receiving care from a community nursing service were administered the extract for twelve weeks compared to a control group. Assessment of the wounds at 0, 4, 8, and 12 weeks revealed no significant change between groups with respect to symptoms or healing, but there was a significant reduction in wound sloughing ($p=0.045$) and a reduction in the frequency of dressing changes required at week 12 ($p=0.009$) favoring the treatment group.

Clinical finding

Horsechestnut seed extract *(Aesculus hippocastanum)* may reduce wound sloughing and the frequency of required dressing changes in individuals with venous leg ulcers.

A case report conducted in India on naturopathic treatment for a 33-year-old female with iron deficiency anemia applied different hydrotherapy and massage techniques over a period of 6 days [22]. The patient was not on any medication. Her presenting symptoms included lethargy, dry pruritic skin, weakness, myalgia, and quickness to fatigue. Over the course of treatment, she received a variety of therapies for a total of 90 minutes per day including mud pack, sitz bath, spinal spray, emersion bath, enemas, Swedish massage, massage, and abdominal pack wrap. Infrared ray therapy and low intensity ultrasound were added to treatment to relieve pain. Post treatment her hemoglobin elevated by 8.2 milligrams/ deciliter, mg/dL, from 7.0 mg/dL. No changes were observed in resting blood pressure, pulse rate, or respiratory rate.

Table 18.1 Clinical research investigating cardiovascular conditions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
Bradley, et al. (2011) [USA, AMRO] [10]	Retrospective observational study	Hypertension	Adjunctive or primary naturopathic care over at least 6 months. 76.5% received adjunctive naturopathic care, 97.6% received dietary advice, 68.2% exercise advice, 56.5% preventive advice regarding alcohol, 47.1% preventative advice regarding tobacco, 100% recommended dietary supplementation including omega-3 oil from fish, magnesium, coenzyme Q10, vitamin B6, resveratrol potassium, botanical supplements including *Rauwolfia serpentina, Terminalia arjuna, Convolvulus pluricaulis, Tribulus terrestris, Crataegus monogyna, Allium sativa, Taraxacum officinalis, Leonurus cardiaca, Passiflora foetida.*	Mean duration of care: 13.8 months	Nil	85	Proportion with systolic blood pressure (BP) <140mmHg (%)	**Increased proportion with <140mmHg systolic BP** +34.1 (p=0.038)
							Proportion with diastolic blood pressure <90mmHg (%)	**Increased proportion with <90mmHg diastolic BP** +26 (p=0.026)
							Neither systolic nor diastolic <140/90mmHg	**Reduced proportion with neither systolic nor diastolic BP <140/90mmHg** -35.3 (p=0.033)
							Either systolic or diastolic blood pressure <140/90mmHg	**Increased proportion with either systolic nor diastolic BP <140/90mmHg** +5.9 (p=0.033)
							Both systolic and diastolic blood pressure <140/90mmHg	**Increased proportion with both systolic and diastolic blood pressure <140/90mmHg** +29.3 (p=0.033)
Braun, et al. (2012) [Australia, WPRO] [15]	Randomized controlled trial	Cardiothoracic patients (post-surgery)	Swedish Massage therapy	20-minute massage therapy on the ward on day 3 or 4 and day 5 or 6 of shoulders, neck back scalp, hands, feet or legs	Active control: rest	146 (75/71)	Pain, Visual Analogue Scale [pre- and post-intervention]	**Reduced pain** Massage -1.19 vs placebo -0.32 (p=0.001)
							Anxiety, Visual Analogue Scale [pre- and post-intervention]	**Reduced anxiety** Massage -1.72 vs rest -0.041 (p<0.001)
							Muscular tension, Visual Analogue Scale [pre- and post-intervention]	**Reduced muscular tension** Massage -1.70 vs rest -0.61 (p=0.002)
							Relaxation, Visual Analogue Scale [pre- and post-intervention]	**Increased relaxation** Massage + 2.11 vs rest 0.74 (p<0.0001)
							Satisfaction, Visual Analogue Scale [pre- and post-intervention]	**Increased satisfaction** Massage +0.31 vs rest -0.28 (p=0.016)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
							Heart rate (beats/sec) [pre- and post-intervention]	NS
							Respiratory rate (breaths/min) [pre- and post-intervention]	NS
							Blood pressure (mmHg) [pre- and post-intervention]	NS
Braun, et al. (2014) [Australia, WPRO] [16]	Controlled trial	Cardiothoracic patients (post-surgery coronary artery bypass graft [CABG] and valve surgery)	Integrative cardiac wellness program (ICWP) including (a) nutritional products – CoQ10 225mg, magnesium orotate 1500mg, (R, S)-alpha lipoic acid 225mg, d-Alpha tocopherol 10.08mg, Omega-3 3000mg (EPA 900mg/DHA 600mg) (b) Naturopathic consult on lifestyle, diet, physical activity and emotional wellbeing	4 weeks: (a) three times per day; (b) between day 3 and 6	Historical, usual care	922 total CABG: 585 (176/354) Valve: 337 (161/231)	Atrial fibrillation % [post-surgery]	**Reduced rate** CABG: usual care 36 vs ICWP 26 (p=0.025) Valve surgery NS
							Inotrope use % [post-surgery]	**Reduced inotropic support** CABG: usual care 43 vs ICWP 24 Relative reduction of 42% (p<0.001) Valve surgery: usual care 48 vs ICWP 29 Relative reduction of 40% (p=0.02)
							Low output state % [post-surgery]	**Reduced incidence** CABG: usual care 16 vs ICWP 9 (p=0.025) Valve surgery NS
							Troponin I 24h [post-surgery]	NS
							Length of hospital stay (days) [post-surgery]	NS
							30 Day mortality [post-surgery]	NS
							Blood drainage first 4 h (ml) Total blood loss (ml) [post-surgery]	**Reduced blood loss** CABG: usual care 190 vs ICWP 160 (p=0.01) Valve surgery NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
							Total blood loss (ml) [post-surgery]	**Increased blood loss** CABG: usual care 250 vs ICWP 400 (p<0.0001) Valve surgery NS
							Blood transfusion requirement % [post-surgery]	NS
							Return to theatre due to hemorrhage % [post-surgery]	NS
							Rehabilitation attendance (%) (random sample of 65 patients)	**Increased** IWCP 86 vs usual care 59 (p=0.033)
Leach, et al. (2006) [Australia, WPRO] [20]	Randomized controlled trial	Venous leg ulceration	Horse-chestnut (*Aesculus hippocastanum*) seed extract (HSCE) 375mg HCSE, standardized to 75mg aescin	12 weeks: 1 tablet BID	Placebo	54 (27/27)	Healed leg ulcers (%) [BL to Wk 4, 8, 12]	NS
							Change in wound dimension [BL to Wk 4, 8, 12]	NS
							Symptoms of chronic venous insufficiency [BL to Wk 4, 8, 12]	NS
							Changes in wound topography [BL to Wk 4, 8, 12]	**Reduced wound slough** RM-ANOVA F=2.76, (p=0.045)
							Frequency of dressing changes [BL to Wk 4, 8, 12]	**Reduced dressing frequency** Wk 12 HSCE 1.11 (p=0.009) Placebo 2.48 Between group (p=0.009
							Recurrent episodes [BL to Wk 4, 8, 12]	NS
Leach (2014) [Australia, WPRO] [21]	Case series (prospective)	Venous ulcers (chronic)	Aesculus hippocastanum seed extract 375 mg (standardized to contain 75 mg aescin); and standardized wound dressing protocol	8 – 12 weeks: 1 tablet twice daily	None	2	Factors associated with healing [BL to Wk 4 and 8]	Smaller wound volume, mild-to-moderate chronic venous insufficient, improvement in underlying chronic venous insufficient

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
							Factors associated with non-healing [BL to Wk 4 and 8]	*Pseudomonas aeruginosa* infection of ulcer, larger wound volume, severe chronic venous insufficient that doesn't improve
McEwan, et al. (2013) [Australia, WPRO] [13]	Uncontrolled trial	Cardiovascular disease history (adults)	Omega-3 PUFA (DHA 260mg: EPA 60mg)	4 weeks: 1 capsule BID	Healthy volunteers (HV)	56 (40/16)	Maximum slope – Healthy population [BL to Wk 4]	Adenosine phosphate -5.6 (p=0.014) Adrenaline NS Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 NS
							Maximum amplitude (%) – Healthy population [BL to Wk 4]	Adenosine phosphate -5.6 (p=0.014) Adrenaline -5.4 (p=0.013) Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 NS
							Lag time (sec) – Healthy population [BL to Wk 4]	Adenosine phosphate NS Adrenaline +10 (p=0.002) Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 +5 (p<0.001)
							Maximum slope – CVD population [BL to Wk 4]	Adenosine phosphate NS Adrenaline NS Arachidonic acid +8.4 (p=0.009) Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 NS
							Maximum amplitude (%) – CVD population [BL to Wk 4]	Adenosine phosphate NS Adrenaline NS Arachidonic acid NS Collagen (1.0 ug/mL), NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
								Collagen (1.0 ug/mL), NS C-reactive protein +5.9 (p=0.012) U46619 NS
							Lag time (sec) – CVD population [BL to Wk 4]	Adenosine phosphate NS Adrenaline +10 (p=0.002) Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein, NS U46619 +13 (p=0.0018)
							Platelet activation [BL to Wk 4]	**Reduced platelet activation in healthy population** Healthy: -15%; CVD: NS
Nair, et al. 2015 [India, SEARO] [22]	Case report	Anemia (female)	Mud pack (lower abdomen and eyes), sitz bath/ hip bath, spinal spray, emer-sion bath, enemas, Swedish massage, vibro (talcum) massage, abdominal cold water wrap electrotherapy	90 min sessions, daily, for 6 days	Nil	1	Hemoglobin (mg/dL) [BL to Dy 6]	**Increased hemoglobin** Dy 6: +1.2
							Blood pressure (mmgHg) [BL to Dy 6]	No change
							Pulse rate (beats/min) [BL to Dy 6]	No change
							Respiratory rate (breaths/min) [BL to Dy 6]	No change
Rosenfeldt, et al. (2011) [Australia, WPRO] [17]	Randomized controlled trial	Coronary artery bypass graft or valve elective surgery	Light exercise and mental stress reduction	2 weeks	Usual care	117 (60/57)	Quality of Life	NS
							Length of Stay	NS
							Rate of postoperative atrial fibrillation	NS
Ryan, et al. (2019) [USA, AMRO] [11]	Uncontrolled trial	Hypertension (pre- or stage 1)	1 herbal-mineral caplet per day over a period of 6 months containing *Rosa centifolia, Boerhaavia. diffusa, Dendrogyra cylindrus* (coral powder) (350 mg), magnesium aspartate (200 mg),	6 months: 1 caplet at night before bed	Nil	30	Serum sodium (nmol.\/L) [BL to Mth 6]	NS
							Serum potassium (nmol/L) [BL to Mth 6]	**Increased levels** Mth 3: +0.12 (p=0.04) NS
							Serum calcium (mg/dL) [BL to Mth 6]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
			Convolvulus pluricaulis (100mg), *Terminalia arjuna* (100mg), *Tribulus terrestris* (100mg), low-reserpine *Rauwolfia serpentina* (50 mg), and *Rosa vinca* (25 mg).				Serum magnesium (mg/dL) [BL to Mth 6]	NS
							Aspartate transferase (U/L) [BL to Mth 6]	NS
							Alanine transferase (U/L) [BL to Mth 6]	NS
							e-Glomerular filtration rate (mL/min/BSA) [BL to Mth 6]	NS
							b-type natriuretic peptide (pg/mL) [BL to Mth 6]	NS
							Patient Health Questionnaire-9 [BL to Mth 6]	NS
							Blood pressure (mmHg) [BL to Mth 6]	**Reduced blood pressure** Systolic: -13.6 (p<0.0001) Diastolic: -9.4 (p<0.0001)
Seely, et al. (2013) [Canada, AMRO] [14]	Randomized controlled trial	Cardiovascular disease	Individualized naturopathic care (NC) and enhanced usual care including diet and lifestyle counseling, nutritional medicine & supplementation, 7 visits over 1 year.	12 months: 7 visits	Usual care	246 (124/122)	10-year CVD risk (Framingham) [BL Wk 25 and 52]	**Reduced risk** NC 7.74%; UC 10.81% Between group -3.07% (p=0.002)
							Prevalent metabolic syndrome [BL to Wk 25 and 52]	**Reduced incidence of metabolic syndrome** NC 31.58%; UC 48.48% Between group -16.9% (p=0.002)
Sriloy, et al. (2015) [India, SEARO] [12]	Randomized controlled trial (parallel)	Hypertension (acupuncture naïve adults)	Acupuncture, unilateral on left, seeking de qi, on GV20, ST36, LV3, HT7 with manual stimulation to all points except GV20	Single session: 20 min	Slow breathing	37 (18/19)	Blood pressure – systolic (mmHg) [BL to post-test]	**Reduced systolic blood pressure** Acupuncture: NS Slow breathing: p=0.007
							Blood pressure – diastolic (mmHg) [BL to post-test]	**Reduced diastolic blood pressure** Acupuncture: p=0.02 Slow breathing: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention / Control)	Measure of Outcome	Outcome
Zick, et al. (2008) [USA, AMRO] [18]	Randomized controlled trial	Heart Failure (NYHA functional classes II – III, for ⩾3 months with a left ventricular ejection fraction (LVEF) ⩽40%)	*Crataegus laevigata* (hawthorn) leaf and flower extract WS 1442 (containing 84.3 mg proanthocyanins) (*Crataegus* Special Extract WS1442 (CSE))	6 months: 450 mg twice daily	Placebo	120 (60/60)	Progression to Heart failure [BL to Mth 6]	**Increased progression to heart failure** CSE resulted in 3.9 times risk of progression. Association of increased risk with LVEF <35%
							Six-minute walk distance [BL to Mth 6]	NS
							Peak exercise oxygen consumption [BL to Mth 6]	NS
							Anaerobic threshold [BL to Mth 6]	NS
							Cardiovascular deaths, cardiac events, hospitalizations due to CHF [BL to Mth 6]	NS
							Quality of life, assessed by multiple measures [BL to Mth 6]	NS
Zick et al. (2009) [USA, AMRO] [19]	Secondary analysis						Exercise capacity – 6 min walk test [BL to Mth 6]	NS
							Blood pressure and heart rate [BL to Mth 6]	NS
							Minnesota Living with Heart Failure Questionnaire [BL to Mth 6]	NS
							EuroQoL-5D [BL to Mth 6]	NS
							Left ventricular ejection fraction (LVEF) (%) [BL to Mth 6]	**Increased LVEF** Hawthorn, +0.4 (p=0.004)

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19 Complex Immune Conditions

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HIGHLIGHTS

- The most complex immune conditions treated by naturopaths/NDs include multiple sclerosis, human immunodeficiency virus (HIV) and chronic fatigue syndrome (CFS).
- The naturopathic lens is well suited to complex immune conditions with its focus on complexity, addressing multiple causative factors and physiological systems concurrently.
- Research has demonstrated that Traditional and Complementary Medicine (T&CM) may be particularly useful in managing complex immunological post-infectious sequalae of emerging infections.
- 71.4% of the clinical research investigating naturopathic interventions for complex immune conditions indicated a positive outcome in at least one primary or secondary outcome measures.

Globally complex immune conditions are on the rise and include a diverse range of inflammatory conditions in various organs and/or tissues that are characterized by tissue damage and the formation of immune complexes and are generally associated with progressive onset of extreme debilitating symptoms [1]. Complex immune conditions include autoimmune diseases such as systemic lupus erythematosus and multiple sclerosis (MS), infectious or inflammatory diseases such as glomerulonephritis, vasculitis, and human immunodeficiency virus (HIV), and chronic fatigue syndrome (CFS) [2, 3]. A holistic approach to care is well suited to complex immune conditions that are likely impacted by lifestyle, environmental, social, and other external influences [4].

Overview of Studies

This section is dedicated to highlighting the original clinical research (n=14) conducted by naturopathic researchers investigating treatments for complex immune conditions. This research includes a total of 553 participants and was conducted in the United States of America (USA) (n=9), Canada (n=3), India (n=1) and Australia (n=1). The study designs include randomized control trials (n=6), uncontrolled trials (n=6) and case reports (n=2). The interventions investigated in these studies included clinical nutrition (n=7), herbal medicine (n=2) (of which one prescribed an herbal constituent and one an herbal complex), hydrotherapy (n=2), applied nutrition (n=3), acupuncture (n=2), yoga (n=1), and mindfulness and counselling (n=2). Two studies combined multiple treatments within a complex naturopathic intervention while 12 studies used only one category of intervention.

The complex immune conditions examined in these studies include HIV and Acquired Immune Deficiency Syndrome (AIDS) (n=7), MS (n=5) and CFS (n=2). Of all the naturopathic clinical studies examining complex immune populations, 71.4% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 19.1: Original research on complex immune conditions conducted by naturopathic researchers.*

Implications

The naturopathic philosophy of *holism* and principles *'Treat the Cause'* and *'Treat the Whole Person'* leads naturopaths/naturopathic doctors to view the management of patients with complex immune conditions through a lens of complexity, addressing multiple causative factors and physiological systems concurrently [5] with the aim of improving overall health of patients. The results of the naturopathic research on complex immune conditions suggest several naturopathic interventions warrant consideration in the treatment and management of complex immune conditions. Three of the most common complex immune conditions that naturopaths/naturopathic doctors report treating are MS, HIV and CFS [6]. Due to the chronicity and complexity of many of

these conditions, as well as the absence of recognized cures, patients often have unmet health needs and seek care from naturopaths/naturopathic doctors to reduce symptoms or improve their quality of life [7, 8]. Further research is needed to confirm the preliminary findings of these studies, but the favorable outcome for the available evidence justifies such researcher attention. This may become particularly apparent as many infectious diseases move from acute to chronic management, as has become the case for HIV/AIDS [9]. Research has demonstrated that T&CM may be particularly useful in managing the complex immunological post-infectious sequalae of emerging infectious agents such as SARS, Chikungunya, Ebola [10] and COVID-19 [11-20], so naturopathic intervention may potentially play a role in long-term management of these health issues as well.

Along with the clinical evidence supporting naturopathic intervention in these conditions, the clinical expertise and educational nature of naturopathic care may also be well suited to assisting people living with these conditions to manage their increasing self-directed and practitioner-directed complementary medicine use. For example, a 2006 survey of people living with MS (n=2026) found the majority (84%) use one or more T&CM therapy including dietary changes (59%), nutritional products (46%), herbal medicines (36%), and mind-body therapies (32%) [21]. Another survey of men and women living with HIV/AIDs (n=1675) reported more than 1600 different types of T&CM therapies (1210 T&CM substances, 282 T&CM therapeutic activities and 119 T&CM provider types) used by study participants to treat their HIV/AIDS [22]. With the wide use of T&CM, including naturopathy, in those living with complex immune conditions, it is important that there is more research on the safety and efficacy of naturopathic therapies in this area.

Studies investigating specific conditions:

HIV and AIDS

Seven naturopathic studies conducted in USA (n=3), Canada (n=2) and India (n=1) examined interventions aimed at improving immunity (through increased CD4 count – a receptor on white blood cells that assists in fighting infections and HIV) and addressing symptoms common in patients with HIV [23-29]. The studied interventions primarily examined a single treatment intervention (n=5) [23-26, 29] with two studies including a combination of more than one category of treatment within a naturopathic care framework [27, 28]. Across all studies, the treatments investigated included clinical nutrition (n=2) [23, 27], herbal medicine (n=2) [24, 26], applied nutrition (diet therapy) (n=2) [27, 28], acupuncture (n=2) [27, 29] hydrotherapy (n=2) [25, 28], lifestyle counselling (n=1) [28], and yoga (n=1) [28].

A single-arm clinical trial conducted in the USA investigated a herbal medicine product containing andrographolide (a constituent of *Andrographis paniculata)* in adults with HIV (n=18) and those with no HIV infection (n=13) for 6 weeks [24]. At the end of the intervention period, participants with HIV had a statistically significant increase in serum CD4 levels compared to HIV negative participants (+96.3 cell/mm3; p=0.002) however, this change was not maintained 3 weeks after the intervention finished. Participants also reported a slight increase compared to baseline values in the liver enzyme alanine transferase (ALT) in Week 3 and Week 6 ($p<0.005$), which returned to levels similar to baseline after discontinuation of treatment. No change in HIV-1 RNA levels were reported.

An uncontrolled trial conducted in India investigated a residential naturopathic intervention on CD4 counts of adults (n=96) diagnosed with HIV [28]. The intervention was conducted in a government naturopathic residential sanitorium, and consisted of naturopathic counselling, yoga, hydrotherapy and dietary and lifestyle treatments. The intervention was found to significantly improve CD4 counts in patients with treatment duration of 30 days or longer (p=0.00038), but not for shorter interventions. A case study conducted in Canada reported the outcomes of acupuncture treatment in a naturopathic clinic for a 40-year-old male diagnosed with HIV and Guillain-Barre´ syndrome who presented with symptoms of progressive bilateral paresthesia [27]. The paresthesia prevented bipedal walking that had ascended to the patient's chest and head causing palpitations, partial ophthalmoplegia and impaired taste. The patient refused pharmaceutical therapy and had little improvement with physiotherapy. After weekly 30-minute acupuncture sessions for 6 weeks and then monthly for 10 months (16 treatments in total), the patient experienced sensation in his soles, wrists and ankles, increased energy, more self-confidence, and greater mobility. The patient reported 75% recovery after 3 months, and 90% recovery after one year with resolution of social isolation, anxiety, and low self-esteem.

Multiple Sclerosis

Five naturopathic studies conducted in the USA investigated treatments for MS [30-34]. Two studies investigated nutritional products using a placebo as the control [33, 34], two investigated mindfulness-based stress reduction [30] and the other compared a complex naturopathic intervention to usual care with an MS education protocol [31]. Of the studies using clinical nutrition as an intervention, one focused on the impact of omega-3 fish oil in isolation on MS disease progression [32] and symptoms [33] with a further trial investigating the effects of lipoic acid as a standalone intervention to reduce MS progression [34]. The MS interventions evaluated a diverse range of

outcomes including quality of life, mental health, fatigue, and physical ability.

Clinical finding

Lipoic acid intake may reduce levels of markers for MS disease progression.

A randomized, open-label three-arm trial conducted in the USA examined the effects of different doses of lipoic acid (600mg or 1200mg, twice daily) on individuals with MS (n=37) [34]. The study found each increase of 1ug/mL in serum lipoic acid levels was correlated with a reduction of 11.10 units (p=0.04) in matrix metalloproteinase-9 (MMP-9); a surrogate marker for MS disease progression. Similarly, a dose response relationship was identified between lipoic acid and serum intracellular adhesion molecule-1. An uncontrolled study conducted in the USA involving 10 individuals with relapsing-remittiing MS investigated the clinical outcome associated with 9.6g of omega-3 fatty acid fish oil concentrate (2.9 g EPA with 1.9g DHA) per day for 6 months. Participants' immune cell secretion of matrix metalloproteinase-9 reduced by more than half (-58%) over the study period (p<0.01). A double-blind, placebo-controlled trial involving 39 females with MS and major depressive disorder employed a lower dose of omega-3 fatty acids (5.81g/day; 1.95 g EPA/1.35g DHA) and reported no difference in the Montgomery-Asberg Depression Rating Scale score after 3 months, when compared to placebo [33].

Chronic Fatigue Syndrome

Of the two naturopathic studies that focused on CFS, one was a randomised, controlled trial (n=35) conducted in Canada [35] and the second an uncontrolled, open-labeled trial from Australia [36]. The Canadian trial explored the impact of probiotics on stool aerobes and changes in Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI) scales. The study lasted eight weeks and showed increased stool aerobes, anaerobes, *Bifidobacteria* and *Lactobacillus*, but did not show any significant improvements in BDI or BAI [14]. The Australian trial investigated the effects of 16-weeks administration of a multivitamin formula containing ubiquinone (Co-enzyme Q10), alpha-lipoic acid, n-acetyl cysteine, acetyl l-carnitine, and 13 other vitamins and minerals in individuals with CFS (n=10) [36]. Following the intervention period, participants had a statistically significant reduction in fatigue (Chalder Fatigue Scale -9.4; p<0.001) and overall improvement in global symptoms (Clinical Global Impression Scale -0.92, p=0.014) and they reported reduced symptoms of insomnia (Insomnia Severity Index -4.55).

Table 19.1 Original research on complex immune conditions conducted by naturopathic researchers

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control	Measure of Outcome	Outcome
Balfour, et al. (2014) [Canada, AMRO] [23]	Randomized controlled trial	HIV-positive (Antiretroviral treatment naive)	High-dose micronutrient, mineral and antioxidant preparation (K-PAX Ultra®)	8 capsules twice daily over 2 years	100% recommended daily allowance (RDA) preparation of multivitamins and minerals.	127 (not specified)	Baseline micronutrient deficiency	**Low baseline micronutrient levels** Carotene: 24% <1 nmol/L Vitamin D: 67% <75 nmol/L, 24% <40 nmol/L, 3.5% <20 nmol/L Serum folate: 20% <15 nmol/L Vitamin B12: 2.4% <133 pmol/L Lower baseline levels of B12 correlated with lower baseline CD4 count (r = 0.21, p= 0.02)
							Treatment adherence	**Good adherence** Nineteen (15%) withdrew early from the study treatment. Mean treatment adherence was 88%. Subjective adherence was 81% and significantly correlated with pill count (r = 0.29, p <0.001). Adherence was <80% in 75% of participants.
Calabrese, et al. (2000) [USA, AMRO] [24]	Uncontrolled trial	HIV-positive (Adults, >18 yrs)	Andrographolide (from *Andrographis paniculata*)	6 weeks (+ 3 week follow up): 5 or 10 mg/kg three times daily (planned 20 mg/kg three times daily, dose not administered due to adverse effects)	Adults with no human immunodeficiency virus infection	31 (18 HIV+/13 HIV-)	Adverse effects including allergy (including anaphylaxis), fatigue, headache, rash, diarrhea, nausea, abnormal taste, and others [BL to Wk 6]	**High incidence of mild adverse effects** HIV+: 12/13 (92%), one experienced anaphylaxis requiring hospitalization HIV-: 4/5 (80%)
							Serum AST [µL] [BL to Wk 6]	NS
							Serum ALT [µL] [BL to Wk 6]	**Increased ALT** HIV+: Wk 3, +22.3 (p<0.005); Wk 6, +20.6 (p<0.005); Wk 9, NS HIV-: NS
							Serum CD4 count [cell/mm3] [BL to Wk 6]	**Increased CD4 Count** HIV+: Wk 3, NS; Wk 6, 501.1 vs 404.8 (p=0.002); Wk 9, NS HIV-: NS
							HIV-1 RNA [log copies/ml] [BL to Wk 6]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control	Measure of Outcome	Outcome
Corroon, et al. (2018) [USA, AMRO] [25]	Uncontrolled trial	HIV-positive (adults)	Constitutional hydrotherapy	Two treatments per week for 6 weeks (+ 1 week follow-up)	Nil	15	Adverse events [BL to Wk 8]	Nonserious
							Viral load (cp/mL) [BL to Wk 8]	NS
							TNF-alpha (pg/mL) [BL to Wk 8]	NS
							Erythrocyte sedimentation rate (pg/mL) [BL to Wk 8]	NS
							High sensitivity C-reactive protein (mg/L) [BL to Wk 8]	NS
							Blood pressure (mmHg) [BL to Wk 8]	NS
							Body mass index (kg/m2) [BL to Wk 8]	NS
							Mean body fat (%) [BL to Wk 8]	**Reduced body fat** -1.6 ($p < 0.0001$)
							Red blood cell (x106/uL) [BL to Wk 8]	NS
							Hemoglobin (g/dL) [BL to Wk 8]	NS
							Hematocrit (%) [BL to Wk 8]	NS
							CD3 (cells/ul) [BL to Wk 8]	NS
							CD4 (cells/ul) [BL to Wk 8]	NS
							CD8 (cells/ul) [BL to Wk 8]	NS
							Sodium (mmol/L) [BL to Wk 8]	**Reduced sodium** -2.08 ($p = 0.005$)
							Potassium (mmol/L) [BL to Wk 8]	NS
							BUN ratio [BL to Wk 8]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control	Measure of Outcome	Outcome
							Creatinine (mg/dL) [BL to Wk 8]	NS
							Aspartate transferase (IU/L) [BL to Wk 8]	NS
							Alanine transferase (IU/L) [BL to Wk 8]	NS
							Bilirubin (mg/dL) [BL to Wk 8]	NS
							Short Form-36 health survey [BL to Wk 8]	**Increased quality of life** Total: NS Energy/Fatigue: +2.5 (p = 0.03) Physical functioning: NS Pain: NS General health: NS
D'Adamo (1992) [USA, AMRO] [26]	Case series	HIV/Autoimmune deficiency syndrome	*Chelidonium majus* 175 mg, *Sanguinaria canadensis* 5 mg, *Ulmus rubra* 20 mg, 1 – 3 tid; concomitant use of *Glycyrrhiza glabra* solid extract (dose not stated). Capsules of freeze-dried extracts.	Wk 1: 1 capsule TID; Wk 2: 2 capsules TID; 3 capsules there after	None	13 (Anti-retroviral drugs: 8; No anti-retroviral drugs: 5	Lymphadenopathy (count) (n=8) [BL to Wk 3]	**Reduced node size and tenderness** 8/8 had diminished node size and tenderness, 3/6 had total or near total resolution
							Serum CD8 lymphocyte count (n=11) [BL to Wk 3]	**Increased** (mild) in 1/11 (⩽7%) **No change** 5/11 **Mild reduction** 4/11 (⩽7%) **Large reduction** 1/11 (>7%)
							Serum CD4 lymphocyte count (n-11) [BL to Wk 3]	**Increased** 4/11 (⩽7%) **No change** 4/11 **Mild reduction** 3/11 mild decrease
							Self-assessed energy level (n=8) [BL to Wk 3]	**Increased** in 6/8 energy increased **No change** in 2/8
Huff, Cooley and Waller (2008) [Canada, AMRO] [27]	Case Report	Guillain-Barre´ syndrome (40 y.o. male with HIV)	Acupuncture (GB34, GB39, PC6, KI3, BL40, GVD, GV3, BL23); Dietary elimination, weekly B12 injections, calcium-rich multi-nutrient formula	12 months: 6 x 30 min weekly sessions for 7 weeks, then monthly sessions for 10 months (16 treatments)	Nil	1	Perceived Sensation, Coordination, Balance, Mobility [BL to 12 mths]	**Increased sensation** **Increased coordination and balance, and confidence in mobility** **90% recovery of functions**

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ control	Measure of Outcome	Outcome
Joseph, et al. (2015) [India, SEARO] [28]	Uncontrolled trial	HIV-positive	Four study arms based on duration of stay: Group 1: 1 – 7 days; Group 2: 8 – 15 days; Group 3: 16 – 30 days; Group 4: >30 days. Naturopathy treatment: hydrotherapy, dietary advice, raw juices, mud therapy, counselling, sun bath. Yoga treatment: loosening exercises, asanas, pranayama, and deep relaxation techniques.	Antiretroviral medications	Nil	96 (G1: 21/ G2: 28/ G3: 23/ G4: 24)	CD4 count [BL to Discharge]	**Reduced for >30 days treatment** G1: NS G2: NS G3: NS G4: p=0.00038
Louie, et al. (2010) [USA, AMRO] [29]	Uncontrolled trial	HIV-positive	10 months (including 4 months pre-intervention observation): Individualized acupuncture treatment based on tongue and pulse assessments	Usual care	Nil	27	Memorial Symptoms Assessment Scale	NS
							WHO Quality of Life instrument	NS
Menon, et al. (2017) [Australia, WPRO] [36]	Uncontrolled trial	Chronic Fatigue Syndrome	16 weeks: Ubiquinone (Co Q10) 200 mg; alpha lipoic acid 150 mg; N-acetylcysteine (NAC) 2000 mg; Acetyl L-carnitine (ALC) 1000 mg; magnesium (as orotate 500 mg) 64 mg; calcium ascorbate dehydrate (equiv. ascorbic acid 200 mg) 242 mg; cholecalciferol (equiv. Vitamin D3 250 IU); 12.5 ug; a-tocopherol (equiv. natural Vitamin E 50 IU) 60 IU; Retinyl palmitate (equiv. Vitamin A 3000 IU) 900 ug REIU; and vitamin B co-factors: biotin (Vitamin H) (600 ug), thiamine hydrochloride (100 mg), riboflavin (100 mg), nicotinamide (200 mg), calcium pantothenate	Twice daily for 16 weeks	Nil	10	Chalder Fatigue Scale [BL to Wk 16]	**Reduced fatigue** -9.4 ($p < 0.001$).
							Montgomery – Asberg Depression Rating Scale [BL to Wk 16]	NS
							Insomnia Severity Index [BL to Wk 16]	**Improved** -4.55
							Patient Global Impression Scale [BL to Wk 16]	NS
							Clinical Global Impression Scale [BL to Wk 16]	**Improved quality of life** Severity: NS Improvement: -0.92 (p=0.014)
							Work and Social Adjustment Scale [BL to Wk 16]	NS
							Short-Form Health Survey [BL to Wk 16]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control	Measure of Outcome	Outcome
			(100 mg), pyridoxine hydrocholoride (100 mg), folic acid (800 mg), cyanocobalamin (Vitamin B12) (800 mg)					
Rao, et al. (2009) [Canada, AMRO] [35]	Randomized controlled trial	Chronic Fatigue Syndrome	8 weeks: Probiotics (24 billion CFU of *Lactobacillus casei* strain Shirota per day)	Nil	Placebo	35 (19/16)	Stool, total aerobes [BL to Wk 8]	**Increased stool aerobes** Placebo: -0.16; Probiotics: +0.43
							Stool, total anaerobes [BL to Wk 8]	**Increased stool anaerobes** Placebo: +0.03; Probiotics: +0.26
							Stool, bifidobacterial [BL to Wk 8]	**Increased stool bifidobacteria** Placebo: -0.36; Probiotics: +0.66
							Stool, lactobacillus [BL to Wk 8]	**Increased stool lactobacillus** Placebo: +0.15; Probiotics: +1.12
							Beck Depression Inventory [BL to Wk 8]	NS
							Beck Anxiety Inventory [BL to Wk 8]	NS
Senders, et al. (2019) [USA, AMRO] [30]	Randomized controlled trial	Multiple sclerosis	8 weeks: Mindfulness-based stress reduction (Kabat-Zinn); 2 hr classes and one 6-hour retreat	Nil	MS education protocol	67 (33/34)	Feasibility	Practiced on 55% of assigned days, median duration of 38min. No relation to perceived stress, emotional wellbeing or fatigue.
							Perceived Stress Score [BL to Wk 8]	NS
							Short Form-36 [BL to Wk 8]	NS
							Anxiety via Patient Reported Outcomes Measurement Information System (PROMIS) [BL to Wk 8]	NS
							Depression (PROMIS) [BL to Wk 8]	NS
							Fatigue (PROMIS) [BL to Wk 8]	NS
							Pain interference (PROMIS) [BL to Wk 8]	NS
							Connor-Davidson Resilience Scale (CD-RISC) [BL to Wk 8]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control	Measure of Outcome	Outcome
							Paced Auditory Serial Addition Test (PASAT) [BL to Wk 8]	NS
Shinto, et al. (2008) [USA, AMRO] [31]	Randomized controlled trial	Multiple sclerosis	6 months: Naturopathic treatments plus usual care – daily supplementation: multivitamin/mineral without iron, vitamin C, vitamin E, fish oil, and alpha-lipoic acid and intramuscular vitamin B12 once a week. Dietary therapy (4 levels): Level 1 – limit *trans* fatty acids, decrease intake of artificial sweeteners, decrease intake of coffee and alcohol, decrease cigarette use, increase intake of water to 6-8 cups per day; Level 2 (1) plus reduced intake of red meat to two 4-6 oz servings per week; Level 3 (2) plus no refined sugar, no fried foods, no processed/packaged foods, no coffee or alcohol; Level 4 – hypoallergenic diet (Brennamen's food elimination and challenge)	Usual care	MS-focused educational visits with a nurse plus usual care	45 (15/15/15)	Short Form-36	NS
							Modified Fatigue Impact Scale	NS
							Beck Depression inventory	NS
							Stroop test	NS
							Paced Auditory Serial Addition Test-3	NS
							Expanded Disability Status Scale	NS
Shinto, et al. (2009) [USA, AMRO] [32]	Uncontrolled trial	Multiple sclerosis (relapsing-remitting)	6 months (including 3 months wash out): Omega-3 fatty acids in the form of fish oil concentrate (9.6 g/day containing 2.9 g EPA and 1.9g DHA)	6 months (including 3 months wash out)	Nil	10	Immune cell secretion of matrix metalloproteinase-9 [BL to Mth 3]	**Reduced levels** Mth 3: - 58% ($p<0.01$)
							Red blood cell omega-3 fatty acid [BL to Mth 3]	**Increased levels** Increased (x6.3 times) ($p=0.001$)
Shinto, et al. (2016) [USA, AMRO] [33]	Randomized controlled trial	Multiple sclerosis (major depressive disorder)	Omega-3 fatty acids in the form of fish oil at a daily dose of 5.81g (1.95 grams of EPA and 1.35 grams of DHA)	3 months	Placebo	39 (21/18)	Montgomery-Asberg Depression Rating scale	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/control	Measure of Outcome	Outcome
Yadav, et al. (2005) [USA, AMRO] [34]	Randomized controlled trial	Multiple Sclerosis	14 days: Lipoic acid (a) 600mg twice per day; (b) 1200mg once per day; (c) 1200mg twice per day	Nil	Placebo	37 (10/9/9/9)	Serum lipoic acid	**Increased levels** Variable levels across all participants 600mg: 0.2ug/mL 1200mg: 4.8ug/mL 2400mg: not reported Placebo: 0.1 ug/mL Between group: p<0.05
							Matrix metalloproteinase-9 [BL to Dy 14]	**Reduced levels** +1ug/mL serum lipoic acid correlated with -11.10 units of serum matrix metalloproteinase-9 (p=0.04)
							Serum intercellular adhesion molecule-1	**Reduced levels** Dose response with lipoic acid (p=0.03)

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20 Endocrine Conditions

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HIGHLIGHTS

- Endocrine conditions are among the top 10 reasons patients seek naturopathic care.
- The most common endocrine conditions treated by naturopaths/NDs include thyroid conditions, type II diabetes, adrenal-related concerns, insulin resistance and metabolic syndrome.
- The risk of many endocrine conditions is strongly associated with modifiable risk factors – lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, dietary choices and environmental exposures – all which are addressed as part of naturopathic care.
- Naturopaths/NDs are well placed to help in the treatment and prevention of endocrine conditions.
- 91% of the research on naturopathic interventions for endocrine conditions indicated a positive outcome.

The endocrine system is comprised of the hormone-producing glands and the brain structures that direct them, including the adrenals, thyroid, parathyroid, pancreas, ovaries, testes, pituitary gland, pineal gland, and the hypothalamus [1]. Endocrine conditions, such as diabetes, are within the top ten causes of death globally and are recognized as a growing and significant contributor to global disease burden [2]. Risk factors for endocrine pathology are both non-modifiable and modifiable, though the latter are responsible for most endocrine disorders. Non-modifiable risk factors include sex, race/ethnicity, age, genetic contribution, and some environmental exposures [3, 4]. Addressing modifiable risk factors where possible is of the utmost importance in decreasing total body burden, so that possible endocrine disease may be modified or avoided altogether. Modifiable risk factors include lifestyle behaviours, physical activity, sedentariness, obesity, alcohol consumption, tobacco use, dietary choices, stress management, auto-immunity, and environmental exposures [5, 6]. The endocrine system is also particularly sensitive to man-made environmental contaminants that disrupt the synthesis, activity, and receptor availability to endocrine hormones (as a group, called 'xenobiotics') [7].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=23) naturopathic researchers have conducted on endocrinological conditions. This research sampled a total of 2,739 participants and was conducted in India (n=12), the United States of America (USA) (n=8), Australia (n=1) and Argentina (n=1). The study designs include randomized controlled trials (n=10), uncontrolled clinical trials (n=7), case reports (n=5), and a prospective cohort trial (n=1). The studied interventions include clinical nutrition (n=4), yoga (n=4), standard naturopathic care including education and yoga (n=4), multifaceted naturopathic care (n=2), technological feedback education (n=2), acupuncture (n=1), applied nutrition including dietary modifications and/or dietary counselling (n=1), bodywork including Qigong compared to progressive resistance training (n=1), hyperbaric oxygen therapy with stem cell therapy (n=1), hydrotherapy (n=1), and dietary changes plus intermittent hypoxic training (n=1).

All populations studied were adults, and the endocrine conditions examined in these studies include type II diabetes mellitus (Type II DM) (n=14); metabolic syndrome (n=4); hypothyroidism with hyperprolactinemia (n=1); impaired fasting glucose (n=1); pre-diabetes (n=1); and obesity with pre-diabetes (n=1). Of all the naturopathic clinical studies examining endocrine condition populations, 91% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 20.1: Clinical research investigating endocrine conditions conducted by naturopathic researchers.* This body of naturopathic research on endocrine conditions is also supported by 15 observational studies and 17 reviews or meta-analyses conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Endocrine-based pathologies are among the top ten primary health concerns of patients seeking naturopathic care while the endocrine system is considered by naturopaths/naturopathic doctors as the third most important body system in the management of overall patient health [8]. The most common endocrinological conditions for which patients seek naturopathic care include thyroid conditions, type II diabetes, adrenal-related concerns, insulin resistance or metabolic syndrome, and a variety of other endocrine conditions [8]. Naturopathic research indicates that patients with endocrine conditions may benefit from naturopathic care, especially when that care is prescribed as an individualized and complex intervention rather than any one individual component or therapy. Most of the clinical research in this chapter focused on naturopathic interventions in the treatment of Type II DM and have shown a variety of efficacious results.

When taken as a whole, these results suggest that comprehensive naturopathic treatment plans encompassing a variety of treatment modalities may be most effective in treating a complex disease state like Type II DM. This is consistent with how naturopathic medicine is taught and practiced through the lens of the naturopathic philosophy, which views each person – and health – as a composite of multiple dimensions. Naturopathic clinicians are well-placed to help in the treatment and prevention of endocrine pathology due to their specific training in lifestyle counselling and treatment of these risk factors, as well as the underlying recognition of the impact of external influences and environmental factors on an individual's state of health [9, 10].To date, the research on endocrine conditions has primarily focused on dietary, yoga, and acupuncture interventions, with combination treatments having the most notable clinical effects. Given the high prevalence of endocrine disorders worldwide, and the increasing global disease burden associated with these disorders, the results of these studies highlight the potential contribution naturopathic care may make to endocrinological health in the community, as well as underscores the need for further well-powered clinical research.

Studies investigating specific conditions:

Type II Diabetes Mellitus

Seventeen studies, conducted in India (n=9), the USA (n=6), Argentina (n=1) and Australia (n=1) assessed the impact of various interventions in adult Type II DM populations. Yoga (n=5) [11-15] was the most commonly researched intervention, followed by applied nutrition (n=4) [16, 17], Qigong (n=2)[18, 19], herbal medicine (n=3) [20-22] and acupuncture (n=2) [18, 23]. The remaining interventions researched included a single study each on hyperbaric oxygen plus stem cells [24], hydrotherapy as a cold abdominal pack [25], adjunctive naturopathic care [26], and an interactive cell phone feedback system [27].

The five studies conducted in India focusing on type II DM found yoga to be beneficial in reducing need for hypoglycemic medication [11]; reducing fasting plasma glucose (FPG) [13-15]; improvements in blood pressure response to handgrip [15], high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol levels [11]; and reducing BMI, weight, and waist circumference [12]. As part of the Stop Diabetes Movement in India, one uncontrolled clinical trial (n=896) assessing the impact of ten days of daily 90-minute yoga practice sessions (including yoga postures, breathing, cleansing technique, meditation, and 30 minutes of lectures on yoga), resulted in a fasting plasma glucose (FPG) decrease of 11.2 mg/dL ($p<0.001$) [13]. This finding was reproduced in another study (n=15) conducted in India, where just seven days of a similar intervention, the Integrated Approach of Yoga Therapy (IAYT; consisting of yoga postures, regulated breathing, cleansing technique, meditation, and lectures on yoga), resulted in a FPG decrease of 24.4 mg/dL ($p<0.05$) [15]. Additionally, one week of IAYT improved sympathetic nervous system activity, as reflected by an improvement in blood pressure response to sustained handgrip (3.2 mmHg, $p<0.01$).

Two studies conducted in the USA indicated that applied nutrition in the form of naturopathic nutrition education was found to improve diabetes self-care and blood markers associated with diabetes management. Improvements were also noted by a decrease in negative emotions associated with having Type II DM (fear, overwhelm, discouragement) and increased adherence to healthy eating, food selection, attention to dining atmosphere, and feelings of competency in addressing Type II DM [16, 17]. An uncontrolled clinical trial conducted in the USA (n=45) assessed the impact of twelve weeks of a naturopathic whole-foods nutrition education program on multiple blood markers of diabetes in a prediabetic population [17]. The program consisted of weekly, in-person 90-minute workshops that emphasized nutrition education (i.e. the health benefits of a whole foods diet) and imparting practical skills in cooking, food label reading, and grocery shopping; additionally, participants were given a book with recipes and lessons to help guide food choices, and a one-pound bag of the featured grain or legume from the week's lesson, to be used in their home cooking during the next week. Outcomes were measured at twelve weeks, and follow-up assessed at six and twelve months. The primary outcome measure – high sensitivity C-reactive protein (hs-CRP) – decreased at twelve weeks by a mean of 0.7 mg/L

($p<0.05$); a decrease was maintained at both follow-up visits ($p<0.05$). FPG also showed a decrease at 12 weeks (-6 mg/dL, $p<0.01$); further decreases were seen at six months (-11.5 mg/dL, $p<0.001$) and twelve months (-13.9 mg/dL, $p<0.001$). HDL cholesterol – considered a protective marker – initially decreased but increased compared to baseline by the twelve month follow up (6.2 mg/dL, $p<0.01$). Decreases in haemoglobin-A1c (HbA1c) (-0.3 %, $p<0.001$), total cholesterol (-30.3 mg/dL, $p<0.001$), LDL cholesterol (-27.3 mg/dL, $p<0.001$), VLDL cholesterol (-8.5 mg/dL, $p<0.01$), and triglycerides (-37.6 mg/dL, $p<0.01$) from baseline to twelve months were also observed. Fasting plasma insulin increased slightly from baseline to twelve months (+4.9 uIU/mL, ($p<0.001$).

A randomized 3-arm pilot trial conducted in India (n=30) assessed the immediate effect of one of a single dose of three naturopathic interventions on FPG: 250 mL of 30% concentrate bittergourd juice *(L. Momordia charantia)* (n=10); 250 mL of 80% concentrate knol-khol *(L. Brassica oleoracea)*, also known as kohlrabi, (n=10); and 250 mL 88% concentrate ashgourd juice *(Benincasa hispida (Thunb).cogn)* [21]. Plasma samples were collected at 30-, 60-, and 120-minutes post-intervention. Of the three interventions, only the knol-khol gourd juice group showed significant results, with a mean decrease in FPG at 30, 90 and 120-minute time points, with effect seen over time ($p=0.029$, $F=4.739$).

Clinical finding

Qigong may reduce stress and fasting plasma glucose.

Qigong applied in a naturopathic setting was found to be beneficial for decreasing FPG and perceived stress [18, 19]. A randomized controlled trial conducted in the USA (n=20) assessed the impact of twelve weeks of either Yi Ren Medical Qigong (YRMQ, intervention group, n=7), progressive resistance training (PRT, active comparator group, n=5), or usual care (control group, n=8) on perceived stress (Perceived Stress Scale, PSS) and depression (Beck Depression Inventory, BDI); both interventions consisted of one 60-minute instructor-led group session per week, with instructions to practice at least twice per week for 30 minute sessions at home [18]. YRMQ decreased mean PSS score by 29.3% ($p<0.05$), and decreased mean PRT score by 50% ($p<0.03$). All other findings were non-significant. Another similar randomized controlled trial conducted in India (n=32) assessed the impact of twelve weeks of Qigong (intervention group, n=11), usual care (control group, n=10), and PRT (active comparator group, n=11) on FPG, fasting plasma insulin, HbA1c, and Homeostatic Model Assessment of Insulin Resistance (HOMA-IR) [19]. At twelve weeks, mean FPG decreased by -23mg/dL ($p<0.003$), and showed significant between-group differences ($p<0.003$); all other results were non-significant.

A prospective clinical trial conducted in India (n=20) assessed the impact of a single 20-minute application of a cold abdominal pack (CAP; cotton cloth dipped in 15 – 16°C water, wrung out, and placed on the abdomen, then covered with a dry cotton cloth and dry flannel cloth) on random blood glucose (RBG) and several markers of cardiovascular function (systolic and diastolic blood pressure [SBP, DBP; mmHg], pulse rate [PR; beats/minute], pulse pressure [PP; mmHg], mean arterial pressure [MAP; mmHg], rate pressure product [RPP; HRxSBP/100], and double product [Do-P; HRxMAP/100]) [25]. A significant reduction was seen in all outcome measures except DBP and PP. Of note, RBG decreased by -4.8mg/dL ($p=0.011$).

Metabolic Syndrome

Two cross-over randomized controlled trials conducted in the USA assessed micronutrient interventions in adult metabolic syndrome populations. The first study assessed the impact of six months of chromium picolinate supplementation (500 mcg or 1000 mcg dose) compared to placebo in participants (n=59) with impaired fasting glucose, impaired glucose tolerance, or metabolic syndrome (14 participants in the 500mcg group and 19 participants in the 1000 mcg group had a diagnosis of metabolic syndrome) [28]. Primary outcome measures included serum insulin, HOMA-IR, 2-hour plasma glucose, fasting plasma glucose, and 2-hour insulin during oral glucose tolerance testing. Secondary outcome measures included anthropometric measures (body weight, BMI, waist circumference), blood pressure, endothelial function (assessed by flow-mediated dilatation), HbA1c, blood lipid levels, and urinary microalbumin. Results revealed no significant changes in any of the primary or secondary outcome measures within or between groups. The second study assessed the impact of eight weeks of supplementation with two different formulations of encapsulated vegetable and fruit powders in adults with metabolic syndrome (n=64), compared to placebo [29]. The first encapsulated blend consisted of vegetable, fruit, and berry powders, while the second consisted of vegetable and fruit powders only. The primary outcome measure was endothelial function (assessed by flow-mediated dilatation); secondary outcome measures included plasma glucose, serum insulin, serum lipids, and body weight. Results revealed no significant changes in any of the outcome measures within or between groups.

On the other hand, a case study conducted in India of a 40-year old male diagnosed with metabolic syndrome reported highly significant changes in all outcome measures [30]. The intervention consisted of three weeks of naturopathic care (60-90 minutes daily of various intervals of several different hydrotherapeutic interventions, mud therapy, and massage therapy, plus various specific

dietary interventions) and yoga (60 minutes twice daily, consisting of postures, controlled breathing, and relaxation techniques). The patient had reductions from baseline in his weight (-9.5kg), BMI (-3.2 kg/m2), waist circumference (-9cm), insulin intake (-40-0-40), fasting blood glucose (-30mg/dL), postprandial blood glucose (-192 mg/dL), systolic (-38mm/Hg) and diastolic (-10 mm/Hg) blood pressure, and serum lipids (total cholesterol [-41mg/dL], HDL cholesterol [-3mg/dL], LDL cholesterol [-36mg/dL], VLDL cholesterol [-2 mg/dL], triglycerides [-6mg/dL]) at the end of the three week intervention.

Another case study conducted in India involved a 50-year-old male diagnosed with metabolic syndrome (and hypothyroidism) who underwent 'Integrated Yoga Naturopathy', which consisted of a combination of naturopathic detoxification therapies (i.e. therapeutic fasting, calorie restricted diet, hydrotherapy, mud therapy, and manipulative therapies) and yoga therapies (i.e. asanas, pranayama, meditation, relaxation techniques, kriyas, educational lectures, and yoga-based counselling sessions), administered for six weeks [31]. For the duration of the intervention, naturopathic therapies were administered for two hours per day, and yoga therapies for 45 minutes per day. After the 6-week intervention period all outcome measures were improved. These included the patient's lipid profile (total cholesterol [-47mg/dL], HDL cholesterol [+6 mg/dL], LDL cholesterol [-43 mg/dL], triglycerides [-63 mg/dL]), thyroid stimulating hormone (-3.85 mIU/mL), glucose profile (fasting blood glucose [-35 mg/dL], post-prandial blood glucose [-167 mg/dL], HbA1c [-0.7%]), Visual Analog Scale (VAS) for knee (-5) and neck (-4) pain, body weight (-20.3kg), BMI (-7.3 kg/m2), and blood pressure (-22/16 mmHg). As these measures were improved, the patient was able to discontinue use of the following medications: hypertensive (Telmisartan 20 mg), oral hypoglycemics (glimepiride, metformin, and Voglibose 0.03 mg), thyroid (levothyroxine sodium 100 mg), and analgesic (Aceclofenac). After the intervention period, the patient was advised to eat a vegetarian, calorie-restricted diet (1200 Kcal/day); practice juice fasting once per week; and to continue practicing the yoga program. Follow-up done at weeks 14 and 18 showed a continuation of the effects seen at the end of the initial intervention period (week six).

The lack of significant results in the randomized controlled trials assessing interventions for metabolic syndrome highlight the complexity in treating this disease, as it is a diagnosis made of multifactorial pathological processes. This point is underscored by the highly clinically significant changes documented in both case studies, in which the interventions were complex, individualized to the patient and multi-faceted. Further research using a systems approach is warranted in further assessing naturopathic treatments for metabolic syndrome.

Other Endocrine Conditions

Other endocrine conditions studied included pre-diabetic individuals with obesity (n=1) [32] and hypothyroidism with hyperprolactinemia (n=1) [33]. Interventions included applied nutrition with intermittent hypoxic training [32]; and naturopathic care with acupuncture and a yoga-based lifestyle modification program [33].

A case study conducted in India involved a 37-year-old female with hypothyroidism, hyperprolactinemia, and symptoms of hormonal imbalance (hot flashes, irregular periods, vaginal dryness, low libido) who underwent naturopathic care, acupuncture, and a yoga-based lifestyle modification program over an 18-month period [33]. Naturopathic care consisted of dietary recommendations (50-60% of diet as raw fruits, elimination of leafy vegetables), therapeutic fasting (two days per week of only coconut water), water-based therapies (immersion, mud and cold baths, water throat pack and abdominal packs), one hour daily of yoga interventions (alternate nostril breathing, fast abdominal breathing, sun salutations), and 21 daily acupuncture sessions. Outcome measures assessed included weight and serum levels of thyroid stimulating hormone, prolactin, and anti-mullerian hormone. At the end of the 18-month intervention period, the patient was able to discontinue use of her thyroid medication (125 mcg of levothyroxine sodium), and resolved her hormonal imbalance symptoms, reflected in the serum measurements of weight (63kg to 51 kg), TSH (9.2U/ml to 4.6 U/ml), prolactin (34.4 ng/ml to 19.6 ng/ml), and anti-mullerian hormone (0.3 ng/ml to 2.6 ng/ml).

Table 20.1 Clinical research investigating endocrine conditions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Ali, et al. (2011) [USA, AMRO] [28]	Randomized controlled trial (Crossover)	Metabolic syndrome or impaired fasting glucose or impaired glucose tolerance (adults)	Chromium picolinate (capsules, daily)	6 months: 500mcg or 1000mcg	Placebo	59 (500mcg: 30/ 1000mcg: 29)	Serum fasting insulin (IU/l) [BL to Mth 6]	NS
							Homeostasis model assessment of insulin resistance [BL to Mth 6]	NS
							2-hour plasma glucose (mg/dl) [BL to Mth 6]	NS
							Fasting plasma glucose (mg/dl) [BL to Mth 6]	NS
							2-hour insulin during oral glucose tolerance testing (IU/l) [BL to Mth 6]	NS
							Anthropometric measures [BL to Mth 6]	NS
							Blood pressure (mmHg) [BL to Mth 6]	NS
							Endothelial function [BL to Mth 6]	NS
							Hemoglobin A1c (%) [BL to Mth 6]	NS
							Urinary microalbumin (mg/dl) [BL to Mth 6]	NS
							Lipids (mg/dl) [BL to Mth 6]	NS
Ali, et al. (2011) [USA, AMRO] [29]	Randomized controlled trial (Crossover)	Metabolic syndrome (adults)	Encapsulated vegetable and fruit powder concentrate blends. Group 1: vegetable, fruit and berry; Group 2: vegetable and fruit	8 weeks (+ 8 week cross-over washout); 3 capsules twice daily (1 capsule = 750mg)	Placebo	64 (22/ 22/20)	Flow-mediated dilatation of the brachial artery [BL to Wk 8]	NS
							Plasma glucose (mg/dl) [BL to Wk 8]	NS
							Serum insulin (IU/l) [BL to Wk 8]	NS
							Serum lipids (mg/dl) [BL to Wk 8]	NS
							Body weight (kg) [BL to Wk 8]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Bradley, et al. (2012) [USA, AMRO] [26]	Prospective Cohort	Type II Diabetes (Inadequately controlled)	Adjunctive naturopathic care (ANC)	Number and timing of follow-up visits determined by naturopathic doctor and participant. Study duration was one year.	Usual care cohort	369 (40/329)	Summary of Diabetes Self-Care Activities [BL to Mth 6, Mth 12]	**Increased self-care behaviors** *Mth 6* Glucose checking: improved (p = 0.001) Diet quality: improved (p = 0.001) Physical activity: improved (p = 0.02) *Mth 12* Glucose testing: improved (p=0.003) Physical activity, NS Diet quality, NS
							Personal Health Depression Scale [BL to Mth 6, Mth 12]	**Increased positive mood** *Mth 6* Mood: improved (p = 0.001) % non-depressed: NS *Mth 12* Mood: NS % non-depressed: NS
							Self-Efficacy Scale [BL to Mth 6, Mth 12]	**Increased self-efficacy** *Mth 6* Self- efficacy: improved (p = 0.0001) *Mth 12* Self-efficacy: improved (p=0.002)
							Readiness Index [BL to Mth 6, Mth 12]	**Increased readiness to change lifestyle** *Mth 6* Lifestyle change: improved (p=0.003) Commitment to change: NS *Mth 12* Lifestyle change: improved (p=0.004) Commitment to change: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Perceived Stress Scale [BL to Mth 6, Mth 12]	*Mth 6* Stress: NS *Mth 12* Stress: NS
							Problem Areas in Diabetes [BL to Mth 6, Mth 12]	*Mth 6* Stress: NS *Mth 12* Stress: NS
							Subjective rating of satisfaction with and self-perceived effectiveness of ANC [BL to Mth 6, Mth 12]	NS
							Hemaglobin A1C (%) [BL to Mth 6, Mth 12]	NS
							Total cholesterol: HDL ratio [BL to Mth 6, Mth 12]	NS
							Blood pressure [BL to Mth 6, Mth 12]	NS
							Number of new prescriptions for insulin, sulfonylureas, and metformin per year [BL to Mth 12]	**Increased new prescriptions**
							Number of prescription refills for insulin, sulfonylureas, and metformin per year [BL to Mth 12]	**Increased number of prescriptions** ANC: +1.2 UC: -0.2
							Number of primary care visits, per year [BL to Mth 12]	**Increased primary care visits** ANC: +1.5 UC: +0.0
							Number of nutritionist visits, per year [BL to Mth 12]	No change

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Number of specialist doctor visits, per year [BL to Mth 12]	No change
Das, et al. (2018) [India, SEARO] [25]	Uncontrolled clinical trial	Type 2 Diabetes Mellitus (Adults, male)	Cold abdominal pack (CAP; 15 – 16°C)	20 minutes	Nil	20	Random blood Glucose (mg/dL) [BL to 20 min]	**Reduced blood glucose** -4.8 (p=0.011)
							Systolic Blood Pressure (mmHg) [BL to 20 min]	**Reduced systolic blood pressure** -2.35 (p=0.023)
							Diastolic Blood Pressure (mmHg) [BL to 20 min]	NS
							Pulse Rate (beats/minute) [BL to 20 min]	**Reduced pulse rate** -1.6 (p=0.028)
							Pulse Pressure (mmHg) [BL to 20 min]	NS
							Mean Arterial Pressure (mmHg) [BL to 20 min]	**Reduced levels** -1.55 (p=0.010)
							Rate Pressure Product (units) [BL to 20 min]	**Reduced levels** -3.77 (p=0.006)
							Double Product (units) [BL to 20 min]	**Reduced levels** -2.72 (p=0.003)
Estrada, et al. (2008) [Argentina, AMRO] [24]	Uncontrolled clinical trial	Type II Diabetes Mellitus (Adults)	Hyperbaric oxygen treatment (HBOT) and Intrapancreatic autologous stem cells infusion	HBOT, 10 total 1-hour sessions (1 session per day 5 days prior to injection, and 5 days post-injection), target pressure of 2.3 – 2.5 atmospheres of 100% oxygen.	Nil	25	Fasting plasma glucose (mg/dL) [BL to Mth 3, Mth 6, Mth 9, Mth 12]	**Reduced fasting glucose** Mth 3: -62.2 (p<0.001) Mth 6: -68.5 (p<0.001) Mth 9: -90.6 (p<0.001) Mth 12: -100.4 (p<0.001)
							Hemaglobin A1C (%) [BL to Mth 3, Mth 6, Mth 9, Mth 12]	**Reduced HbA1C** Mth 3: -1.1 (p<0.001) Mth 6: -1.7 (p<0.001) Mth 9: -2.2 (p<0.001) Mth 12: -2.6 (p<0.001)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
				Stem cells harvested from each participant's bone marrow (target of 375 mL bone marrow), for 1 injection into the body and tail of each participant's pancreas.			Basal C-peptide [BL to Mth 3, Mth 6, Mth 9, Mth 12]	**Increased C-peptide** Mth 3: +0.2 (NS) Mth 6: +0.4 (NS) Mth 9: +0.8 ($p<0.04$) Mth 12: +1.8 ($p<0.04$)
							C-Peptide/Glucose ratio [BL to Mth 3, Mth 6, Mth 9, Mth 12]	**Increased ratio** Mth 3: +0.5 (NS) Mth 6: +1.0 ($p<0.003$) Mth 9: +1.4 ($p<0.003$) Mth 12: +2.8 ($p<0.003$)
							Insulin requirements in participants using insulin (n=15) [BL to Mth 3, Mth 6, Mth 9, Mth 12]	**Reduced insulin requirements** Mth 3: -13.2 ($p<0.004$) Mth 6: -20.0 ($p<0.004$) Mth 9: -26.9 ($p<0.004$) Mth 12: -32.3 ($p<0.004$) Discontinued: 27% >50% reduction: 82% (of continued users)
Faridi, et al. (2008) [USA AMRO] [27]	Randomized controlled trial (Pilot)	Type II Diabetes Mellitus (Adults)	NICHE System (an interactive informational feedback system that delivers tailored feedback and reminders through cell phone messaging)	1-day training followed by 3 months of interaction with the NICHE System.	Usual care	30 (15/15)	Adherence by intervention group	Full adherence: 13% 75% adherence: 25%
							HbA1c, trend analysis of glucometer readings between groups [BL to Mth 3]	NS
							Physical activity via pedometers and self-report using the Yale Physical Activity Scale [BL to Mth 3]	NS
							Summary of Diabetes Self-care Activities [BL to Mth 3]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Fuller and Courtney (2016) [Australia WPRO] [32]	Case Report	Obesity and pre-diabetes (Female, 49 years)	Commonwealth Scientific and Industrial Research Organisation (CSIRO) diet and intermittent hypoxic training (IHT) using the GO2® altitude training device	CSIRO diet for 5 weeks, followed by CSIRO diet + IHT (1-hour daily) for 4 weeks	Nil	1	Body weight (kg) [BL to Wk 5, Wk 9]	**Reduced body weight** Wk 5: −2.3 Wk 9: −7.3
							Body mass index (kg/m2) [BL to Wk 5, Wk 9]	**Reduced BMI** Wk 5: −0.9 Wk 9: −2.8
							Waist circumference (cm) [BL to Wk 5, Wk 9]	**Reduced waist circumference** Wk 5: -0.0 Wk 9: −3
							Blood pressure [BL to Wk 5, Wk 9]	**Reduced blood pressure** BL: 118/75 Wk 5: 124/73 Wk 9: 116/72
							Diet quality (3-day food diary) [BL to Wk 9]	**Increased diet quality** Total calorie: -150 % total energy from carbohydrate: -10 % total energy from protein: +7 % total energy from fat: +0.0 Fibre (g): +1.0
							Chalder Fatigue score [Wk 5 to Wk 9]	**Reduced fatigue** Wk 5: 27 ('chronic fatigue') Wk 9: 8, ('normal/healthy')
							Fasting blood glucose (mmol/L) [BL to Wk 5, Wk 9]	**Reduced blood glucose** Wk 5: -0.5 Wk 9: -1.0
							Total cholesterol (mmol/L) [BL to Wk 5, Wk 9]	**Reduced cholesterol** Wk 5: -0.1 Wk 9: -0.6
							High-density lipoprotein (HDL) − cholesterol (mmol/L) [BL to Wk 5, Wk 9]	**Increased HDL cholesterol** Wk 5: +0.7 Wk 9: +0.3

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Low-density lipoprotein (LDL) – cholesterol (mmol/L) [BL to Wk 5, Wk 9]	**Reduced LDL cholesterol** Wk 5: -0.8 Wk 9: -1.0
							Triglycerides (mmol/L) [BL to Wk 5, Wk 9]	**Increased triglycerides** Wk 5: +0.0 Wk 9: +0.2
Gowda, et al. (2017) [India, SEARO] [31]	Case Report	50years old male diagnosed with Metabolic Syndrome and Hypothyroidism	Integrated Yoga Naturopathy (IYN): a combination of naturopathic therapies focused on detoxification (therapeutic fasting, calorie restricted diet, hydrotherapy, mud therapy, and manipulative therapies) and yoga therapies (*asanas*, *pranayama*, meditation, relaxation techniques, kriyas, educational lectures, and yoga-based counseling sessions).	Naturopathy therapies: alternating therapies, 2 hours total per day, for 6 weeks. Yoga therapies: 45 minutes daily, for 6 weeks.	Nil	1	Total cholesterol (mg/dl) [BL to Wk 6]	**Reduced cholesterol** -47
							High-density lipoprotein (HDL) – cholesterol (mg/dl) [BL to Wk 6]	**Increased HDL cholesterol** +6
							Low-density lipoprotein (LDL) – cholesterol (mg/dl) [BL to Wk 6]	**Reduced LDL cholesterol** -43
							Triglycerides (mg/dl) [BL to Wk 6]	**Reduced triglycerides** -63
							Thyroid stimulating hormone (TSH) (mIU/ml) [BL to Wk 6]	**Reduced TSH** -3.85
							Blood glucose [BL to Wk 6]	**Reduced blood glucose** Fasting: -35 Post-prandial: -167
							HbA1c (%) [BL to Wk 6]	**Reduced HbA1C** -0.7
							Pain, Visual Analog Scale [BL to Wk 6]	**Reduced pain** Knee pain: -5 Neck pain: -4
							Body weight (kg) [BL to Wk 6]	**Reduced body weight** -20.3
							Body mass index (kg/m2) [BL to Wk 6]	**Reduced BMI** -7.3
							Blood pressure (mmHg) [BL to Wk 6]	**Reduced blood pressure** -22/16

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Medication use [BL to Wk 6]	**Reduced medication use** All able to be discontinued: anti-hypertensive (Telmisartan 20 mg), oral hypoglycemics (glimepiride, metformin, and Voglibose 0.03 mg), thyroid (levothyroxine sodium 100 mg), and analgesic (Aceclofenac)
Grise, McAllister and Langland (2015) [Australia WPRO] [22]	Case report	Type II Diabetes Mellitus	DB-7: *Gymnema sylvestre* (25% gynemic acids) 75mg; vitamin C 250mg; alanine 250mg; glutamine 100mg; zinc (L-monomethionine) 30mg; chromium 200ug; vanadium 1.5mg. (1 capsule TID). Opti Lipotropic: vitamin B6 30mg; magnesium 75mg; choline 225mg; inositol 600mg; L-methionine 900mg; Dandelion root 300mg; Celandine leaf 150mg; Beet leaf 150mg; Oregon grape root 300mg; Milk Thistle seed 120mg (2 capsules BID). Alpha lipoic acid 300 mg/d, Lypo-spheric vitamin C (1000mg BID). Rauwolfia tincture (10 drops BID-TID). Metformin 500mg (BID). Exercise, motivational interviewing for dietary changes (whole-foods, high-vegetable diet with a maximum of 20 g per day net grain carbohydrates)	10 months	Nil	1	Fasting Glucose (mg/dL) [BL to Mth 7]	**Reduced** 168 to 97 at 7 months
							Glycated hemoglobin – HbAlc (%) [BL to Mth 4, 7 and 10]	**Reduced** 7.7 to 5.0 at 7 months, 4.7 at 10 months
							Liver function tests (IU/L) [BL to Mth 7]	**Reduced** alanine aminotransferase (ALT): 130 – 41 aspartate aminotransferase (AST): 83 – 32
							Fasting Lipid Profile (IU/L) [BL to Mth 7]	**Reduced** total cholesterol: 249 to 296 triglycerides levels: 219 – 76 low density lipoprotein (LDL) levels: 153 -104
							Medication use [BL to Mth 4, 7 and 10]	**Ceased medication use** Metformin and DB-7 at 7 months (no longer meet diagnostic criteria of T2DM)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Kumar, et al. (2017) [India, SEARO] [23]	Randomized controlled trial (Pilot)	Type II Diabetes Mellitus	Acupuncture (TCM style) at CV-12 (4 cun above the center of the umbilicus, depth of 0.5 cun)	Needling at CV-12 for 30 minutes.	Sham placebo (needling at non-acupuncture point 1 cun lateral to CV-12) for 30 minutes	40 (20/20)	Random blood glucose [BL to 30 mins]	**Reduced blood glucose** Acupuncture: -12.25 mg/dL ($p < 0.001$) Sham: NS Between group: NS
McDermott, et al. (2014) [India, SEARO] [12]	Randomized controlled trial (Pilot)	Type II Diabetes Mellitus risk (elevated blood glucose) (Adults)	Yoga sessions were manualized and included stress management education, breathing exercises, loosening exercises, standing, supine, prone, sitting and child poses, as well as a chanting exercise and seated meditation.	1 day (8 hour) group counselling session on healthy lifestyle changes including on diet, physical activity and smoking cessation. Attend at least 3 (up to 6) 75 minute yoga sessions over 8 weeks of the study.	1 day (8 hour) group counseling session on health lifestyle changes including on diet, physical activity and smoking cessation. Asked to do 30 min of walking for 3-6 days/ week for the 8 weeks. Walks were in a park and were monitored.	41 (21/20)	Fasting blood glucose (mmol/L) [BL to Wk 8]	NS
							Post prandial blood glucose [BL to Wk 8]	NS
							Body mass index (kg/m2) [BL to Wk 8]	**Reduced BMI** Yoga: -0.2 (NS) Control: +0.6 (NS) Between group: p=0.05
							Weight (kg) [BL to Wk 8]	**Reduced weight** Yoga: -0.8 (NS) Control: +1.4 (NS) Between group: p=0.02
							Waist circumference (cm) [BL to Wk 8]	**Reduced waist circumference** Yoga: -4.2 ($p<0.05$) Control: +0.7 (NS) Between group: $p<0.01$
							Blood pressure [BL to Wk 8]	NS
							Low-density lipoprotein (LDL) – cholesterol [BL to Wk 8]	NS
							Total cholesterol (mmol/L) [BL to Wk 8]	NS
							Triglycerides (mmol/L) [BL to Wk 8]	NS
							Insulin [BL to Wk 8]	NS
							Insulin resistance [BL to Wk 8]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Perceived Stress Scale [BL to Wk 8]	NS
Mooventhan and Shetty (2015) [India, SEARO] [30]	Case report	Metabolic syndrome (40 y/o male)	Integrative naturopathic care 60–90 min/day of hydrotherapy, mud therapy, massage therapy and diet therapy including fenugreek powder, and yoga therapies 120-min/ day. 3 weeks treatment.		Thyronorm (levothyroxine sodium) 125 mcg	1	Weight (kg) [BL to Wk 3]	**Reduced weight** -9.5
							Body mass index (kg/m2) [BL to Week 3]	**Reduced BMI** -3.2
							Waist Circumference (cm) [BL to Wk 3]	**Reduced waist circumference** -9
							Insulin Intake (units) [BL to Wk 3]	**Reduced insulin intake** -40-0-40
							Fasting blood glucose (mg/dL) [BL to Wk 3]	**Reduced blood glucose** Fasting: -130 Post-prandial: -192
							Systolic blood pressure (BP) (mmHg) [BL to Wk 3]	**Reduced systolic BP** -38
							Diastolic blood pressure (BP) (mmHg) [BL to Wk 3]	**Reduced diastolic BP** -10
							Serum total triglycerides (mg/dL) [BL to Wk 3]	**Reduced triglycerides** -6
							Serum total Cholesterol (mg/dL) [BL to Wk 3]	**Reduced cholesterol** -41
							High-density lipoprotein (HDL) – cholesterol (mg/dL) [BL to Wk 3]	**Reduced HDL cholesterol** -3
							Low-density lipoprotein (LDL) – cholesterol (mg/dL) [BL to Wk 3]	**Reduced LDL cholesterol** -36
							Very-low-density lipoprotein (VLDL) – cholesterol (mg/dL) [BL to Wk 3]	**Reduced VLDL cholesterol** -2

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Nagarathna, et al. (2012) [India, SEARO] [11]	Randomized controlled trial	Type II Diabetes Mellitus (Adults)	Yoga-based Lifestyle modification program (YLSP) tailored to diabetes (Integrated Approach of Yoga for Diabetes (IAYD)	12 weeks of one hour/d, 5 days/week sessions. Then one 2 hour/week session for the next 6 months plus advice for 1 hour daily home practice	Exercise-based Lifestyle modification Program (ELSP)	277 (141/136)	Medication score – Total [BL to Mth 9]	NS
							Medication score – Oral hypoglycemic agents (%) [BL to Mth 9]	**Reduced medication** YLSP: -12.8 ($p<0.001$) ELSP: -3.7 (NS) Between group: $p<0.05$
							Medication score – Lipid lowering drugs [BL to Mth 9]	NS
							Medication score – Antihypertensive drugs [BL to Mth 9]	NS
							Fasting blood glucose [BL to Mth 9]	NS
							HemoglobinA1c [BL to Mth 9]	NS
							Post prandial blood glucose [BL to Mth 9]	NS
							High-density lipoprotein (HDL) – cholesterol (% change) [BL to Mth 9]	**Increased HDL cholesterol** YLSP: +7.0 ($p=0.002$) ELSP: -2.1 (NS) Between group: $p=0.007$
							Low-density lipoprotein (LDL) – cholesterol (% change) [BL to Mth 9]	**Reduced LDL cholesterol** YLSP: -12.3 ($p=0.001$) ELSP: -0.9 (NS) Between group: $p=0.003$
							Triglycerides [BL to Mth 9]	NS
							Total Cholesterol [BL to Mth 9]	NS
							Very-low-density lipoprotein (VLDL) – cholesterol [BL to Mth 9]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Nagasukeerthi, et al. (2017) [India, SEARO] [20]	Randomized controlled trial	Type II Diabetes Mellitus (Adults)	Bell pepper juice *(capsicum annuum var grossum)* plus integrated approach of yoga therapy (IAYT)	100 ml bell pepper juice morning and evening plus daily IAYT sessions throughout the day for four consecutive days	IAYT only	50 (25/25)	Fasting blood glucose [BL to Day 4]	NS
							Post prandial blood glucose (mg/dL) [BL to Day 4]	**Reduced post prandial blood glucose** IAYT+Juice: -68.3 (NS) IAYT only: -42.7 (NS) Between group: p<0.001
							Weight [BL to Day 4]	NS
							BMI [BL to Day 4]	NS
							Systolic blood pressure (mmHg) [BL to Day 4]	**Reduced systolic blood pressure** IAYT+Juice: -14.5 (p<0.05) IAYT only: -6.8 (p<0.05) Between group: p=0.002
							Diastolic blood pressure (mmHg) [BL to Day 4]	NS
							Pulse rate [BL to Day 4]	NS
							Mean arterial pressure [BL to Day 4]	NS
							Pulse pressure (mmHg) [BL to Day 4]	**Reduced pulse pressure** IAYT+Juice: -9.7 (p<0.05) IAYT only: +0.48 (NS) Between group: p=0.003
							Rate pressure product [BL to Day 4]	**Reduced rate pressure product** IAYT+Juice: -19.7 (p<0.05) IAYT only: -8.7 (p<0.05) Between group: p=0.001
							Double product [BL to Day 4]	**Reduced double pressure product** IAYT+Juice: -12.6 (p<0.05) IAYT only: -7.9 (p<0.05) Between group: p=0.03

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Nair (2017) [India, SEARO] [33]	Case report	Hypothyroidism, hyperprolactinemia, hot flushes (Female, 37 years)	Naturopathy and yoga-based lifestyle modification program including dietary recommendations (50-60% of diet as raw fruit + elimination of leafy greens), therapeutic fasting (2 days/week coconut water only), water-based therapies (immersion, mud and cold baths, water throat and abdominal packs), and 1-hour daily yoga interventions (alternate nostril breathing, fast abdominal breathing, sun salutations), and 21 daily acupuncture sessions.	Variable over 18- months	Nil	1	Weight (kg) [BL to Mth 18]	**Reduced weight** -12
							Thyroid stimulating hormone (TSH) (U/ml) [BL to Mth 18]	**Reduced TSH** -4.6
							Prolactin (ng/ml) [BL to Mth 18]	**Reduced prolactin** -15.1
							Anti-mullerian hormone (AMG) (ng/ml) [BL to Mth 18]	**Increased AMH** +2.3
							Thyroxine use [BL to Mth 18]	**Reduced thyroxine use** Discontinued (from 125 mcg per day)
Oberg, et al. (2011) [USA, AMRO] [16]	Uncontrolled trial (pilot)	Type II Diabetes Mellitus (Adults)	Nutrition program delivered as a combination of one-on-one naturopathic physician-delivered dietary counselling and bi-weekly educational sessions for the entire cohort conducted following potluck-style dinners.	Total of 10 hours combined one-on-one (4 30-minute sessions) plus group education (4 90 minute sessions) spread out over 12 week program.	nil	15 enrolled, 12 analysed per protocol	Hemoglobin A1c (HbA1C) (%) [BL to Wk 12]	**Reduced HbA1C** -0.4%, p=0.02
							Serum lipid profile [BL to Wk 12]	NS
							Blood pressure [BL to Wk 12]	NS
							Body Mass Index [BL to Wk 12]	NS
							Summary of Diabetes Self-Care Activities [BL to Wk 12]	**Increased diabetes self-care behavior** Healthy eating pattern (days in last week): +1.8 (p=0.05) Healthy eating pattern (days per week in last month): +1.2 (p=0.02) >5 fruits/vegetables per day (days in last week): +1.3 (p=0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Physical activity (days in last week): +3.4 (p=0.02) Blood glucose checking (% of time): +38% (p=0.05) Checked blood sugar as recommended (days in last week): +3.0 (p=0.04)
							Problem Areas in Diabetes [BL to Wk 12]	**Reduced emotional issues associated with diabetes** Feeling scared about living with diabetes: -1.8 (p=0.006) Feeling overwhelmed by diabetes: -1.9 (p=0.03) Feeling discouraged about diabetes treatment plan: NS Composite score: -18.9% (p=0.05)
							Three-day diary [BL to Week 12]	**Increased healthy eating** Adherence to healthy eating increased (p=0.05)
							Perceptions about Nutritional Counseling [BL to Wk 12]	**Reduced confidence in following dietary guidelines** Average daily carbohydrate intake: NS Attention to type of dietary fat consumed: From 'Seldom' to 'Often' (p=0.04) Know how to follow dietary guidelines: From 'Definitely no' to 'Yes' (p=0.02) Feel in control of my diabetes: From 'Definitely no' to 'Yes' (p=0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Seven Eating Styles Questionnaire [BL to Wk 12]	**Reduced negative eating behaviors** Emotional eating: -0.7 (p=0.02) Food fretting: NS Selecting fast food/fresh food: -0.8 (p=0.05) Attention to sensory/spiritual dimensions of food: -1.2 (p<0.01) Task snacking: NS Attention to dining atmosphere: -0.6 (p=0.01) S Attention to positive social settings: NS Integrated eating score: -3.7 (p=0.03)
Putiri, et al. (2012) [USA, AMRO] [18]	Randomized controlled trial	Type II Diabetes Mellitus (Adults)	Group 1: Yi Ren Medical Qigong (YRMQ) (plus oral diabetes medication), Group 2: Progressive resistance training (PRT) (plus oral diabetes medication)	60 min YRMQ or PRT group session once/ week plus instructions for 30 min at-home sessions at least twice/week for 12 weeks	Usual care (UC; oral diabetes medication)	20 (7/5/8)	Perceived Stress Scale [BL to Wk 12]	**Reduced stress** YRMQ: -29.3%, (p<0.05) PRT: NS UC: NS
							Beck Depression Inventory [BL to Wk 12]	**Reduced depression** YRMQ: NS PRT: -50% (p<0.03) UC: NS
Selvakumar, et al. (2017) [India, SEARO] [21]	Randomized controlled trial (pilot)	Type II Diabetes Mellitus (Adults)	Group 1: 250 ml bittergourd juice (30% concentrate) Group 2: 250 ml Knol-khol (80% concentrate) Group 3: 250 ml ashgourd juice (88% concentrate)	Single dose, morning oral administration	Nil	30 (10/10/ 10)	Fasting plasma glucose [BL to 30 min, 60 min, 90 min and 120 min]	**Reduced blood glucose** Bittergourd: NS Knol-khol: Reduced at 30, 90 and 120 min time points with effect seen over time (p=0.029, F=4.739). Ashgourd: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Sun, et al. (2010) [USA, AMRO] [19]	Randomized controlled trial	Type II Diabetes Mellitus (Adults)	Group 1: Qigong (plus oral diabetes medication) Group 2: progressive resistance training (PRT) (plus oral diabetes medication)	One hour Qigong or PRT sessions once/ week plus instructions for 30min at home sessions/week for 12 weeks	Usual care (oral diabetes medication)	32 (11/11/ 10)	Fasting plasma glucose [BL to Wk 12]	**Reduced blood glucose** Qigong: -23mg/dl (p=0.003) PRT: NS UC: NS Between group: p<0.003
							Fasting plasma Insulin [BL to Wk 12]	NS
							Hemoglobin A1c [BL to Wk 12]	NS
							Homeostasis model assessment of insulin resistance (HOMA-IR) [BL to Wk 12]	NS
Tippens, et al. (2019) [USA, AMRO] [17]	Uncontrolled clinical trial	Prediabetes (adults)	Naturopathic whole-foods nutrition education	12 weeks	Nil	45	High sensitivity c-reactive protein (mg/L) [BL to Wk 12, Mth 6, Mth 12]	**Reduced HsC-RP** Wk 12: -0.7 (p<0.05) Mth 6: -0.2 (p<0.05) Mth 12: -0.6 (p<0.05)
							Hemoglobin A1c (%) [BL to Wk 12, Mth 6, Mth 12]	**Reduced HbA1C** Wk 12: -0.0 (NS) Mth 6: -0.4 (p<0.001) Mth 12: -0.3 (p<0.001)
							Total cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced cholesterol** Wk 12: -7.6 (NS) Mth 6: -26.2 (p<0.001) Mth 12: -30.3 (p<0.001)
							High-density lipoprotein (HDL) – cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced HDL cholesterol** Wk 12: -1.0 (NS) Mth 6: -11.4 (p<0.001) Mth 12: +6.2 (p<0.01)
							Low-density lipoprotein (LDL) – cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced LDL cholesterol** Wk 12: -5.4 (NS) Mth 6: -6.0 (NS) Mth 12: -27.3 (p<0.001)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Very-low-density lipoprotein (VLDL) – cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced VLDL cholesterol** Wk 12: +0.1 (NS) Mth 6: -8.8 (p<0.001) Mth 12: -8.5 (p<0.01)
							Triglycerides (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced triglycerides** Wk 12: +2.0 (NS) Mth 6: -38.7 (p<0.001) Mth 12: -37.6 (p<0.01)
							Fasting plasma insulin (uIU/mL) [BL to Wk 12, Mth 6, Mth 12]	**Increased plasma insulin** Wk 12: +0.8 (NS) Mth 6: -3.9 (p<0.001) Mth 12: +4.9 (p<0.001)
							Fasting plasma glucose (mg/dl) [BL to Wk 12, Mth 6, Mth 12]	**Reduced blood glucose** Wk 12: -6 (p<0.01) Mth 6: -11.5 (p<0.001) Mth 12: -13.9 (p<0.001)
							Healthy dietary behavior (food frequency questionnaire) [BL to Wk 12, Mth 6, Mth 12]	**Increased healthy dietary behavior** Processed and refined grains: reduced (p<0.001) More healthy oils: increased (p<0.05) Less healthy oils: reduced (p=0.02) Vegetables: NS Fruits: NS Grains: Wk 12: -0.7 (p<0.01) Mth 6: -0.8 (p<0.01) Mth 12: -0.4 (NS) Meat: Wk 12: -0.2 (NS) Mth 6: -0.5 (p<0.01) Mth 12: -0.1 (NS) Dairy: Wk 12: -0.4 (p<0.05) Mth 6: -0.5 (p<0.01) Mth 12: -0.3 (p<0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Fat: Wk 12: -0.3 ($p<0.01$) Mth 6: -0.4 ($p<0.01$) Mth 12: -0.4 ($p<0.01$)
Venugopal, et al. (2017) [India, SEARO] [13]	Uncontrolled clinical trial	Type II Diabetes Mellitus (Adults)	Yoga-based Lifestyle intervention (Stop Diabetes Movement)	10 days	Nil	1292 (primary outcome data on 896)	Fasting plasma glucose (mg/dL) [BL to Dy 10]	**Reduced blood glucose** -11.2 ($p<0.001$)
Vijayakumar, et al. (2018) [India, SEARO] [14]	Uncontrolled clinical trial	Type II Diabetes Mellitus (Adults) compared with Healthy adults	Group yoga + yoga and diabetes education	60 min/wk group yoga and diabetes education (30 min/wk) for 10 weeks	Healthy adults	310 (189 diabetic, 121 healthy adults)	Fasting plasma glucose (mg/dL) [BL to Wk 10]	**Reduced blood glucose** Group 1 (healthy): NS Group 2 (diabetes): -6.9 ($p=0.01$)
Vinutha, et al. (2015) [India, SEARO] [15]	Uncontrolled clinical trial	Type II Diabetes Mellitus (Adults)	Integrated approach to yoga therapy (IAYT)	1 week	Nil	15	Fasting plasma glucose (mg/dL) [BL to Wk 1]	**Reduced blood glucose** -24.4 ($p<0.05$)
							Heart rate variability [BL to Wk 1]	NS
							Heart rate response to deep breathing [BL to Wk 1]	NS
							Blood pressure response to sustained handgrip (mmHg) [BL to Wk 1]	**Increased BP** +3.2 ($p<0.01$)

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21 Gastrointestinal Conditions

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HIGHLIGHTS

- Gastrointestinal conditions are the second most common reason patients seek naturopathic care.
- The most common gastrointestinal conditions treated by naturopaths/NDs include inflammatory bowel disease, gastroesophageal reflux disease, irritable bowel syndrome, dyspepsia, and/or diarrhea or constipation.
- Within naturopathy, the gastrointestinal system is viewed as central to the health of the whole person with naturopaths/NDs playing a vital role in the recognition of the importance of the microbiome in overall health.
- Naturopaths/NDs use a range of therapies in the treatment of gastrointestinal conditions.
- 82.4% of naturopathic interventions indicated a positive outcome in the treatment of gastrointestinal conditions.
- Additional research investigating the effectiveness of naturopathic care in treating gastrointestinal conditions is warranted.

Gastrointestinal and liver diseases are responsible for approximately 8 million deaths per year worldwide [1]. Furthermore, approximately 48% of Australians and 38% of Americans with gastrointestinal conditions visit at least one complementary medicine practitioner within a 12-month period [2]. Gastrointestinal symptoms and conditions such as inflammatory bowel disease (IBD), gastroesophageal reflux disease (GERD) and/or functional gastrointestinal disorders (such as irritable bowel syndrome (IBS), or functional dyspepsia and/or diarrhea and constipation) are amongst the most common gastrointestinal conditions and reasons people seek care from health care practitioners [3].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=17) naturopathic researchers conducted examining gastrointestinal conditions. This research includes a total of 447 participants and was conducted in the United States of America (USA) (n=5), Australia (n=5), Canada (n=3), Germany (n=2), and India (n=2). The study designs include randomized control trials (n=7), uncontrolled clinical trials (n=4) and case reports/series (n=5). The studied interventions evaluated either single or combination therapies that involved dietary and lifestyle changes (n=7), clinical nutrition (n=6), herbal medicine (n=5), yoga (n=3), and hydrotherapy (n=2).

The main conditions examined in these studies were irritable bowel syndrome (IBS) and functional gastrointestinal disorders (n=7), conditions of the hepatobiliary and pancreatic system (n=5), inflammatory bowel disease (n=2), coeliac disease (n=1), gastrointestinal infection (n=1) and dyspepsia (n=1). Of all the naturopathic clinical studies examining gastrointestinal condition populations, 82.4% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 21.1: Clinical research investigating gastrointestinal conditions conducted by naturopathic researchers.* This body of naturopathic research on gastrointestinal conditions is also supported by 13 observational studies and 39 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Research indicates that the types of gastrointestinal conditions for which people seek naturopathic care may benefit from a range of naturopathic interventions. To date, the number of naturopathic research papers reporting the effects of naturopathic treatments on gastrointestinal health is limited yet employ a diverse range of research methodologies and study designs. Case studies play an important role in presenting the effectiveness of unique individualized treatment approaches which are common in naturopathic care. All studies involving the evaluation of single (herbs, probiotics, yoga) and combined multiple interventions (including diet, yoga, massage, lifestyle, and herbal treatments) indicated positive outcomes in the

primary or secondary measurements. It is also interesting to note that some herbal intervention studies employed multi-botanical formulas and, in some instances, combined herbal treatments with yoga and other therapies. While naturopathic researchers have conducted systematic reviews of herbal medicines for gastrointestinal conditions [4-6], the current clinical research did not employ multiple herbal medicines for gastrointestinal conditions and as such these systematic reviews reflect an important contribution to the literature. The important role of probiotics in the management of gastrointestinal conditions (e.g. antibiotic-associated [7-11] and *Clostridium difficile*-associated diarrhea [12-14]) have also been reviewed by naturopathic researchers.

Within naturopathy, the gastrointestinal system is viewed as central to the health of the whole body [3]. In an international survey of naturopathic practice, gastrointestinal complaints were the second most common reason people sought naturopathic care [3]. The most common gastrointestinal health conditions reported by those using naturopathic services and products are irritable bowel syndrome, gastroesophageal reflux disease, gluten intolerance, coeliac disease, and inflammatory bowel disease [15, 16]. Even for those patients presenting with other health conditions, gastrointestinal health is an important focus of the clinical naturopathic practice [3], and is core to the integrative physiological approach that naturopaths/naturopathic doctors adopt [17].

Although contemporary research is increasingly identifying the important role between gut health and other diseases, addressing this link has always been a core tenet of naturopathic practice [18]. As such, naturopathic researchers have also reviewed published literature examining the intestinal microbiome to provide a clearer understanding of the role it plays in other health conditions [19-23] as well as how it is affected by external factors [19, 24-26]. Overall, there are a substantial number of people with gastrointestinal conditions consulting naturopaths/naturopathic doctors and a longstanding tradition of increased naturopathic focus of gastrointestinal health when compared to other medical systems. When combined with the results of the clinical studies highlighted in this chapter and the additional systematic reviews through which naturopathic researchers have synthesized other existing research, the potential value of naturopaths/ naturopathic doctors and their treatments in the management of gastrointestinal conditions and the need for further research is clearly justified.

Studies based on specific conditions:

Irritable Bowel Syndrome and Functional Gastrointestinal Disorders

Seven naturopathic studies recruited 224 participants with functional bowel disorders. Three [27-29] investigated the effect of orally administered herbal extracts on bowel symptoms, one of which also measured expired breath gases following an oral lactulose challenge [29]. Two studies involved dietary modifications, each based on data obtained by testing serum antibodies to various foods [30, 31]. One study compared a dietary intervention with a yoga intervention [32], and one evaluated the efficacy of digestive enzymes and probiotics on IBS symptoms [33].

Clinical finding

Elimination of foods with positive leucocyte activation test results may reduce symptom severity and improve overall health in individuals with irritable bowel syndrome.

A randomized control trial conducted in USA investigated the effect food elimination and a challenge protocol based on the results of a leucocyte activation test (Alcat) [30]. Adults with IBS (n=55) were randomized to a 4-week elimination diet in which they either avoided foods with positive Alcat assay results and consumed foods with negative assay results (intervention), or eliminated foods with negative assay results and consumed foods with positive assay results (control). Improvements in the intervention arm were observed in measures of IBS Global Improvement Scale (GIS) and continued improvement 4 weeks after completing the intervention (mean group difference 1.22, p=0.02). A greater reduction in IBS-Symptom Severity Scale (IBS-SSS) (mean score reduction 66.42 (p=0.03) was maintained at the conclusion of the intervention.

In a randomized controlled trial conducted in Germany involving a 12-week naturopathic intervention, 59 adults with IBS were randomized to either yoga (75 minutes twice a week) or a diet low in fructo-, oligo-, mono-saccharides and polyols (FODMAPs) [32]. Significant reductions in IBS-SSS were observed for participants in both groups (p<0.001), with abdominal distension scores being significantly lower in the FODMAP group at week 12 (+14.13; p=0.04). No significant between

group difference was demonstrated at week 24. Both interventions had similar efficacy for alleviating overall symptoms associated with IBS. However, those on the yoga had higher QoL scores related to food avoidance (IBS Quality of Life – Food avoidance: +17.1, p=0.005) and less anxiety (Hospital Anxiety and Depression Scale – Anxiety: -1.35; p=0.025) at the conclusion of the study.

Clinical finding

Both yoga and a diet low in fructo-, oligo-, mono-saccharides and polyols (FODMAPs) may reduce symptom severity such as abdominal distension in individuals with irritable bowel syndrome. Yoga may also increase quality of life and reduce anxiety in this population.

Inflammatory Bowel Disease (IBD) and Coeliac Disease

Three studies investigated naturopathic therapies for inflammatory bowel disease or coeliac disease [34-36]. Two studies reported the evaluation of naturopathic approaches/interventions in people suffering inflammatory bowel diseases [34, 36]. A randomized trial conducted in Germany evaluated the effects of yoga in a naturopathic setting in 77 participants with ulcerative colitis following randomization to either 12 weeks of yoga therapy or directed self-care [34]. The participants' disease-specific quality of life, as measured by the Inflammatory Bowel Disease Questionnaire (IBDQ) was significantly improved at the end of the 12-week intervention in the yoga group (+14.7, p=0.02), with benefits sustained at 24 weeks (+16.4; p=0.02). In addition, the Rachmilewitz clinical activity index scores for anxiety were also significantly lower in the yoga group (-1.2; p=0.03).

A randomized controlled trial conducted in Australia with 45 adults with coeliac disease who had persistent symptoms in spite of compliance with a gluten-free diet were recruited [35]. Participants were allocated to receive either a probiotic (n=23) or placebo (n=22) twice daily for 12 weeks. No changes in fecal microbiota were observed except normalization of a baseline difference in *Saccharomyces sp.* counts between the groups (p=0.02 at baseline, p=0.242 at 12 weeks). Urinary d-lactate, a potential indicator of gastrointestinal bacteria metabolomic activity, decreased significantly in the intervention group (p=0.004).

Hepatobiliary and pancreatic system

Of the five papers reporting effectiveness of naturopathic treatments in hepatobiliary and pancreatic conditions, three were case reports [37-39], one a retrospective observational study [40] and one a randomized trial [41].

Clinical finding

St Mary's Thistle *(Silybum marianum)* may reduce ferritin levels in individuals with chronic hepatitis C, particularly those with advanced fibrosis.

In a controlled trial conducted in the USA, 37 patients with chronic hepatitis C (HCV), were randomized to one of three doses of a standardized herbal extract (120 mg silybin from *Silybum marianum*), combined with phosphatidylcholine (IdB 1016) [41]. An HCV genotype 1 was identified in 77.5% of participants with a further 22.5% having either genotype 2 or 3 and 40.5% had at least one of the common hemochromatosis mutations. Clinically elevated serum ferritin levels were identified in 59% of participants at recruitment. At the end of the intervention, serum ferritin levels were reduced in 29 participants (78%) (mean, 244 vs. 215 mug/L; median, 178 vs. 148 mug/L; p=0.0005), with greater reductions observed in those with elevated baseline ferritin, compared to those which were within normal range. Those with more advanced fibrosis (Batts-Ludwig stage III or IV) had the largest reductions in serum ferritin (p=0.015).

Other Gastrointestinal Conditions

Two other studies investigated prevention of gastrointestinal infections [42] and dyspepsia [43], respectively. A randomized controlled trial conducted in Australia over 17 weeks (following a 10-week control period) evaluated the effects of a naturopathic probiotic protocol on the incidence of gastrointestinal infections in elite rugby players [42]. The 19 athletes were randomized to receive either a probiotic or placebo twice daily for 17 weeks. Participants in the probiotic group had a reduced incidence of gastrointestinal infection over the course of the study, and higher salivary a-amylase (+16.2 vs +8.1, p=0.007), a potential marker for host defense.

A randomized controlled trial conducted in Canada evaluated the effect of 30 days of administration of inositol hexaniacinate (IHN), 1782 mg /day for 30 days, on fasting gastric pH and symptoms associated with dyspepsia in 22 participants [43]. Results at completion were evenly divided between those in the active and placebo

arms. Symptoms, as measured by the Gastrointestinal Symptom Questionnaire (GSQ), were reduced from 10.73 to 8.45 in those receiving IHN. Gastric pH reduced significantly in both groups (both $p<0.01$) and study participants receiving placebo reported similar rates of adverse effects as those receiving IHN. The authors report that compliance was suboptimal in both groups. Analysis of baseline data revealed no correlation between fasting gastric pH and GSQ scores.

Table 21.1 Clinical research investigating gastrointestinal conditions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
Ali, et al. (2017) [USA, AMRO] [30]	Randomized controlled trial	Irritable bowel syndrome	Dietary elimination based on leucocyte antigen test results (LATR)	4 weeks elimination, systematic *ad lib* re-introduction over 4 weeks	Elimination contrary to LATR	55 (26/29)	IBS Global Improvement Scale [BL to Wk 4, Wk 8]	**Reduced** Wk 4: -0.86 (p=0.04) Wk 8: -1.22 (p=0.04)
							IBS Severity Scoring System [BL to Wk 4, Wk 8]	**Reduced** Wk 4: -61.78 (p=0.04) Wk 8: -66.42 (p=0.05)
							IBS Adequate Relief Scale [BL to Wk 4, Wk 8]	NS
							IBS-Quality of Life [BL to Wk 4, Wk 8]	NS
Bares, et al. (2008) [USA, AMRO] [41]	Uncontrolled clinical trial	Hepatitis C (chronic)	Standardized silybin and soy phosphatidylcholine complex (IdB 1016) 314mg with 120mg silybin per capsule	12 weeks Dose 1: 314mg TD Dose 2: 628mg TD Dose 3: 942mg TD	Nil	37	Serum iron (ug/dL) [BL to Wk 12]	NS
							Total Iron binding capacity (ug/dL) [BL to Wk 12]	NS
							Transferrin iron saturation (%) [BL to Wk 12]	NS
							Serum ferritin, by dose (ug/L) [BL to Wk 12]	**Reduced ferritin** All participants: -30 (p=0.0005) Dose 1: -51 (p=0.004) Dose 2: -13 (p=0.03) Dose 3: NS
							Serum ferritin, by stage of fibrosis (ug/L) [BL to Wk 12]	**Reduced ferritin (Stage III and IV)** Stage II: NS Stage III: -36 (p=0.005) Stage IV: -16 (p=0.01)
							Liver enzymes [BL to Week 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
Carter, et al. (2019) [Australia, WPRO] [27]	Case series	Functional gastrointestinal disorder	Case 1: *Botanical medicines* – Flordis Iberogast liquid herbal formula containing, *Foeniculum vulgare* seed, *Gentiana lutea* root, chamomile, or dandelion root teas; *Nutritional supplements* – Bioceuticals MultiGest Enzymes, Metagenics CalmX; *Lifestyle advice* – mindfulness/meditation practices, mindful eating, exercise, self-massage. *Dietary advice:* plant based whole foods, fiber, low FODMAP, bone broths. Case 2: *Botanical medicines* – Liquid herbal formula containing *Matricaria chamomilla* 1:2, *Cynara scolymus* 1:2, *Taraxacum officinale* radix 1:2, *Althea officinalis* 1:5, *Lavandula angustifolia* 1:2; *Eschscholzia californica* 1:2; *Scutellaria lateriflora* 1:2; *Lifestyle advice* – sleep hygiene, mindful eating; *Dietary advice* – apple cider vinegar, protein, legumes, vegetables, fruit, fibrous food. 5 weeks treatment.	Case 1: 3 Visits Case 2: 4 Visits	Nil	2	Gastrointestinal Symptom Rating Scale (self-reported) [BL to Visit 2, 3, 4]	**Reduced symptoms** Case 1: Visit 2, -5 Visit 3, -2 Total, -2 Case 2: Visit 2, -6 Visit 3, -6 Visit 4, -11 Total, -11
Cramer, et al. (2017) [Germany, EURO] [34]	Randomized controlled trial	Ulcerative colitis	Yoga: 90 min (Hatha yoga class) plus optional daily practice	Weekly for 12 weeks	Written self-care advice (evidence-based informative books)	77 (39/38)	Inflammatory Bowel Disease Questionnaire [BL to Wk 12, 24]	**Increased quality of life** Wk 12 Yoga: +16.3 Self-care: +0.8 Between group: +14.7 (p=0.02) Wk 24 Yoga: +21.5 Self-care: +9.6 Between group: +16.4 (p=0.02)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
							Rachmilewitz clinical activity index [BL to Wk 12, 24]	**Reduced disease activity** Wk 12 – NS Wk 24 Yoga: -1.8 Self-care: +0.8 Between group: -1.2 (p=0.03)
Fathima-Jebin, et al. (2018) [India, SEARO] [37]	Case report	Non-alcohol fatty liver disease and ascites	Integrated naturopathy & yoga therapy (IYNT) (yoga, acupuncture, massage, hydrotherapy, chromotherapy, mud therapy, reflexology) Diet therapy	20-30 min/ session Varied: 4-12 sessions each in 30 days	Nil	1	Weight (kg) [BL to Dy 30]	**Reduced weight** - 4
							Body mass index (BMI) (kg/m2) [BL to Dy 30]	**Reduced BMI** -1.5
							Abdominal girth (cm) [BL to Dy 30]	**Reduced abdominal girth** -5
							Blood pressure (BP) [BL to Dy 30]	**Reduced BP** Systolic: -10 Diastolic: -2
							CT imaging of liver density [BL to Dy 30]	**Reduced liver density** BL: 12.4cm x 12cm x 9.3cm Dy 30: 12.8cm x 9cm x 8.6cm
							CT fluid estimate [BL to Dy 30]	**No change**
							Fasting plasma glucose (mg/DL) [BL to Dy 30]	**Reduced fasting glucose** -7
							Postprandial glucose (mg/dL) [BL to Dy 30]	**Reduced post-prandial glucose** -2
							Bilirubin, total (mg/dL) [BL to Dy 30]	**Reduced total bilirubin** -0.03
							Bilirubin, direct (mg/DL) [BL to Dy 30]	**Reduced direct bilirubin** -0.11
							Alkaline phosphatase (ALP) (U/L) [BL to Dy 30]	**Reduced ALP** -11

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
							Aspartate transaminase (AST) (U/L) [BL to Dy 30]	**Reduced AST** -4.1
							Alanine transaminase (ALT) (U/L) [BL to Dy 30]	**Reduced ALT** -8.3
							Gamma-glutamyl transaminase (GGT) (U/L) [BL to Dy 30]	**Reduced GGT** -6
							Urea (mg/dL) [BL to Dy 30]	**Reduced urea** -31.3
							Creatinine (mg/dL) [BL to Dy 30]	**Reduced creatinine** -0.26
							Uric acid (mg/dL) [BL to Dy 30]	**Reduced uric acid** -4.9
Harnett, et al. (2016) [Australia, WPRO] [35]	Randomized controlled trial	Coeliac disease	Probiotics (VSL #3) 450 bill CFU per sachet, with meals	1 sachet 2x/day X 12 weeks	Placebo	42 (21/21)	Fecal microbial counts [BL to Wk12]	NS
							Urinary organic acids [BL to Wk12]	**Reduced** Reduction in urinary D-lactate (p=0.004)
Hawrelak & Myers (2010) [Australia, WPRO] [28]	Uncontrolled clinical trial	Irritable bowel syndrome	DA-IBS: *Vaccinnium myrtillus* (dried, powdered) 10g, *Ulmus fulva* 4.5g, *Agrimonia eupatoria* (aerial parts) 3g, and *Cinnamonium zelanicum* 1.5g C-IBS: lactulose 3g, *Ulmus fulva* 7g, *Glycyrrhiza glabra* 1.5g, *Avena sativa* (bran) 2g.	Twice daily in 250mL apple juice for 3 weeks	Nil	31 (21/10)	Bowel movements per day [BL to Wk 3]	**Reduced bowel movements (Diarrhea subtype)** DA-IBS: -0.19 (p=0.03) **Increased bowel movements (Constipation subtype)** C-IBS: +0.22 (p=0.02)
							Consistency of stool [BL to Wk 3]	**Increased stool consistency (Constipation subtype)** DA-IBS: NS C-IBS: +0.67 (<0.0001)
							Sense of straining [BL to Wk 3]	**Reduced sense of straining** DA-IBS: -0.19 (0.004) C-IBS: -0.74 (<0.0001)
							Sense of urgency [BL to Wk 3]	DA-IBS: NS C-IBS: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
							Abdominal pain [BL to Wk 3]	**Reduced abdominal pain** DA-IBS: -0.19 (p=0.006) C-IBS: -0.20 (p=0.03)
							Bloating severity [BL to Wk 3]	**Reduced bloating severity** DA-IBS: -0.32 (p<0.0001) C-IBS: -0.19 (p=0.03)
							Flatulence severity [BL to Wk 3]	**Reduced flatulence (Diarrhea subtype)** DA-IBS: -0.25 (p=0.0001) C-IBS: NS
							Global symptom severity [BL to Wk 3]	**Reduced overall symptoms** DA-IBS: -0.40 (p=0.002) C-IBS: -0.71 (p=0.0005)
Kennedy, et al. (2014) [Canada, AMRO] [31]	Uncontrolled clinical trial	Irritable bowel syndrome	Elimination/reintroduction diet based on the results of non-IgE mediated food allergy test	4 wk elimination 8-food challenges over 4 weeks	Nil	4	Non-IgE food allergy tests [BL to Wk 4]	NS
							Symptoms [BL to Wk 4]	NS
							IBS Symptom Severity Scale [BL to Wk 4]	NS
Kim, et al. (2006) [USA, AMRO] [33]	Randomized controlled trial	Functional gastrointestinal disease	Probiotics & nutrients Group 1: 50mill CFU x6 *spp* AND grass juice, fulvic acid derived minerals Group 2: 50mill CFUx12 *spp* AND grass juice, fulvic acid derived minerals Group 3: C. 50mill CUF x5 *spp* AND Mixed mushroom/algae Group 4: 50mill CFU x6 *spp* Group 5: Grass juice, fulvic acid derived minerals	12 weeks: 4-week run-in 8 weeks of 4 cap TD	Placebo	72 (12/12/12/12/12)	Gastrointestinal Quality of Life Index [BL to Wk 12]	NS
							Gastrointestinal Visual Analogue Scales (bloating, gas, abdominal discomfort, indigestion, constipation, diarrhea) [BL to Wk 12]	NS
							Urinary lactulose-mannitol challenge test [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
Logan and Beaulne (2002) [Canada, AMRO] [29]	Case report	Irritable bowel syndrome	Enteric Coated Peppermint oil (Herbal/ aromatherapy)	0.2mL TD 20 days	Nil	1	Lactulose Hydrogen Breath Test [BL to Day 20+6]	**Reduced breath test** Hydrogen: Fasting -6ppm 20 min -19ppm 60 min -22ppm Methane: Fasting -0.0ppm 20 min -2.0ppm 60 min -0.0pm
							Self-reported symptoms [BL to Day 20]	**Decreased bloating, pain, eructation, improved frequency of bowel function**
Milliman. et al. (2000) [USA, AMRO] [40]	Retrospective observational study	Hepatitis C	All patients: (a) Silymarin 80% standardized extract (150 mg); (b) d-alpha tocopherol (400IU), vitamin C (500 mg), beta carotene (15 mg), selenium amino acid chelate (50 mcg) (c) N-acetyl-L-cysteine (1000mg); (d) cod liver oil 1-2 tsp daily (e) dietary and lifestyle advice including breakfast muesli. (f) colchicine (1.2 mg); (g) ursodeoxycholic acid (300 mg) Some patients: (h) herbal mixture of *Phyllanthus nigrum or amarus*, *Picrorrhiza kurroa*, *Zingiber officinale*, *Boerhaavia diffusa*, *Andrographis paniculata*, *Cichorium intybus*, *Emblica officinalis*, *Embelia ribes*, *Terminalia chebula*, *Terminalia arjuna*, *Piper longum*, and *Eclipta alba* (i) deglycyrrhizinated licorice 500mg	Minimum one month treatment. All patients: (a), (b) and (c) twice daily; (d) once daily; (e) daily; (f) daily, five days per week; (g) twice daily Some patients: (h) twice daily; (i) two to four time daily	Nil	14	Alanine aminotransferase (ALT) (U/L; % reduction)	**Reduced ALT** -35 U/L (p=0.026) Reduction of greater than 25%: 7 of 14 patients
							Self-reported symptoms of advancing liver disease (liver pain, enlarged liver, jaundice, ascites, generalized edema, or liver-related bowel dysfunction)	None
							Self-reported symptoms of wellbeing	Most patients reported an increased sense of well-being on the treatment program.

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
Prousky and Seely (2011) [Canada, AMRO] [43]	Randomized controlled trial	Non-ulcer dyspepsia	Inositol hexaniacinate (IHN) (540mg crystalline niacin and 54mg inositol)	3 capsules OD, 4 weeks	Placebo	22 (11/11)	Gastrointestinal Symptom Questionnaire	NS
							Gastro-test® pH	NS
Pumpa, et al. (2019) [Australia, WPRO] [42]	Randomized controlled trial	Prevention of gastrointestinal infection (elite rugby players)	Probiotics (Ultrabiotic 60 and SB Floractiv)	Total duration: 27 weeks (Control period, Wk1-10; Ultrabiotic 60 introduced, Wk11-17; SB Floractiv introduced, Wk18-27)	Placebo	19 (11/8)	Incidence of GI infection [BL to Wk 17]	**Reduced incidence**
							Salivary Immunoglobulin A (U/mL) [BL to Wk 17]	NS
							Salivary alpha-amylase (U/mL) [BL to Wk 27]	**Increased salivary alpha-amylase** Wk 10: NS Wk 17: NS Wk 27: Probiotics +16.2 Placebo +8.1 Between group p=0.007
							Salivary cortisol (ug/dL) [BL to Wk 27]	**Increased cortisol** Wk 10: NS Wk 17: Probiotics +0.02 Placebo -0.01 Between group p=0.02 Wk 27: Probiotics -0.01 Placebo -0.05 Between group p=0.001
Revadi, et al. (2018) [India, SEARO] [38]	Case report	Hepatic cirrhosis & ascites	Integrated naturopathy & yoga therapy (yoga, acupuncture, massage, hydrotherapy, mud therapy) Diet therapy (vegetarian) + Ayurvedic treatment & furosemide (from pre-baseline)	Various, over 4 weeks	Nil	1	Blood pressure (mmHg) [BL to Wk 4]	**Reduced BP** Systolic: -10 Diastolic: -12
							Weight (kg) [BL to Wk 4]	**Reduced weight** -17
							Body mass index (kg/m2) [BL to Wk 4]	**Reduced BMI** -6.3
							Abdominal girth (in)	**Reduced abdominal girth** -12
							Breath holding time (seconds)	**Increased breath holding** +6

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
							Bilirubin, total (mg/dL) [BL to Wk 4]	**Reduced total bilirubin** -0.6
							Bilirubin, direct (mg/DL) [BL to Wk 4]	**Reduced direct bilirubin** -0.2
							Serum albumin (g/dL) [BL to Wk 4]	**Increased albumin** +1.3
							Aspartate aminotransferase (AST) (U/L) [BL to Wk 4]	**Reduced AST** -6
							Alanine transaminase (U/L) [BL to Wk 4]	**Reduced ALT** -14
							Urea (mg/dL) [BL to Wk 4]	**Reduced urea** -8
							Creatinine (mg/dL) [BL to Wk 4]	**Reduced creatinine** -0.4
Schumann, et al. (2018) [Germany, EURO] [32]	Randomized controlled trial	Irritable bowel syndrome	Low FODMAP diet (nutritional counselling including an educational group lecture, 2 individual counselling and 1 group counselling sessions; low-FODMAP recipes, lists of foods to avoid)	12 weeks (+12 week follow up): Low FODMAP diet – nutritional counselling x 4, individual counselling x 2; group counselling x 1; Yoga – 75 min, 2x/week	Yoga	59 (29/30)	IBS Symptom Severity Scale – Total [BL to Wk 12, 24]	**Decreased abdominal distension** Wk 12: Total NS Duration of pain NS Severity of pain NS Abdominal distension -14.13, p=0.04 Bowel satisfaction NS Interference with life NS Wk 24: NS
							IBS Quality of Life – Dysphoria [BL to Wk 12, 24]	**Increased food avoidance** Wk 12: Dysphoria NS Interference with activity NS Body image NS Health worries NS Food avoidance +17.1 (p=0.005) Social reaction NS Sexual NS Relationships NS Overall NS Wk 24: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
							Perceived Stress Questionnaire [BL to Wk 12]	NS
							Cohen Perceived Stress Scale [BL to Wk 12]	NS
							Hospital Anxiety and Depression Scale [BL to Wk 12]	**Reduced anxiety** Anxiety: Wk 12 -1.35 (p=0.03) Wk 24 NS Depression: Wk 12 NS Wk 24 NS
							Short Form-36 [BL to Wk 12]	NS
							Body Responsiveness Scale [BL to Wk 12]	NS
							Body awareness questionnaire [BL to Wk 12]	**Increased body awareness** Wk 12: NS Wk 24: +7.6 (p=0.02)
Sinclair (2015) [Australia, WPRO] [39]	Case report	Acute pancreatitis	Dietary changes: avoid coffee, stimulants, purified sugar and fatty meals; increase nutrient- and phytochemical-dense foods; Vegetable soup (butter, onions, garlic, carrot, celery, cauliflower, broccoli, zucchini) cooked for 2-3 hours in a base of *Curcuma longa* (3 tablespoons, dried), *Zingiber officinale* (1 tablespoon, fresh), *Allium sativum* (3 bulbs, fresh), *Coriandum sativum* (1 bunch, leaf and roots; 2 tablespoons, dried), *Cuminum cyminum* (1 tablespoon, dried) *Illicium verum* (3 x fruit), *Foeniculum vulgare* (1 tablespoon, crushed seed),	Day 1: Dietary changes and herbal medicines Day 2: Herbal medicines and exercise	Nil	1	Pain	**Reduced pain** Resolved within 1 hour
							Nausea	**Reduced nausea** Resolved within 1 hour
							Bowel motions	**Reduced bowel motions** Normalised on day 2 of treatment

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/Control)	Measure of Outcome	Outcome
			Ellettaria cardamomum (5 x pods), *Piper nigrum* (1/2 teaspoon) Herbal medicines: *Ulmus rubra* (2 tablespoons); *Plantago ovata* (2 tablespoons); *Zingiber officinale* and *Matricaria chamomilla floz* infusion Exercise: Gentle hike in local nature reserve (6km; 3 hours)					
Suskind, et al. (2013) [USA, AMRO] [36]	Uncontrolled clinical trial	Inflammatory Bowel Disease (pediatric)	Curcumin in addition to standard therapy.	500mg BD x 3 weeks 1g BD x 3 weeks 2g BD x 3 weeks	Nil	9	Pediatric Ulcerative Colitis Index (<30) [BL to Wk 3]	**Remission** -20 pts in 2 patients (=remission)
							Pediatric Crohn's Disease Activity Index (<34) [BL to Wk 3]	**Reduced symptoms** -5 (to 0) in 1 patient

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22 Mental Health Conditions

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HIGHLIGHTS

- Mental health concerns – including anxiety, depression, obsessive compulsive disorder, stress, and various forms of psychosis – are the third most common reason for patients seeking naturopathic care.
- The naturopathic approach recognizes the connection between a patient's psychological state and their functional and structural conditions.
- The naturopathic community has been active in codifying herbal medicine, lifestyle and nutritional approaches to mental health treatment into contemporary practice.
- 64.7% of clinical studies investigating naturopathic treatment for mental health conditions report a positive outcome in at least one primary or secondary outcome measure.

Mental health is an integral and essential component of overall health. According to the World Health Organization (WHO) constitution, "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [1]. Mental health encompasses emotional well-being (happiness, interest in life), psychological well-being (good relationships, managing responsibilities of daily life, satisfied with life) and social well-being (being able to contribute and be part of society) [2]. Mental health disorders involve changes in emotion, thinking and/or behaviour including conditions such as depression, anxiety, bipolar disorders, schizophrenia and other psychoses or mental health conditions. It is affected by socioeconomic, lifestyle and environmental factors and is a comorbidity of many other symptoms and conditions. The rate of mental health disorders is increasing around the world with the WHO 2019 statistics indicating that 20% of children and adolescents suffer from a mental health disorder [3]. As of 2016, mental and addictive disorders affected more than 1 billion people globally, caused 7% of the total burden of disease and 19% of all years lived with disability [4].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=31; published in 34 papers) naturopathic researchers conducted to investigate treatments for mental health conditions. This research includes 2,264 participants and was conducted in Australia (n=18), the United States of America (USA) (n=6), India (n=5) and Canada (n=5). The study designs include randomized control trials (n=22), case reports (n=3), uncontrolled trials (n=3), retrospective cohort study (n=1), non-randomized controlled studies (n=2) and secondary analysis (n=3). The studied interventions featured a range of therapeutics, prescribed both as a single intervention and with more than one intervention including clinical nutrition (n=14), yoga (n=6), herbal medicine (n=12), complex naturopathic intervention (n=4), dietary and lifestyle change (n=4), acupuncture (n=2), homeopathy (n=1) and mind-body medicine (n=1).

The conditions examined in these studies included depression (n=14), anxiety (n=13), stress (n=2), schizophrenia (n=1), obsessive compulsive disorder (n=2), sleep disorder (n=2), smoking cessation (n=1), bipolar disorder (n=1), eating disorder (n=1) and psychotic episode (n=1). Of all the naturopathic clinical studies examining mental health populations, 64.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 22.1: Clinical research investigating mental health conditions conducted by naturopathic researchers.* This body of naturopathic research on mental health is also supported by over 50 observational studies and more than 80 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Mental health conditions including anxiety, depression, obsessive compulsive disorder (OCD), stress and various forms of psychosis are the third most common reason for patients to seek naturopathic care [5]. Naturopathic research indicates that mental health conditions may benefit from naturopathic care. The research in mental health has focused on several naturopathic interventions with herbal medicines, nutraceuticals and yoga having the most notable clinical effects.

Naturopaths/naturopathic doctors recognize that mental and psychological health is affected by functional and structural disorders [6]. The broad-spectrum approach to health and disease and the naturopathic principle *Treat the Whole Person* is well-suited when working with patients with mental health disorders as it acknowledges the significance of a person's mental status when treating any condition. For this reason not only have naturopaths/naturopathic doctors been able to lead the development of theoretical and research development of fields such as nutritional psychiatry [7, 8], but have also played a leading role in understanding how this knowledge can be effectively translated into practice, particularly with respect to effectively individualizing treatment [9].

The naturopathic community has been active in translating traditional approaches to mental health treatment into contemporary practice, leading the development of research and practice guidelines on herbal medicine, lifestyle and nutritional support [7, 10-12]. Addressing mental and emotional health concerns also has the potential to improve outcomes for other clinical disorders as part of a holistic care model, and naturopathic approaches to health align well with this paradigm. Given the significant prevalence of patients with mental health concerns seeking naturopathic care, it is important that high-quality research in this area be continued, and that integrative models incorporating naturopathic care in mental health are evaluated.

Studies investigating specific conditions:

Depression

Fourteen studies, involving 1,160 participants, conducted in Australia (n=8), India (n=4), Canada (n=1) and the USA (n=1) investigated naturopathic approaches and interventions for depression. Seven of the interventions included the use of individual or combination nutraceuticals (clinical nutrition) [13-19], five included mind-body medicine interventions including four that investigated yoga therapy [20-23], and one that investigated meditation as a component of yoga therapy practice [24] and three investigated herbal medicine [25-27].

Clinical finding

A combination of Kava *(Piper methysticum)* and St John's wort *(Hypericum perforatum)* may reduce symptoms of depression in individuals with major depressive disorder with comorbid anxiety.

A randomized, double blind placebo-controlled study (n=28) conducted in Australia explored the efficacy of *Hypericum perforatum* (St. John's wort flowering tops, SJW) and *Piper methysticum* (Kava rhizome) in adults with major depressive disorder (MDD) with comorbid anxiety [26]. This study used two subsequent crossover phases of 4 weeks each following a two-week placebo-run, with individuals receiving 1.8g standardized tablets of SJW and 2.66g standardized tablets of Kava, three times per day each. Participants in the intervention arm had a greater reduction in symptoms of depression (assessed by the Beck Depression Inventory (BDI)) compared to placebo.

A pilot dosage-condition blinded controlled trial (n=26) conducted in Australia investigated the effect of S-adenosylmethionine (SAMe) in combination with magnesium orotate in adults (>18 years of age) with MDD who reported a previous suboptimal response to selective-serotonin reuptake inhibitors (SSRIs) [14]. Participants received either 800mg per day (400mg BID) or 1600mg (800mg BID) of SAMe for 15 weeks. Participants who showed no response to treatment after the first 7 weeks (n=8) received 1600mg per day of magnesium orotate as an adjunct to SAMe for an additional 8 weeks. Both groups of participants reported a reduction in BDI scores (SAMe only: -26.8, $p<0.001$; SAMe & magnesium: -19.3; $p=0.001$), reduced functional distress assessed via the Outcome Questionnaire 45 (OQ45) (SAMe only: -56.9, $p<0.001$; SAMe & magnesium: -32.4; $p<0.001$), and increased quality of life (SAMe only: +23.2; $p<0.001$; SAMe & magnesium: +20.8; $p=0.001$) compared to baseline. No difference was noted between participants receiving 800mg or 1600mg of SAMe daily.

An additional open-label pilot trial (without placebo control) conducted in Australia explored the role of omega-3 fatty acids in adults with mild to moderate MDD who were previously non-responsive to medication or psychotherapy using a low dose of DHA (260 mg or 520 mg/day) without EPA [19]. There was a significant effect on depressive symptoms, as assessed by total change in the Hamilton Depression Rating Scale (HAM-D) scores (-10.33; $p<0.001$) and the proportion of participants with a clinical response to treatment ($\geqslant$ 50% reduction in HAM-D scores) (54%) or achieving remission [(HAM-D score = 0) (46%) ($p<0.0001$)]. Participants also reported

reduced severity in overall symptoms (Clinical Global Impression Severity Scale: -1.28; p<0.05).

A comparative randomized controlled trial conducted in Australia explored the effect of "Mental silence" Meditation (Sahaja yoga) compared to a "Relaxation" active control and a waitlist group [24]. The intervention was delivered via twice weekly 1-hour sessions plus twice daily 10-20 minutes practice at home for 8 weeks. This randomized controlled trial involved 178 adults and found both groups achieved a significant improvement in psychological strain, measured by the Psychological Strain Questionnaire (PSQ), compared with placebo (meditation: -37.0; relaxation: -22.3; waitlist: -17.5). However, only participants in the mediation group reported reduced depressive symptoms as assessed by the Depression-Dejection (DD) subscale of the Profile of Mood States (POMS) (meditation: -3.0; relaxation and no treatment no significant change p=0.019).

Anxiety

Thirteen studies from Australia (n=7), Canada (n=5) and the USA (n=1) addressed naturopathic approaches and interventions for anxiety. Four studies investigated the use of herbal medicines: three using *Piper methysticum* (Kava) in adults with a range of anxiety disorders [28-30], and the fourth a standardized dose of *Bacopa monnieri* in adults >65 years of age with anxiety and depression without signs of dementia [25]. Two studies examined the impact of clinical nutritional supplementation on anxiety – one involving epigallocatechin gallate (EGCG) and conjugated linoleic acid (CLA) [31] and one the impact of L-theanine (an amino acid typically derived from Green Tea) in adults with generalized anxiety disorders (GAD) [32]. One study investigated the use of a homeopathic preparation (*Argentum nitricum* 12X) in university students with test anxiety [33]. Two studies evaluated whole-person naturopathic care: one combining a botanical medicine preparation, multi-vitamin therapy, and lifestyle counselling in adults with anxiety [34], the second exploring whole-person naturopathic care in individuals with anxiety and depression [13]. One case report looked at the impact of dietary modifications on anxiety [35]. Finally, one study investigated the use of acupuncture, cupping, and/or herbal ear seeds in children and adolescence with GAD [36].

Clinical finding

Kava *(Piper methysticum)* may also reduce symptoms of anxiety in adults with generalized anxiety disorder.

Two randomized, double blind placebo-controlled studies conducted in Australia found *Piper methysticum* (Kava) extracts to reduce anxiety in adults with GAD without major depression. Both studies compared standardized extracts (ranging between 120 and 250mg kavalactones per day) to inert identical tablets (placebo control). The first study (n=60) compared a standard dose of 250mg kavalactones/day in adults over the age of 18 who had experienced at least 1 month of generalized anxiety (>10 on the Beck Anxiety Inventory) to a placebo. The study found reduced anxiety (Hamilton Anxiety Scale: p<0.0001; Beck Anxiety Inventory; p=0.001) and depression (Montgomery-Asberg Depression Rating Scale: p=0.003) favoring the Kava group [28]. The second study (Phase I n=58, Phase 2 n=29) explored the effect of two doses (120mg and 240mg of Kava extract) and found statistically significant reduction in Hamilton Anxiety Rating Scale (HAM-A) in adults with GAD without comorbid mood disorder (p=0.05) [30]. Participants received the higher dose of 240mg if they were deemed non-responders by week 3 of this 6-week trial. Effect sizes were more pronounced in those individuals with moderate to severe pre-intervention anxiety (p=0.02). Researchers also identified two polymorphisms in the GABA transporter that were associated with greater HAM-A reduction in the Kava treatment group (rs2601126: p=0.02; rs2697153: p=0.046).

Clinical finding

Whole-person naturopathic care involving herbal medicine, clinical nutrition, dietary counselling, and lifestyle modification – in addition to breathing exercises and psychotherapy/counselling – may reduce fatigue, body mass index and patient-prioritized symptoms in individuals with anxiety.

A randomized control study conducted in Canada compared the efficacy of individualized whole-person naturopathic care with psychotherapy in Canadian Post employees with anxiety (Beck Anxiety Inventory >10) without comorbid depression [34]. Naturopathic care consisted of *Withania somnifera* (300mg BID) herbal extract, a multi-vitamin (BID) and naturopathic dietary and lifestyle counselling. Both groups also received training in diaphragmatic breathing, encouragement to exercise, cognitive behaviour therapy, and stress reduction counselling. Based on the between group analysis, the naturopathic care intervention group reported reduced fatigue across all domains of the Fatigue Questionnaire: subjective (-18.0; p<0.001), physical (-13.19; p=0.0033), motivation (-20.32; p<0.0001) and concentration (-17.51; p<0.0001). Reductions in self-prioritized symptoms, recorded using the Measure Yourself Medical Outcomes (MYMOP) instrument, also favored the *Withania*

somnifera group (Symptom 1: -1.77, p<0.0001; Symptom 2: -1.08, p=0.0115) and reduced weight (-1.47; p=0.00146) and reduced body mass index (-0.56; p=0.00128).

Other mental health conditions

Studies investigated other health conditions such as obsessive-compulsive disorder [37, 38], schizophrenia and psychotic disorders [39-41], eating disorders [42], smoking cessation [43], sleep disorders [44, 45], and chronic psychological stress [46].

Clinical finding

N-acetyl cysteine may reduce compulsive behaviours in individuals with obsessive compulsive disorder.

A randomized control trial and a secondary analysis conducted in Australia examined adults (18 – 70 years old) with DSM-5-diagnosed obsessive-compulsive disorder (OCD) taking 1.5 grams of N-acetyl-cysteine (NAC) orally twice per day for 16 weeks [37, 38]. It observed significant interaction in the 'Compulsions' subscale of the Yale-Brown Obsessive Compulsive Scale (YBOCS) in those taking NAC (p=0.013), with a significant reduction in compulsion observed at week 12 (dissipating at week 16) [37] and a significant decrease in the YBOCS compared to a placebo for participants under 34 years of age (p=0.037) [38].

An uncontrolled trial conducted in the USA explored the effect of whole-person naturopathic care in a population of patients with bipolar disorder presenting to a Community Health Center [41]. Individuals who scored a minimum of 10 on the Patient Health Questionnaire depression screener (PHQ-9) and Generalized Anxiety Disorder 7-item scale (GAD-7) and returned for care on at least two occasions over 26 months were entered into the trial (n=60). Interventions consisted of personalized recommendations for treatment including but not limited to nutraceuticals, pharmaceuticals, homeopathics, and/or herbal medicines. Improvement was measured as a greater than 50% reduction based on initial anxiety or depression scores. There was a significant reduction in both anxiety (50.0% saw improvement in GAD-7 scores) and depression (58.6% saw improvement in PHQ-9 scores). Another uncontrolled trial conducted in India of adult schizophrenia patients stabilized on antipsychotic medication for 6 weeks found significant reduction in symptoms (Scale for Assessment of Negative Symptoms: -30.36, p<0.001; Scale for Assessment of Positive Symptoms: -21.34, p<0.001) and social disability (Groningen social disability scale: -25.01, p<0.001) but increased social cognition (Social Cognition composite score: +18.97, p<0.001) after 6 weeks (20 sessions) of 1-hr yoga sessions [39].

Table 22.1 Clinical research investigating mental health conditions conducted by naturopathic researchers

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Aucoin and Bhardwaj (2016) [Canada, AMRO] [35]	Case report	Generalized anxiety disorder (with hypoglycemia symptoms)	Macronutrient modification – Increased dietary intake of protein, fat, and fiber	4 weeks	Nil	1	Anxiety symptom severity [BL to Wk 4]	**Reduced anxiety** Wk 4 (8/10 to 4 or 5/10)
							Subjective symptoms [BL to Wk 4]	**Reduce symptoms** Increased energy Reduced frequency and intensity of hypoglycemic symptoms Reduced headaches (once per wk compared to everyday). Cessation of chronic vaginal discharge.
Aucoin (2017) [Canada, AMRO] [13]	Case report	Mood and anxiety disorders (depressive disorder and social anxiety disorder)	Breakfast smoothies, increased vegetable intake, herbal formula *(Hypericum perfortum*, *Passiflora incarnata, Valeriana officinalis)* and fish oil supplement (750mg EPA, 500mg DHA) exercise 45min twice weekly, ferrous bisglycinate chelate (36mg) and B12 1000ug/ day sublingual	4 weeks	Nil	1	Subjective mood and anxiety symptoms [BL to Wk 4]	**Reduce symptoms** Improved mood at each return visit, increased tolerance to anxiety provoking situations, increased energy and no headaches
Baker, et al. (2003) [Australia, WPRO] [33]	Randomized controlled trial	Anxiety (university students 18.5-52.2yo scoring > 50 on Benson Revised Test Anxiety Scale)	1st arm: traditionally prepared *Argentum nitricum* 12X 2nd arm: radionically prepared *Argentum nitricum* 12X 3rd arm: placebo	5 drops of preparation in 30 ml of water twice daily for 4 consecutive days	Placebo	62	Revised Test Anxiety Scale [BL to Dy 4]	NS
							Test Anxiety Scale [BL to Dy 4]	NS
							A. nitricum profile questionnaire	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Bambling, et al. (2015) [Australia, WPRO] [14]	Randomized controlled trial	Major Depressive Disorder (adults > 18 years of age with previous suboptimal response to SSRI)	S-adenosylmethionine (SAMe) and 8 mg Magnesium Orotate as adjunct to SSRI	1600 mg (800mg BID) or 800 mg (400mg BID) daily of SAMe for 15 weeks. Non-responders supplemented with 1600 mg (800mg BID) of Magnesium Orotate for 8 weeks	nil	26 (14/12)	Beck Depression Inventory [BL to Wk 15]	**Reduced depression** SAMe: -26.8 (p<0001) NS difference between 800mg and 1600mg dose of SAMe. SAMe & Mg: -19.3 (p=0.001)
							Outcome Questionnaire 45 [BL to Wk 15]	**Reduced functional distress** SAMe: -56.9 (p <0.001) SAMe & Mg: -32.4 (p<0.001)
							Quality of Life [BL to Wk 15]	**Increased quality of life** SAMe: +23.2 (p<0.001) SAMe & Mg: +20.8 (p=0.001)
							ICD-DSM Mini International Neuropsychiatric Interview [BL to Wk15, Wk25]	NS
							Depression, Anxiety and Stress Scale [BL to Wk15, Wk25]	NS
							Structured Interview for the DSM-IV [BL to Wk15, Wk25]	NS
Bier, et al. (2002) [USA, AMRO] [43]	Randomized controlled trial	Smoking cessation	Auricular acupuncture bilaterally at five ear points and one wrist point commonly used in treatment of chemical dependency: HT7, Sympathetic, LU, KI, LV, LI4 OR Acupuncture alone	30 mins, 5 treatments per week for 4 weeks	Educational smoking cessation program with sham acupuncture (Sham plus)	141 (38/45/ 58)	Smoking cessation (smoking or not) [BL to Mth 1, 3, 6, 12, 15, 18]	**Increased cessation** Mth 1: Acupuncture alone, +10%; Acupuncture plus, +40%; Sham plus, +22%; Between group, p=0.023

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Percentage decrease in cigarettes smoked [BL to Mth 1, 3, 6, 12, 15, 18]	**Reduced smoking** Mth 1: Acupuncture alone, -49%; Acupuncture plus, -53%; Sham plus, 40%; Between group, p=0.003
							Craving intensity [BL to Mth 1, 3, 6, 12, 15, 18]	NS
							Beck Depression Inventory [BL to Mth 1, 3, 6, 12, 15, 18]	NS
							Zung Anxiety Scale [BL to Mth 1, 3, 6, 12, 15, 18]	NS
Bradbury, et al. (2017) [Australia, WPRO] [46]	Randomized controlled trial	Chronic psychological stress	Omega-3 Fish Oil	12 weeks: Fish oil 4000mg as 2.2 g EPA, and 0.44 g DHA per day.	Placebo	90 (45/45)	Perceived Stress Scale [BL to Wk 12]	NS
							Omega-3 index [BL to Wk 12]	**Improved omega-3 fatty acids** Arachidonic acid (AA): Fish oil -22.6; Placebo -11.5 Between group (-8.7, p=0.002) EPA: Fish oil +7.3; Placebo -0.5; Between group (+9.6, p<0.001) DHA: NS AA: EPA (%): Fish oil -13.5; Placebo -0.8; Between group (-13.0, p<0.001) EPA: AA (%): Fish oil +0.28; Placebo +0.2; Between group (+3.0, p<0.001)

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Plasma interleukin-1β [BL to Wk 12]	NS
							Plasma interleukin-6 [BL to Wk 12]	NS
							Plasma interleukin-10 [BL to Wk 12]	NS
							Tumor necrosis factor-α [BL to Wk 12]	NS
							High-sensitivity c-reactive protein [BL to Wk 12]	NS
							Salivary cortisol/DHEA ratio [BL to Wk 12]	NS
							Depression, Anxiety, Stress Scale [BL to Wk 12]	NS
							Occupational Stress Inventory Strain and Resources subscales [BL to Wk 12]	NS
							COPE Inventory [BL to Wk 12]	NS
							Copenhagen Burnout Inventory [BL to Wk 12]	NS
Breed and Bereznay (2017) [USA, AMRO] [41]	Uncontrolled trial	Bipolar Disorder (patients with PHQ-9 scores ⩾ 10 or GAD-7 scores ⩾ 10	Individualized naturopathic care consisting of nutraceuticals, pharmaceuticals, homeopathics, and/or herbal medicines	At least 2 community health centre visits over 26 months, mean number of visits 3.3	Nil	60	Patient Health Questionnaire [Group average #, initial to final]	**Increased quality of life** -7.8, ($p<0.0001$) >50% improvement: 58.6%
							Generalized Anxiety Disorder 7-item scale [Group average #, initial to final]	**Reduced anxiety symptoms** -5.2, ($p<0.0001$) >50% improvement: 50%
Calabrese, et al. (2008) [USA, AMRO] [25]	Randomized controlled trial	Anxiety and depression (⩾65 yrs, without signs of dementia)	*Bacopa monnieri* aerial parts dry methanol extract tablet, standardized to 50% bacosides A and B	300mg BID, 12 weeks (6 wk placebo run-in)	Placebo	48 (24/24)	Rey Auditory Verbal Learning Test delayed recall (# of words) [BL to Wk 6 and 12]	**Increased verbal learning** Wk 6 (+0.2 vs -0.2) Wk 12 (+1.2 vs +.01) ($p=0.03$)

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Rey Auditory Verbal Learning immediate reaction times [BL to Wk 6 and 12]	NS
							Center for Epidemiologic Studies Depression scale [BL to Wk 6 and 12]	**Reduced depression** Wk 6: -0.1 vs +1.8 Wk 12: -0.9 vs +0.8, (p=0.05)
							State-Trait Anxiety Inventory [BL to Wk 6 and 12]	**Reduced anxiety** Wk 6, -2.0 vs +2.7 Wk 12, -1.6 vs +1.1, (p=0.04)
							Stroop task reaction time (seconds) [BL to Wk 6 and 12]	**Reduced task reaction time** Wk 6, -3.8 vs -0.6 Wk 12, -2.9 vs -0.4, (p=0.003)
							Stroop task errors (seconds) [BL to Wk 6 and 12]	NS
							Divided attention task score [BL to Wk 6 and 12]	NS
							Wechsler Intelligence Scale digit task [BL to Wk 6 and 12]	NS
							Profile of Mood States [BL to Wk 6 and 12]	NS
							Heart rate [bpm] [BL to Wk 6 and 12]	**Reduced heart rate** Wk 6, -1.4 vs +2.8 Wk 12, -1.1 vs +5.1, (p=0.01)
							Blood pressure [mmHg] [BL to Wk 6 and 12]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Cooley, et al. (2009) [Canada, AMRO] [34]	Randomized controlled trial	Anxiety	Naturopathic care- lifestyle and diet counseling, deep breathing techniques, herbal: *Withania somnifera 300mg BID*, multivitamin/ mineral formula.	Naturopathic Care once per week for 30 Min for 12 Weeks	Psychotherapy care: patient directed counseling, cognitive behavioral therapy, educated on healthy diet, reducing caffeine/tobacco stimulants, deep- breathing techniques, exercise advice, matched placebo supplement	75 (36/39)	The Fatigue Questionnaire [BL to Wk 12]	**Reduced fatigue** Subjective: NM, -20.39; PC, -2.38 Between group (-18.01, p<0.0001) Physical: NM, -14.29; PC, -1.10 Between group -13.19 (p=0.0033) Motivation: NM, -18.95; PC, +1.37 Between group -20.32 (p<0.0001) Concentration: NM, -1.98; PC, +0.37 Between group -17.51 (p<0.0001)
							Measure Yourself Medical Outcomes [BL to Wk 12]	**Reduced symptoms** Symptom 1: NM, -2.24; PC, -0.46 Between group -1.77 (p<0.0001) Symptom 2: NM, -1.94; PC, -0.86 Between group -1.08 (p=0.0115)
							Weight (kg) [BL to Wk 12]	**Reduced weight** -1.47 (p=0.00146)
							Body mass index (BMI) (kg/m2) [BL to Wk 12]	**Reduced BMI** -0.56 (p=0.00128)
Gangadhar, et al. (2013) [India, SEARO] [20]	Randomized controlled trial	Major depressive disorder (non-suicidal hospital out-patients)	Group 1: Generic yoga module of *asana* poses and breathing procedures from traditional texts Group 2: Combination yoga + medication	1hr daily for 2 wks, then weekly for 2 wks, then monthly for 2 months, with optional home practice	Psychiatrist-prescribed antidepressant medication	58 (15/27/ 16)	Hamilton Depression Rating Scale [BL to Mth 1 and 3]	**Reduced depression** Mth 1: Yoga only, -12.5; Yoga+medication, -10.00; Medication only, -7.1; Between group p=0.029 Mth 3: Yoga only, -14.9; Yoga+medication, -12.7; Medication only, -9.0; Between group p=0.001

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Clinical Global Impression Scale (CGI) – Depression Severity [BL to Mth 1 and 3]	**Reduced depression severity** Mth 1: Yoga only, -2.2; Yoga + medication, -1.7; Medication only, -0.9; Between group p=0.001 Mth 3: Yoga only, -2.9; Yoga + medication, -2.5; Medication only, -1.6; Between group p=0.001
							CGI – Depression Improvement (lower score represents greater improvement) [BL to Mth 1 and 3]	**Reduced symptoms** Mth 3: Yoga only, -0.6; Yoga + medication, -0.7; Medication only, -0.6; Between group p=0.001
							Responders/Remitters (no. of participants) [BL to Mth 1 and 3]	**Increased response to treatment** Mth 1: Yoga only +11; Yoga + medication +11; Medication only +2; Between group p=0.003 Mth 3: Yoga only +14; Yoga + medication +22; Medication only +5; Between group p=0.001
Govindaraj, et al. (2018) [India, SEARO] [39]	Uncontrolled trial	Schizophrenia (stabilized patients on antipsychotic medications)	Yoga: *asana* postures, *pranayama* breathing, and OM chanting	20 sessions, 1-hour in length, over 6 weeks	Nil	15	Scale for Assessment of Negative Symptoms (of schizophrenia) [BL to 1 Mth]	**Reduced symptoms** -30.36, ($p<0.001$)
							Scale for Assessment of Positive Symptoms (of schizophrenia) [BL to 1 Mth]	**Reduced symptoms** -21.34, ($p<0.001$)
							Socio-occupational dysfunction – Groningen Social Disability Scale [BL to 1 Mth]	**Reduced dysfunction** -25.01, ($p<0.001$)

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Social cognition – Social Cognition Rating Tool for Indian Setting [BL to 1 Mth]	**Increased social cognition** +18.97, (p<0.001)
Katzman, et al. (2007) [Canada, AMRO] [31]	Case report	Social anxiety disorder (adults taking Quetiapine)	Self-prescribed supplement, abs+ (containing 270mg green-tea-derived epigallocatechin-gallate (EGCG) and 3,400mg conjugated linoleic acid (CLA))	Daily administration of abs+ for 10-24 weeks	Nil	4	Total weight, body fat percentage (BF%), body fat mass (BFM) and lean body mass (LBM) [pre- and post- intervention]	**Improved anthropometrics** **Increase** total body weight in two, no change in one, **Reduced** in one **Reduced** BFM, BF% in all. **Increased** LBM in all.
Leung, et al. (2018) [Canada, AMRO] [36]	Randomized controlled trial (pilot)	Anxiety (children and adolescents)	Acupuncture and cupping and/or ear seeds. examples of points included: LI4, Du20, He7, Pe6, CV4, CV6, CV, AB14, B15, Du4, TW5, Yin Tang, CV12, Sp6, St36, Sp20, Ki3, Ki7, B23 and B25	5 sessions, 30 minutes 1 per week for 5 weeks	Waitlist control	19 (10/9)	Hamilton Anxiety Rating Scale [BL to Wk 5]	**Reduced anxiety** Acupuncture: -11.1 (p<0.001); Waitlist Control: NS Waitlist post-treatment: +10.38 (p=0.007); Between group at endpoint: NS
							Multidimensional Anxiety Scale for Children (MASC-2) [BL to Wk 5]	**Reduced anxiety** Acupuncture: NS; Waitlist control: NS Waitlist post-treatment: -8.37 (p=0.022) Between group at endpoint: NS
							MASC-Parent [BL to Wk 5]	**Reduced patient-reported anxiety** Acupuncture: -9.5 (p=0.008); Waitlist: NS Waitlist post treatment: -5.13 (p=0.048) Between group at endpoint: Acupuncture -15.4, (p=0.025)

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Manocha, et al. (2011) [Australia, WPRO] [24]	Randomized controlled trial	Stress, anxiety and depressed mood (full time workers)	"Mental silence" Meditation (Sahaja yoga)	Twice weekly 1-hour sessions plus twice daily 10 – 20-minute practice at home for 8 weeks	Relaxation active control vs wait-list (no treatment) control	178 (59/56/ 63)	Psychological Strain Questionnaire [BL to Wk 8]	**Reduced psychological strain** Meditation -37.0; Relaxation -22.30 Waitlist-17.5 (p=0.026)
							State/Trait Anxiety Inventory for Adults [BL to Wk 8]	NS
							Profile of Mood States, Depression-dejection subscale [BL to Wk 8]	**Reduced depression** Meditation -3.0; Relaxation: NS No treatment: NS (p=0.019)
Naveen, et al. (2013) [India, SEARO] [21]	Randomized controlled trial	Depression (non-suicidal adult outpatients)	Yoga therapy module developed for patients with depression: *asana* postures, stretching, *pranayama* breathing, chanting, yogic counselling	(60 min, daily for 10 days, then weekly for 2 wks, booster class at Wk 12, and home practice)	Yoga with anti-depressant medication, Anti-depressant medication alone.	137 (23/36/ 78)	Hamilton Depression Rating Scale [BL to Wk 12]	**Reduced depression** Yoga only, -14.0; Yoga and medication, -13.5; Medication only, -8.3 Between group p=0.005
							Clinical Global Impression (of depression severity) [BL to Wk 12]	**Reduced depression** Yoga only, -2.8; Yoga and medication, -2.7; Medication only, -1.9 Between group: p=0.001
							Brain-derived neurotrophic factor, serum (ng/mL) [BL to Wk 12]	**Increased brain-derived neurotrophic factor** Yoga only, +1.1; Yoga and medication, +1.9; Medication only, +2.1 Between group p=0.02

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Naveen, et al. (2016) [India, SEARO] [22]	Randomized controlled trial	Major depression (non-suicidal adults)	Yoga therapy module developed for patients with depression: *asana* postures, stretching, *pranayama* breathing, chanting, yogic counselling	(60 min, daily for 10 days, then weekly for 2 wks, booster classes Mths 2 and 3, home practice)	Yoga with anti-depressant medication, Anti-depressant medication alone.	54 (19/19/16)	Cortisol, serum (reduction vs. increase) [BL to Wk 12]	**Reduced cortisol** Yoga only, 68.4%; Yoga and medication, 68.4%; Medication only, 31.3% Between group p=0.042
							Brain-derived neurotrophic factor (BDNF), serum (ng/mL) [BL to Wk 12]	**Increased with lower cortisol** Negative correlation between change in BDNF and change in cortisol. Yoga only p=0.008, Yoga and medication NS, Medication only NS
Ross, et al. (2008) [USA, AMRO] [42]	Retrospective cohort study	Eating disorders	Various integrative therapies for insomnia and constipation: insomnia was treated with instructions on sleep hygiene as well as an herbal product (containing valerian root extract, *Rhodiola rosea* root extract, Hops strobiles extract, *Passiflora incarnata* aerial parts extract, and German chamomile flower extract) and/or 5-hydroxy-tryptophan (the metabolic precursor to serotonin) were prescribed. Constipation was treated with plant-based digestive enzymes at mealtimes and a daily probiotic supplement containing *Lactobacillus rhamnosus*	2 or 3 days	Usual care	65 (27/38)	Medications used for sleep [After Dy 3]	NS
							Sleep medications [After Dy 3]	NS
							Constipation medications [After Dy 3]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Sarris, et al. (2009) [Australia, WPRO] [28]	Randomized controlled trial	Generalized anxiety (adults (18-65 years with > 1 month of > 10 on Beck Anxiety Inventory)	Tablet from pressed, dried aqueous extract of *Piper methysticum* (Kava) standardized to 50mg kavalactones per tablet	5 Kava tablets (total 250mg of kavalactones/day) for 3 weeks	Placebo	60	Hamilton Anxiety Scale (HAM-A) [BL to Wk 1 and phase 1 and 2]	**Reduced anxiety** Phase 1: −9.9 vs −0.8, (p<0.0001) Phase 2; −10.3 vs. +3.3, (p<0.0001) Increased pooled effect in kava across phases (p<0.0001)
							Beck Anxiety Inventory (BAI) [BL to Wk 1 and post treatment 1 and 2]	**Reduced anxiety** Phase 1: −7.2 vs −1.6, (p=0.001) Phase 2: −8.1 vs. +1.4, (p=0.001) Increased pooled effect in kava (p=0.001)
							Montgomery-Asberg Depression Rating Scale (MADRS) [BL to Wk 1 and post treatment 1 and 2]	**Reduced depression** Phase 1: −5.9 vs −1.1, (p=0.003) Phase 2: −7.6 vs. +3.3, (p=0.003)
Sarris, et al. (2009) [Australia, WPRO] [26]	Randomized controlled trial (cross-over)	Adults (age 18-65) with Massive Depressive Disorder and comorbid anxiety (minimum score of 10 on Beck Anxiety Inventory)	*Hypericum perforatum* (St. John's wort (SJW) 1.8g (standardized 990mcg of hypericin, and 1500 mcg of flavone glycoside) and *Piper methysticum* (Kava) 2.66g (standardized to 50 mg of kavalactones)	8 weeks: SJW 1 tablet TID Kava 1 table TID	placebo	28	Beck Depression Inventory (BDI-II) [Wk 2 to Wk 6 and 10]	**Reduced depression** Intention-to-treat Over time: p=0.047 Between group: p=0.023 Completer analyses Over time: p=0.008 Between group: p=0.003
							Beck Anxiety Inventory [Wk 2 to Wk 6 and 10]	NS
							WHO Quality of Life Survey (WHOQOL) [Wk 2 to Wk 6 and 10]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Sarris, et al. (2012) [Australia, WPRO] [29]	Randomized controlled trial	Mild to moderate anxiety (adults (18-65 years) with HAM-A score between 14 and 25)	Three-arm study design: kava vs oxazepam vs placebo, each arm contained 3 tablets and 1 capsule of either active ingredient or identical placebo *Piper methysticum* (Kava) acute dose of 180mg kavalactones vs 30mg oxazepam after exposure to cognitive tasks	Single dose of each intervention 1 week apart over 3 weeks	Placebo	22	State – Trait Anxiety Inventory-State (STAI-S) [BL to visit 2 and 3]	Significant interaction between conditions after exposure to cognitive tasks (p=0.046) Oxazepam: -2.6, (p=0.035) Placebo: +1.8, (p=0.08) Kava: NS
							Bond-lader VAS [BL to visit 2 and 3]	Oxazepam: 'calmness': +10.25, (p-0.02) 'alertness': -13.45, (p=0.032)
							STCI-S [BL to visit 2 and 3]	Placebo: Seriousness, -1.5 (p=0.047) placebo -1.32, (p=0.036) Oxazepam: 'bad mood' -1.14, (p<0.01)
							Post-Intervention Cognitive Deficits	Oxazepam: 'alertness' (p<0.001)
Sarris, et al. (2012) [Australia, WPRO] [27]	Randomized controlled trial	Major Depressive Disorder (adults)	*Hypericum perforatum* (St John's wort) vs Sertraline	26 Weeks: SJW (LI-160, 900 – 1 500 mg, standardized for between 0.12 – 0.28 % hypericin) vs Sertraline (50 – 100 mg) vs placebo. All taken TID. SJW and Sertraline dose titrated according to response throughout trial	Placebo: matched to both active interventions	124 (35/49/40)	Hamilton depression rating scale (HAM-D) [Wk 10 to 26]	NS
							Beck Depression inventory (BD) and improvement (CGI-I) [Wk 10 to 26]	NS
							Global Assessment of Functioning (GAF) [Wk 10 to 26]	NS
							Clinical Global Impressions Scales for severity (CGI-S) [Wk 10 to 26]	NS
							Clinical Global Impressions Scales for severity (CGI-S) and improvement (CGI-I) [Wk 10 to 26]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Sarris, et al. (2013) [Australia, WPRO] [30]	Randomized controlled trial	Generalized Anxiety Disorder without Major Depressive Disorder (adults (age 18-65) with DSM-IV diagnosed MADRS > 17)	Aqueous extract of *Piper methysticum* (Kava)	6 weeks: 120mg Kavalactones OD (one 3 g tablet BID) for the first 3-week controlled phase, titrated to 240 mg of kavalactones in non-responders at the 3-week mark for the second 3-week controlled phase.	Placebo	Phase 1: 58 (29/29) Phase 2: 29 (13/16)	Hamilton Anxiety Rating Scale (HAM-A) [BL to Wk 6]	**Reduced anxiety** −7.6 points vs −4.2, (p=0.046). Effect more pronounced in those with moderate to severe pre-intervention anxiety (no other comorbid anxiety disorders) (p=0.020)
							Genetic polymorphisms assessed for improved response to Kava [BL to Wk 6]	GABA transporter polymorphisms rs2601126 (p=0.021) and rs2697153 (p=0.046) were found to be associated with greater HAM-A reduction in Kava group
							Beck Anxiety Inventory (BAI) [BL to Wk 6]	NS
Sarris, et al. (2014) [Australia, WPRO] [15]	Secondary analysis (sub-cohort from PMID: 2450-0245)	Major depressive disorder (adults score of > 25 on Inventory of Depressive Symptomatology – Clinician-Rated)	S-adenosylmethionine (SAMe) vs escitalopram	12 Weeks: SAMe 1600-3200 mg/day; escitalopram 10mg/day	Placebo	102 (32/35/35)	Hamilton Depression score (HAM-D) [BL to Wk 12]	**Reduced depression** SAMe -7.31; Escitalopram -6.69; placebo -4.00 (p=0.039) Between group (SAMe vs placebo, p=0.018)
							Response rates (HAM-D >50% reduction) [BL to Wk 12]	**Increased response** SAMe 45% Escitalopram 31% Placebo 26%
							Remission rates (<7) HAM-D [BL to Wk 12]	**Increased remission** SAMe, 34%; Escitalopram, 23%; Placebo, 6% (p=0.014) Between group (SAMe vs placebo, p=0.003)
							Correlation of BL histamine and carnitine levels with HAMD-17	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Sarris, et al. (2015) [Australia, WPRO] [16]	Secondary analysis (PMID: 2450-0245)					113 (62 Female/ 51 Male)	Hamilton Depression Rating Scale (HAM-D) [BL to Wk 12]	**Reduced in males** **Reduced** between SAMe to placebo for males (not females) (-8.9 vs -4.6, p= 0.034) NS difference between gender groups.
Sarris, et al. (2015) [Australia, WPRO] [37]	Randomized controlled trial	DSM-5-diagnosed obsessive-compulsive disorder (OCD) participants (18 – 70 years)	N-acetyl cysteine (NAC)	16 weeks: Week 1 1000mg Week 2 2000mg Week 3 3000mg	placebo	35 (20/15)	Yale – Brown Obsessive Compulsive Scale (YBOCS) [BL to Wk 4, 8, 12 and 16]	**Reduction in compulsion** Wk 12: NAC, (p=0.013) Wk 16: NAC, NS
							HAM-A [BL to Wk 4, 8, 12 and 16]	NS
							MADRS [BL to Wk 4, 8, 12 and 16]	NS
							CSG-S/I [BL to Wk 4, 8, 12 and 16]	NS
							General health (GHQ-28) [BL to Wk 4, 8, 12 and 16]	NS
Sarris, et al. (2016) [Australia, WPRO] [38]	Secondary analysis						Age (years), OCD severity (YBOCS total at baseline), duration of illness (years), gender, medication status, and OCD symptom presentation [BL to Wk 4, 8, 12 and 16]	Significant effect age (<34 p=0.037. remained with OCD severity as covariate (p-0.044) Significant effect for <34 less than 17year OCD duration (p=0.037)
Sarris, et al. (2019) [Australia, WPRO] [32]	Randomized controlled trial	Generalized Anxiety Disorder (GAD) (18-75 years; primary diagnosis of GAD at study entry (DSM-V; confirmed via the MINI International	L-theanine	10 Weeks Phase 1 450 mg of L-theanine first 4 weeks, titrated to 900 mg of L-theanine in minimal responders (<35% reduction in HAM-A) at	Placebo	46 (22/24)	Hamilton Anxiety Rate Score [BL to Wk 10]	NS
							Insomnia Severity Index [BL to Wk 10]	**Improved sleep for individuals with clinical insomnia** Between group: NS Participants without clinical insomnia: **Increased** self-reported sleep satisfaction (p=0.015)

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
		Neuro-psychiatric Interview version 6.0 and Hamilton Anxiety Rating Scale [HAMA] score ⩾16)		the 4-week mark for the second 4-week controlled Phase (phase 2)				**Reduced** difficulty falling asleep (p=0.049) problems waking up early (p=0.017) increased self-reported sleep satisfaction (p<0.001)
Sarris et al. (2018) [Australia, WPRO] [17]	Randomized controlled trial	Major Depressive Disorder (18-75 DSM-5 diagnostic criteria, currently taking an SSRI, SNRI, NaRI, tetracyclic (mirtazapine) or 5-HT2c antagonist (agomelatine) for a minimum of four weeks)	S-adenosylmethionine (SAMe); Folinic acid and co-factor vitamin B12	8 Weeks: SAMe (800 mg/day); Folinic acid (500 mcg/day) and Vitamin B12 (200 mcg/day), given in divided doses twice daily	Placebo	107 (55/52)	Montgomery-Asberg Depression Rating Scale [BL to Wk 8]	NS
							Beck Depression Inventory-II [BL to Wk 8]	NS
							Hamilton Anxiety Rating Scale [BL to Wk 8]	NS
							Short Form-12 [BL to Wk 8]	NS
							Leeds Sleep Evaluation Questionnaire [BL to Wk 8]	NS
							Clinical Global Impression Severity and Improvement (CGI-S, CGI-I) [BL to Wk 8]	NS
Sarris, et al. (2019) [Australia, WPRO] [18]	Randomized controlled trial	Major Depressive Disorder (18-70 DSM-5 diagnostic criteria, currently taking an SSRI, SNRI, NaRI, tetracyclic (mirtazapine) or 5-HT2c antagonist (agomelatine) for a minimum of four weeks)	Nutraceutical combination: SAMe, folinic acid, vitamin B12. Capsules: omega-3 fatty acid concentrate, 5-Hydroxy tryptophan, zinc picolinate, vitamin B6, vitamin C, magnesium (amino acid chelate, elemental, vitamin E	8 weeks: SAMe (800 mg/day) Folinic acid (500mcg/day) Vitamin B12 (200mcg/day) Omega-3 fatty acid concentrate (EPA-esters 1000 mg/day, DHA-esters 656 mg/day)	Placebo	158 (81/77)	Montgomery-Asberg Depression Rating Scale [BL to Wk 8]	NS
							Beck Depression Inventory II [BL to Wk 8]	NS
							Hamilton Anxiety Rating Scale [BL to Wk 8]	NS
							SF-12 -Short Form Survey-12 [BL to Wk 8]	NS
							Leeds Sleep Evaluation Questionnaire [BL to Wk 8]	NS
							Arizona Sexual Experience Questionnaire [BL to Wk 8]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
				5-HTP (200 mg/day) Zinc picolinate (30 mg elemental/ day) Vitamin B6 (100 mg/day) Vitamin C (60 mg/day) Magnesium (amino acid chelate, elemental 40 mg/day) Vitamin E (40IU/day)			CORE Assessment of Psychomotor Change [BL to Wk 8]	NS
							Clinical Global Impression (CGI) [BL to Wk 8]	NS
							CGI-S [BL to Wk 8]	NS
							CGI-I [BL to Wk 8]	NS
							The Systematic Assessment for Treatment Emergent Effects [BL to Wk 8]	NS
							The Sternbach and Hunter Serotonin Toxicity Criteria [BL to Wk 8]	NS
Scholey, et al. (2017) [Australia, WPRO] [44]	Randomized controlled trial	Sleep difficulties	Multi vitamin / herbal combination: Lactium™ (hydrolysed milk protein; alpha casozepine enriched) 75 mg; Sour date (Zizyphus jujube var. spinosa) ext. equiv. to dry seed 4.5 g; Hops (Humulus lupulus) ext. equiv. to dry flower 500 mg; Magnesium oxide (equivalent magnesium) 81.7 mg (52.5 mg); Vitamin B6; pyridoxine hydrochloride (equivalent pyridoxine) 10 mg (8.23 mg)	3 Weeks (includes 1 week single-blind placebo run-in) 2 tablets 30 min before sleep	Placebo	171 (85/86)	Pittsburgh Sleep Quality Index (PSQI) [BL to Wk 3]	NS
							Leeds Sleep Evaluation Questionnaire [BL to Wk 3]	NS
							Epworth Sleepiness Scale [BL to Wk 3]	NS
							Insomnia Severity Index [BL to Wk 3]	NS
							Consensus Sleep Diary [BL to Wk 3]	NS
							Burckhardt Quality of Life Scale [BL to Wk 3]	NS
							Chalder Fatigue Scale [BL to Wk 3]	NS
							Bond-Lader Visual Analogue Scale [BL to Wk 3]	NS
							State-Trait Anxiety Inventory State subscale [BL to Wk 3]	NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Stress and Fatigue Visual Analogue Mood Scales [BL to Wk 3]	NS
							Multi-tasking Framework [BL to Wk 3]	NS
Smith, et al. (2018) [Australia, WPRO] [19]	Uncontrolled trial	Major Depressive Disorder	Docosahexaenoic acid (DHA)	8 weeks: Low-dose DHA, (260 mg or 520 mg/day)	Nil	26	Hamilton Depression Rating Scale [BL to Wk 8]	**Reduced depression** -10.33, ($p<0.001$)
							⩾50% reduction on HAM-D [BL to Wk 8]	**Increased clinical response** Clinical response to treatment: 54% In remission: 46% ($p<0.0001$)
							Clinical Global Impression Severity Scale [BL to Wk 8]	**Reduced overall symptoms** -1.28, ($p<0.05$)
							Epsworth sleepiness scale [BL to Wk 8]	NS
Thirthalli, et al. (2013) [India, SEARO] [23]	Non- Randomized controlled trial	Major depression (hospital outpatients)	Yoga, combination yoga and anti-depression medication	*Yoga:* daily 1 hour yoga sessions for 2 weeks, then once/week check in yoga sessions for 2 weeks, then once/month for 2 months plus encouragement to practice at home. Anti-depressant medication: Either Fluoxetine (20-40 mg/day),	Anti-depressant medication: Either Fluoxetine (20-40 mg/day), Escitalopram (10-15 mg/day), Sertraline (50-100 mg/day) or Mirtazapine (15-30 mg/day) as prescribed by psychiatrist. Healthy hospital staff controls on no medication	72 (19/19/16/18)	Serum cortisol [BL to Mth 3]	**Reduced cortisol** Yoga groups $p=0.006$ Medication alone group NS Control group NS
							Hamilton Depression Rating Scale [BL to Mth 3]	**Direct correlation between reduction in depression and reduction in cortisol** Treatment groups total $p=0.001$ Yoga alone $p=0.008$ Yoga and medication NS Medication alone NS Control group NS

Author (year) [Country World, Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
				Escitalopram (10-15 mg/ day), Sertraline (50-100 mg/day) or Mirtazapine (15-30 mg/day) as prescribed by psychiatrist				
Usher, et al. (2019) [USA, AMRO] [40]	Non-randomized controlled trial	Psychotic episode (Age 15 to 25y, early Assessment and Support Alliance client or graduate (within past 2 years).	Holistic behavior intervention models to facilitate healthier living (M^3) (mindfulness meditation, cooking classes, field trips to a supermarket and a low-cost fast-food restaurant for hands-on learning, nutrition education, exercise, and moderated group discussion.	6 weeks: 6 sessions	Control (usual care)	33 (17/16)	Session attendance (target of ⩾50% of enrolled participants attending at least 4 out of 6 sessions) [BL to Wk 12]	Outcome met (88% completion rate of 4 or more sessions [mean 4.29, SD 1.26]).
							Anthropometric [BL to Wk 12]	NS
							Quick Scale for the Assessment of Negative – Positive Symptoms (QSANS-QSAPS) [BL to Wk 12]	**Increased negative symptoms** Behavior: Increased negative, t= -3.29 (p=0.02) Psychotropic medication: Increased positive, t=−3.10 (p = 0.004)
							Child and Youth Resilience Measure (CYRM) [BL to Wk 12]	Not reported
							Short Form Health Survey (SF-12) [BL to Wk 12]	Not reported
Zick, et al. (2011) [USA, AMRO] [45]	Randomized controlled trial	Insomnia for ⩾ 6-months	German chamomile *(Matricaria recutita)*	28 Days: 270 mg of chamomile twice daily	Placebo	34 (17/17)	Total sleep time (hrs) [BL to Dy 90]	NS
							Subjective sleep efficiency	NS
							Beck Depression Inventory	NS
							State Trait Anxiety Inventory – Trait Subscale	NS
							Fatigue Severity Scale	NS

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23 Musculoskeletal Conditions

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HIGHLIGHTS

- Musculoskeletal (MSK) conditions are seen in all age groups and are becoming a significant disease burden globally.
- The main MSK conditions that patients seeking naturopathic care present with include chronic pain, low back pain, injury related symptoms, osteoarthritis, fibromyalgia and sciatica.
- Naturopaths/NDs approach to MSK conditions employs a range of internal and external therapies and focuses on both the physical and psychological aspects for each patient.
- 89.3% of the research on naturopathic interventions for the treatment of MSK conditions indicated a positive outcome.

Musculoskeletal conditions represent a significant and growing disease burden globally, with increases observed across all regions, all age groups, and all income levels [1]. The musculoskeletal system is integral to good health and can include more than 150 diagnoses that affect the locomotor system. The musculoskeletal system provides form, stability and movement to the human body. It consists of the bones, muscles, tendons, ligaments, joints, cartilages, and connective tissues of the body but its central role can also pose major threats to health by limiting physical and mental capacities and functional ability [2]. The symptoms and conditions of the musculoskeletal system can be grouped into general or unspecific symptoms (e.g., pain, muscle cramps or spasms), arthritic or rheumatic conditions (e.g., gout, osteoarthritis, rheumatoid arthritis, fibromyalgia), joint or ligament injuries or disorders (e.g., bursitis, tendonitis, sciatica, plantar fasciitis, sprains, strains, carpal tunnel syndrome), bone disorders (e.g., osteopenia or osteoporosis) and other conditions (e.g., connective tissue disorders).

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=30) naturopathic researchers undertook in the field of musculoskeletal conditions. This research includes a total of 2,243 participants and was conducted in Germany (n=18), the United States of America (USA) (n=4), Australia (n=4), India (n=3) and Canada (n=2). The study designs include randomized control trials (n=26), uncontrolled trials (n=2), secondary analysis (n=2) and follow-up (n=1). The studied interventions featured a varying range of therapeutics including cupping (n=6), acupuncture (n=4), bodywork such as cranial sacral therapy (CST), *Gua Sha* therapy, *tai chi* and massage (n=4), yoga (n=4), clinical nutrition (n=3), hydrotherapy (n=3), complex naturopathic care (n=3), herbal medicine (n=2), dental (n=1) and Intravenous therapy (n=1).

The musculoskeletal conditions examined in these studies include chronic neck pain (n=13), osteoarthritis of the knee or hip (n=6), low back pain (n=3), fibromyalgia (n=2), heel pain (n=1), tendonitis (n=1), heel pain (n=1) and temporomandibular joint pain (n=2). Of all the naturopathic clinical studies examining musculoskeletal condition populations, 89.3% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 23.1: Clinical research investigating musculoskeletal conditions conducted by naturopathic researchers*. This body of naturopathic research on musculoskeletal conditions is also supported by over 50 observational studies and more than 50 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Naturopathic research demonstrates that patients who pursue naturopathic care for musculoskeletal conditions may benefit from naturopathic interventions. Musculoskeletal treatment was among the first clinical area for which naturopathic care gained prominence among the global population [3], and an international cross-sectional survey of naturopathic practice found that musculoskeletal conditions are the most common reason for patients to seek naturopathic treatment

[4]. Common musculoskeletal complaints identified in an international cross-sectional naturopathic survey included chronic pain, injury-related symptoms, osteoarthritis, fibromyalgia, and sciatica [4]. The inter-systems and holistic nature of naturopathic treatment lends itself well to treatment and management of musculoskeletal conditions, which are not only characterized by pain and reduced physical function of the musculoskeletal system itself, but can also lead to significant mental health decline, increased risk of developing other chronic health conditions and increased all-cause mortality [5]. Naturopathic treatment approaches varied widely, both in the cross-sectional survey and in the published literature reviewed below, which indicated the diverse and individualized naturopathic approach taken with patients presenting with musculoskeletal concerns.

The variety of naturopathic physical modalities studied by naturopathic physicians shows a diverse set of therapeutic tools, which is influenced by the long-standing historical focus of naturopathic care on musculoskeletal health [3]. As non-pharmacological approaches to treatment of musculoskeletal conditions become prioritized in primary health care [6], naturopaths/naturopathic doctors may be well-placed to play a greater role in integrative and multi-disciplinary models of musculoskeletal care. Musculoskeletal conditions are also one of the few areas where whole practice naturopathic care has demonstrable effectiveness as an intervention in multiple randomized controlled trials [7, 8], which suggests a larger primary care role for naturopaths/naturopathic doctors in this area. This holistic approach of naturopathic practice may be particularly important for patients who seek its care to treat musculoskeletal conditions, given that musculoskeletal conditions are also strongly associated with other elements of physical and mental health, and share many of the same preventable risk factors as other chronic conditions [5].

The increase in musculoskeletal conditions posing major threats to healthy ageing by limiting physical and mental capacities and functional ability [9], with profound consequences on an individual's ability to participate in social roles and in the prosperity of communities. While the contribution of musculoskeletal pain conditions to the global burden of disability has been widely acknowledged, this has largely not translated into global health policy initiatives [10]. There is a mismatch between the burden of musculoskeletal pain conditions and appropriate health policy response and planning internationally that can be addressed with an integrated research and policy agenda. Given the high levels of utilization of naturopathic care for musculoskeletal conditions, the historical focus of the naturopathic profession on musculoskeletal care, the holistic and inter-systems approach to naturopathic treatment that can address the whole person, and the active research presence of the naturopathic community in musculoskeletal research, naturopaths/naturopathic doctors should be considered in future policy responses to reducing the burden of musculoskeletal conditions.

Studies based on specific conditions:

Chronic Neck Pain

Fifteen studies investigated interventions on neck pain [11-25]. Six of those studies investigated different cupping treatments [11, 18-21, 25] and two investigated different acupuncture or acupressure protocols [17, 24]. Additional studies investigated thermotherapy [12], craniosacral therapy [16], Tai Chi [22], and yoga [13-15, 23].

Clinical finding

Cupping therapy may reduce neck pain, including pain at rest, movement-related pain, and neck disability while increasing quality of life in individuals with chronic non-specific neck pain. Cupping may also reduce pain in individuals with fibromyalgia.

A randomized controlled trial conducted in Germany investigated dry cupping for chronic non-specific neck pain [18]. Participants (n=25) received 5 treatments over two weeks and were compared to a waitlist group (n=25). Based on the Visual Analog Scale the treatment group experienced reduced pain at rest (cupping -19.4 vs waitlist +4.8; between groups -22.5, p=00002) and reduced movement-related pain (cupping -33 vs waitlist -12.9; between groups -17.8, p=0.01). There was a reduction in neck disability based on the Neck Disability Index (cupping -6.4; waitlist +0.1; between groups -6.3, p=0.002). An increase in quality of life, based on the Short Form 36 Questionnaire (SF-36), was reported on the scales related to bodily pain (between groups +13.8, p=0.006), vitality (between groups +10.2, p=0.006), social function (between groups +5, p=0.06) and mental health (between groups +11.4, p=0.04). A similar randomized controlled trial study from Germany (n=50) also investigated cupping for chronic neck pain delivered twice a week for three weeks (total of five treatments) with similar findings [25].

A randomized controlled trial conducted in India (n=60) investigated the addition of hot sand fomentation to an integrated treatment including yoga, a low fat and low salt vegetarian diet and sesame seed oil topical application over a five-day intervention [23]. The group that included the hot sand fomentation (n=30) reported a reduction in pain based on the Visual Analogue Scale

(-5.18 to -1.54, p<0.00), a reduction in neck disability (-23.27 to -11.07, p<0.001) and an increase in quality of life based on the SF-36 on the social functioning (+26.5 vs +15.25, p<0.035) and pain scale (+28.25 vs +10.09, p<0.01).

Low Back Pain

Five studies (n=700) on low back pain [7, 17, 26-28] were conducted. The interventions covered naturopathic care [7], a comparison of yoga to physical therapy [28], acupuncture [27], *Gua Sha* Therapy [25] and home-based needle stimulation [17].

Clinical finding

Yoga practice involving relaxation exercises, pranayama (yogic breathing), discussion of yoga philosophy and at-home yoga practice may reduce back pain and use of pain medication in individuals with chronic low back pain.

A large randomized control trial (n=320) conducted in the USA compared yoga, physical therapy (PT) and education for the treatment of chronic low back pain [28]. The yoga intervention (n=137) included relaxation exercises, pranayama, discussion of yoga philosophy and was supplemented with at-home daily practice materials. Following initial program (week 1 – 12), participants were re-randomized to a structured yoga maintenance program (n=64) or no structured maintenance (n=64). The PT intervention (n=129) included specific exercises, or stabilization exercises which were supplemented with at-home daily exercises. At twelve-weeks, participants were re-randomized to a structured PT maintenance program (n=64) or no structured maintenance (n=64). The education group consisted of an educational pamphlet "The Back Pain Help Book" with assignment sheet. Based on the Modified Roland Morris Disability Questionnaire both yoga and PT resulted in >30% reduction in disability score compared to education-alone group (yoga vs education 3.1 [95% CI 1.6 to 6.2], PT vs education 2.0 [95% CI 1.0 to 4.0]) [28]. All group showed a reduction in back pain with the greatest decrease based on the Back Pain Intensity Score reported in the PT group (yoga, -1.7; PT, -2.3; education, -1.4). The reduction in self-reported pain medication use was highest when comparing yoga to education alone (0.36 [95% CI 0.17 to 0.78].

A randomized controlled trial conducted in Canada (n=75) compared generalized naturopathic medical care (NM) (n=39) to a standardized educational booklet on exercise and relaxation exercises (n=36) for chronic low back pain over a twelve-week period of time [7]. The naturopathic care consisted of acupuncture, breathing exercises, nutritional counselling and physical exercises. Participants in the NM group reported a greater reduction in low back pain compared to the control group (Oswestry Low Back Pain Disability Questionnaire [Oswestry]: -5.0, p<0.0001). They also reported an increased quality of life on a number of scales from the SF-36: physical component (+8.47, p<0.0001), mental component (+5.56, p<0.0045), physical functioning (+5.56, p<0.0033), physical role (+11.48, p<0.001), bodily pain (+10.83, p<0.0001), general health (+7.18, p=0.0002), social functioning (+10.57, p<0.0001), emotional role (+8.05, p=0.0090) and mental health (+7.44, p=0.0003). Based on the Roland Morris Disability Questionnaire the NM group reported a reduction in disability (-4.0) while the education-only group reported an increase (+2.0) (between group, p<0.0001). The NM group also reported a reduction in number of NSAID pills used per week (-1.0) compared to the education group (+1.3).

Clinical finding

Naturopathic care involving acupuncture, breathing exercises, nutritional counselling and physical exercises may reduce low back pain, disability and use of pain medication, while increasing quality of life in individuals with chronic low back pain.

Osteoarthritis

Five studies investigated treatment approaches to osteoarthritis of the knee [29-33], with one study including participants with osteoarthritis of the hip [34]. Two studies examined the effects of clinical nutrition interventions on knee [32] and knee and hip osteoarthritis [34]. One study examined the effect of cabbage leaf wraps on knee osteoarthritis [31], while another investigated Swedish massage therapy [33].

The randomized controlled trial conducted in the USA on Swedish massage therapy investigated optimal treatment frequency strategies for knee osteoarthritis compared to usual care in 125 individuals [33]. The four intervention arms included 25 participants each and compared 8 weeks of 30 minutes massage once per week, 4 weeks of 30 minutes massage twice per week, followed by 4 weeks of 30 minutes massage once per week, 8 weeks of 60 minutes massage once per week, and 4 weeks of 60 minutes massage twice per week followed by 4 weeks of 60 minutes massage once per week. The investigators found that the optimal treatment duration that produced significant reductions in pain was 60 minutes. All 60-minute treatment groups showed significant improvements in pain compared to usual care, indicating that once-weekly massages would be an effective dosing strategy for improving osteoarthritis knee pain.

A randomized controlled trial conducted in Germany (n=81) investigated the effects of cabbage leaf wrapping for two hours/day for 4 weeks on osteoarthritis of the knee compared to topically applied diclofenac gel and usual care [31]. Investigators found significant reductions in pain (-12.2 mm on a 100mm Visual Analog Scale, p = 0.033) when cabbage leaf wrapping was compared to usual care; however, this difference was not significant compared to the topical diclofenac group. At the 12-week follow-up, there were no significant differences in knee pain scores between any of the groups suggesting that the cabbage leaf wrapping was as effective as topical diclofenac prescription.

Clinical finding

Cabbage leaf wrap may be as effective as topical anti-inflammatory gel in reducing knee pain in individuals with knee osteoarthritis.

Fibromyalgia

Two studies investigated two different treatment approaches to fibromyalgia [35, 36]. A randomized controlled trial conducted in Germany investigated the effects of cupping therapy on participants with fibromyalgia (n = 141) [36]. Participants were randomized into three separate groups. Group one received five cupping sessions over eighteen days (n = 47). Group two received five sham cupping sessions over eighteen days (n = 48). Group three served as a waitlist control (n = 46). On day eighteen, participants in the intervention group reported a significant decrease in pain based on the Visual Analog Scale (-12.4 mm difference, $p < 0.001$) compared to the waitlist control group but not to the sham cupping group (-3.0 mm difference, p = 0.396).

Other Musculoskeletal Conditions

Other musculoskeletal conditions researched included heel pain [37], temporomandibular joint pain [38, 39] and rotator cuff tendonitis [8]. An Indian study on heel pain (n=20) compared complex hydrotherapy to standard naturopathic physical care [37]. The hydrotherapy included alternating compresses to the heels and partial or vibrational massage to the legs, along with hot foot baths and mud packs. Based on the Visual Analogue Scale both groups showed reduced pain and based on the FFI both showed increased function, yet the increase was more significant in the complex hydrotherapy group.

Clinical finding

Naturopathic care involving herbal medicine, nutritional supplements, and diet and lifestyle advice may reduce facial pain in individuals with temporomandibular joint pain.

A temporomandibular joint pain randomized controlled trial conducted in the USA (n=128) comparing three treatment style interventions: traditional Chinese Medicine (n=42) (acupuncture, herbal therapy, massage and relaxation tapes), naturopathic medicine (n=36) (herbal medicine, nutritional supplementation, nutritional and lifestyle advice, stress reduction advice) to specialty dental care (n=50) (education, bite splints, self-care counselling and pain management strategies) [38]. All groups resulted in a reduction in their worst facial pain, but the improvement was greatest in the naturopathic medicine group.

Clinical finding

Naturopathic care involving dietary counselling, acupuncture and nutritional supplements may reduce pain and disability and increase quality of life in individuals with rotator cuff tendonitis.

A randomized control trial conducted in Canada (n=85) compared complex naturopathic care to standardized physical exercise (PE) for participants with rotator cuff tendonitis. The naturopathic medical care (NM) included dietary counselling, standardized acupuncture, and nutritional supplementation with Phlogenzym (bromelain [90mg], trypsin [48 mg] and rutin [100 mg]). The intervention lasted twelve weeks and resulted in significant reductions in pain and disability based on the Shoulder Pain and Disability Index (NM, -42.34; PE -23.59; between groups, -29.66, $p<0.0001$), reduced pain based on the visual pain analog scale (-1.67, $p<0.0001$) and an increased quality of life on all domains on the SF-36.

Table 23.1 Clinical research investigating musculoskeletal conditions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Ali, et al. (2009) [USA, AMRO] [35]	Randomized controlled trial	Fibromyalgia syndrome	Intravenous micronutrient therapy (Myers' Cocktail): Magnesium chloride hexa-hydrate, 20% (5mL); Calcium gluconate, 10%) (3mL); Hydroxyocobalamin, 1000u/mL (1mL); Pyridoxine hydrochloride, 100mg /mL (1mL); Dexpanthenol, 250mg /mL (1mL); B-complex 100 (1mL) containing thiamine HCl [100mg], riboflavin [2mg], pyridoxine HCl [2mg], panthenol [2mg], niacin-amide [100mg + 2% benxyl alcohol], vitamin C [5mL of 500mg/mL], 20mL of sterile H20	8 weeks (+ 4-week washout): one infusion per week	Placebo	35 (17/18)	Tender Point Index [BL to Wk 8]	NS
							Visual Analogue Scale [BL to Wk 8]	NS
							Fibromyalgia Impact Questionnaire [BL to Wk 8]	NS
							Beck Depression Inventory [BL to Wk 8]	NS
							Health Status Questionnaire [BL to Wk 8]	NS
Arankalle, et al. (2016) [India, SEARO] [37]	Randomized controlled trial	Heel pain	Alternating compresses (AC) to heels and partial or vibro massage to legs (Neutral Immersion Bath; Hot Foot Bath; Infrared Radiation; Neutral Immersion Bath; Mud Pack	6 days	Naturopathic physical care (NPC)	20 (10/10)	Visual Analogue Scale [BL to Dy 6]	**Reduced pain** AC: -1.48 (p<0.001) NPC: -1.0 (p<0.001) Between group: NS
							Foot Functional Index (FFI) [BL to Dy 6]	**Increased function** AC: -18.47 (p-0.001) NPC: -14.99 (p=0.005) Between group: p=0.007
Cramer et al. (2011) [Germany, EURO] [11]	Randomized controlled trial	Chronic non-specific neck pain	Pneumatic pulsation therapy: pulsating cupping applied to neck and shoulder areas where manual pressure and lifting of the skin caused the most discomfort (5 treatments over 2 wks)	2 weeks: 5 treatments	Standard care: self-directed standard medical care, including physiotherapy, sports activities, and analgesics as needed	50 (25/25)	Pain intensity (numerical rating scale) [BL to Wk 2.5]	**Reduced pain intensity** Acupuncture: -1.4; Standard care: +0.24 Between group: p=0.001
							Total pain at motion (Visual Analogue Scale) [BL to Wk 2.5]	**Reduced total pain at motion** Acupuncture: -8.1; Standard care: +4.1 Between group: p < 0.001
							Maximum pain at motion (Visual Analogue Scale) [BL to Wk 2.5]	**Reduced maximum pain at motion** Acupuncture: -2.5; Standard care: -0.26 Between group: p=0.004

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Functional disability (Neck Disability Index) [BL to Wk 2.5]	**Reduced functional disability** Acupuncture: -5.5; Standard care: -0.3 Between group: p=0.025
							Short Form-36 (SF-36) health survey – physical component [BL to Wk 2.5]	**Increased physical function** Acupuncture: +3.7; Standard care: -1.2 Between group: p=0.002
							SF-36 health survey – mental component [BL to Wk 2.5]	NS
Cramer, et al. (2012) [Germany, EURO] [12]	Randomized controlled trial	Neck pain (chronic)	Thermotherapy self-treatment: mud heat pad	14 days: 20 min, once per day	Wait list	50 (25/25)	Visual Analogue Scale [BL to Dy 14]	**Reduced pain** Thermotherapy: -23.24 Waitlist: +0.04 Between group: -16.0 (p=0.003)
							Neck Disability Index [BL to Dy 14]	NS
							Short form-36 [BL to Dy 14]	NS
							Mechanical detection threshold [BL to Dy 14]	**Reduced threshold to mechanical detection** Thermotherapy: -0.22 Waitlist: +0.14 Between group: -0.35 (p=0.001)
							Vibration detection threshold [BL to Dy 14]	**Reduced threshold to vibration detection** Thermotherapy: +0.58 Waitlist: +0.01 Between group: +0.49 (p=0.032)
							Pressure pain threshold [BL to Dy 14]	NS
							Pain diary [BL to Dy 14]	**Reduced pain** Between group: F (13,585) =3.02 (p=0.013)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Cramer, et al. (2013) [Germany, EURO] [13]	Randomized controlled trial	Chronic non-specific neck pain	Iyengar yoga	9 weeks: weekly 90 minute class	Home-based exercise program (10mins daily)	51 (25/26)	Pain intensity (Visual Analogue Scale 100mm) [BL to Wk 9]	**Reduced pain intensity** Yoga -28.6; exercise -3.1 Between group 13.9 (p=0.030) Pain at motion NS
							Neck Disability Index [BL to Wk 9]	**Reduced disability** Yoga -10; exercise -0.4 Between group -7.8 (p=0.006)
							Health related quality of Life Short form-36 [BL to Wk 9]	**Improved** Between groups: Bodily pain (7.8, p=0.001) Social functioning (6.0, p=0.027) Emotional role functioning (7.9, p=0.005) Mental quality of life (6.1, p=0.016)
							Range of Motion [BL to Wk 9]	**Increased ROM** Yoga 32.5; exercise -1.0 Between group 27.1 (p=0.036)
							Joint position errors (JPE) [BL to Wk 9]	**Reduced** Yoga -2; exercise -21.1 Between group -1.8 (p=0.006)
							Pressure pain threshold [BL to Wk 9]	**Increased pressure pain threshold** At all measurement sites (Between group, p<0.05)
Cramer, et al. (2013) [Germany, EURO] [14]	12 month follow-up					36 (22/14)	Visual Analogue Scale (intensity) [BL to Mth 12]	**Reduced pain intensity** Mth 12: -16.5 (p<0.001)
							Neck Disability Index [BL to Mth 12]	**Reduced disability** Mth 12: -5.77 (p=0.001)
							Generic disability (days non-functioning) [BL to Mth 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Cramer, et al. (2013) [Germany, EURO] [15]	Secondary sub-analysis					18	Short Form-36 (SF-36) health survey [BL to Mth 12]	**Increased bodily function** Pain-related bodily function: +9.98 (p=0.005) Physical functioning: NS Physical role: NS General health: NS Vitality: NS Social functioning: NS Emotional role: NS Mental health: NS: Total physical component: NS Total mental component: NS
							Participant drawings and semi-structured interview – Physical dimension [Wk 9]	**Improved physical dimension** Renewed awareness of and approach to bodily functions. More balanced and natural perception of body.
							Participant drawings and semi-structured interview – Cognitive dimension [Wk 9]	**Improved cognitive dimension** Greater perceived control over body, health and general well-being in daily life. Feeling less controlled by pain.
							Participant drawings and semi-structured interview – Emotional dimension [Wk 9]	**Improved emotional dimension** Deep relaxation, less irritability and different perceptions of emotions. Improved coping and pain acceptance.
							Participant drawings and semi-structured interview – Behavioral dimension [Wk 9]	**Improved behavioral dimension** Use of yoga as self-help/coping strategy to relieve or prevent stress and pain. Reduced reliance on pain medication.

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Participant drawings and semi-structured interview – Social dimension [Wk 9]	**Improved social dimension** Re-engagement with preferred social activities, greater self-determination. Enriched work and social lives.
Coulson, et al. (2012) [Australia, WPRO] [29]	Uncontrolled trial	Osteoarthritis (knee)	*Perna canaliculus* (green-lipped mussel) extract	12 weeks, 15g BID	Nil	21	Lesquesne Index [BL to Wk 4 and 8]	**Reduced osteoarthritis severity** Wk 4 (-2.86, p=0.001) Wk 8 (-4.03, p<0.001)
							Western Ontario McMaster Universities Arthritis Index [BL Wk 4 and 8]	**Reduced total symptoms** Wk 4 (-11.63, p=0.001) Wk 8 (-18,833, p<0.001)
							Gastrointestinal symptom rating score [BL Wk 4 and 8]	**Reduced gastrointestinal symptoms** Wk 4 (-4.26 (p=0.004) Wk 8 (-3.96 (p=0.005)
							Rescue medication use [BL Wk 4 and 8]	14/21 used rescued medication
							Adverse symptoms [BL Wk 4 and 8]	Reflux (n=1), abdominal pain, reflux, and diarrhea (n=1), gout (n=2)
							Blood pressure [BL Wk 4 and 8]	NS
Coulson, et al. (2013) [Australia, WPRO] [30]	Randomized controlled trial	Osteoarthritis (knee)	*Perna canaliculus* (green-lipped mussel) extract	12 weeks, 15g BID	Glucosamine sulfate 1.5 g twice daily	38 (21/17)	Total fecal bacteria count, as well as levels of four genera of aerobic and six anaerobic bacteria as well as yeast [BL to Wk 12]	NS
							Lesquesne Index [BL to Wk 12]	NS
							Western Ontario McMaster Universities Arthritis Index [BL to Wk 12]	NS
							Gastrointestinal symptom rating score [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Adverse effects	NS
Haller, et al. (2016) [Germany, EURO] [16]	Randomized controlled trial	Neck pain (chronic)	Craniosacral therapy	8 weeks: craniosacral therapy, lasting 45 minutes, once per week	Sham: light touch applied to standardized anatomic areas for 2 minutes each time, once per week	54 (27/27)	Pain on Movement Questionnaire [BL, Wk 8, Wk 20]	**Reduced pain** Wk 8: CST -28.8; Sham -11.2 Between group -18.6 (p=0.001) Wk 20: CST -31.2; Sham -21.1 Between group -11.4 (p=0.020)
							Visual Analogue Scale, intensity [BL, Wk 8, Wk 20]	**Reduced pain intensity** Wk 8: CST -32.4; Sham -16.6 Between group -21.0 (p=0.001) Wk 20: CST -32.5; Sham -21.1 Between group -16.8 (p=0.003)
							Pressure pain sensitivity test [BL, Wk 8, Wk 20]	Point of max. pain: NS M. levator scapulae: NS M. trapezius: NS M. semispinalis capitis: NS
							Neck Disability Index [BL, Wk 8, Wk 20]	**Reduced disability** Wk 8: CST -14.8; Sham -4.5 Between group -8.2 (p=0.010) Wk 12: CST -13.9; Sham -5.4 Between group, -6.5 (p=0.006)
							Short Form-12, Physical [BL, Wk 8, Wk 20]	**Increased quality of life** Physical Wk 8: CST +9.2; Sham +2.1 Between group -8. (p=0.010) Wk 12: CST +10.5; Sham +2.0 Between group -6.5 (p=0.006)
							Short Form-12, Mental [BL, Wk 8, Wk 20]	NS
							Questionnaire for Assessing Subjective Physical Wellbeing [BL, Wk 8, Wk 20]	NS
							Hospital Anxiety and Depression Scale [BL, Wk 8, Wk 20]	**Reduced Anxiety** Wk 8: CST -1.6; Sham -0.1 Between group -1.0 (NS) Wk 20: CST -1.9; Sham +0.7 Between group -2.1 (p=0.020) Depression: NS

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							Perceived Stress Questionnaire [BL, Wk 8, Wk 20]	NS
							Emotional/Rational Disease Acceptance Questionnaire [BL, Wk 8, Wk 20]	NS
							Scale of Body Connection [BL, Wk 8, Wk 20]	NS
							Global Impression of Improvement [BL, Wk 8, Wk 20]	**Increased impression of improvement** Wk 8: CST 2.2; Sham 3.3 Between group -1.0 (p<0.001) Wk 20: CST 2.3; Sham 3.1 Between group -0.7 (p=0.029)
Hohmann, et al. (2012) [Germany, EURO] [17]	Randomized controlled trial	Chronic neck pain (CNP) / low back pain (LBP)	Home-based, self-administered needle stimulation pad: press both hands (CNP group) or both feet (LBP group) on the pad, then place the pad on a soft base (e.g., bed) and lie on top of the mat with the neck (CNP group) or back (LBP group) uncovered. Pain medication with the exception of corticosteroids, physiotherapy	14 days: 10 minutes per day for hands or feet; 30 minutes for neck or back.	Waitlist	82	Pain, Numeric Rating Scale [BL to Dy 14]	**Reduced pain** CNP: -1.6 (p=0.021) LBP: -2.3 (p<.001)
							Mechanical Detection Threshold [BL to Dy 14]	NS
							Vibration Detection Threshold [BL to Dy 14]	NS
							Pressure Pain Threshold (area of maximum pain) [BL to Dy 14]	**Increased threshold to pain** CNP: +0.106 (p = .032) LBP: +0.082 (p = .013)
							Pressure Pain Threshold (10cm close to area of maximum pain) [BL to Dy 14]	**Increased threshold to pain** CNP: NS LBP: +0.073 (p = .018)
							Neck Pain Questionnaire [BL to Dy 14]	**Reduced neck pain** CNP: -7.4 (p = 0.028)
							Oswestry Disease Index [BL to Dy 14]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Lauche, et al. (2011) [Germany, EURO] [18]	Randomized controlled trial	Chronic non-specific neck pain	Dry cupping therapy: performed according to patient pain diagram and physical examination to determine areas of muscle tension and myogeloses	10-20 min, every 3-4 days for five treatments	Waitlist	50 (25/25)	Pain at rest, Visual Analog Scale [BL to Day 18]	**Reduced pain at rest** Cupping: -19.4; Waitlist: +4.8 Between groups – 22.5 (p=0.00002)
							Maximal pain related to movement, Visual Analog Scale [BL to Dy 18]	**Reduced movement-related pain** Cupping: -33; Waitlist: -12.9 Between groups -17.8 (p=0.01)
							NDI [BL to Dy 18]	**Reduced neck disability** Cupping: -6.4; Waitlist: +0.1 Between groups -6.3 (p=0.002)
							Short Form-36 [BL to Dy 18]	**Increased Quality of Life** Bodily pain Cupping: +13.4; Waitlist: -2.9 Between groups 13.8 (p=0.006) Vitality Cupping: +8.9; Waitlist: +0.5 Between groups 10.2 (p=0.006) Social function Cupping: +11.9; Waitlist: -1.1 Between groups 5 (p=0.06) Mental Health Cupping: +5; Waitlist: -4.7 Between groups 11.4 (p=0.04) Physical functioning: NS Role physical: NS General health perception: NS Role emotional: NS Mental health: NS Physical Component Score: NS
							MDT at two pain-related and control areas [BL to Dy 18]	NS
							PPT at two pain-related and control areas [BL to Dy 18]	**Pain thresholds increased in cupping, decreased in waitlist** pain-related areas

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								Cupping: -0.5; Waitlist: -0.4 Between groups 0.08 (p=0.026) pain-adjacent areas Cupping: +0.4; Waitlist: -0.7 Between groups 11 (p=0.001) Hand Cupping: +0.1; Waitlist: -0.8 Between groups 0.07 (p=0.034) Foot Cupping: +0.19; Waitlist: +0.06 Between groups 0.12 (p=0.004)
							VDT at two pain-related and control areas [BL to Dy 18]	NS
Lauche, et al. (2012) [Germany, EURO] [19]	Randomized controlled trial	Chronic, non-specific neck pain	Cupping therapy: superficial incisions made at areas of pain, and covered with double-walled glass cups using flame-generated vacuum	15 minutes (+ 3 day washout): 1 cupping treatment; 10-15 minutes	Waitlist control	50 (25/25)	Pain at rest, Visual Analog Scale [BL to 15 minutes]	**Reduced pain at rest** Cupping: -16.4; Waitlist: +3.1 Between group: -17.9 pts (p=0.003)
							Maximal pain related to movement, Visual Analog Scale [BL to Dy 3]	**Reduced movement-related pain** Cupping: -24.8; Waitlist: -11.8 Between group: -19.7 pts (p = 0.003)
							Neck Disability Index [BL to Dy 3]	NS
							Short Form-36 [BL to Dy 3]	**Increased Quality of Life** Physical functioning: Cupping, +5.5; Waitlist, -1.1 Between group, +7.5 (p = 0.017) Bodily pain: Cupping, +15.3; Waitlist, -0.4 Between group, +14.9 (p = 0.007) Physical component score: Cupping, +5.5; Waitlist, +1.1 Between group, +5.0 (p = 0.008)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Role physical: NS General health perception: NS Vitality: NS Social function: NS Role emotional: NS Mental health: NS Mental Component Score: NS
Lauche, et al. (2013) [Germany, EURO] [20]	Secondary analysis of 4 trials	Chronic non-specific neck pain	Wet cupping treatment (single application), Dry cupping (5 applications), Pulsating cupping (5 applications), of Cupping massage (5 applications) (2 yr follow-up post-intervention, pooled across four studies)	2 years Follow-up post intervention	Nil	133	Pain intensity, Visual Analog Scale [BL to Mth 24]	NS
							Functional Disability (NDI) [BL to Mth 24]	**Reduced disability** -3.5 (p=0.025)
							SF-36 [BL to Mth 24]	**Increased quality of life** Bodily pain +14.6 (p<0.001) Physical component study +3.0 (p=0.004)
Lauche, et al. (2013) [Germany, EURO] [21]	Randomized controlled trial	Chronic neck pain	Self-directed partner-delivered cupping massage	12 weeks: 10-15 min, twice per wk, for 12 wks, with initial 1 hr workshop training	Progressive muscle relaxation	61 (30/31)	Pain intensity, Visual Analog Scale [BL to Wk 12]	NS
							Pain on motion, Visual Analog Scale [BL to Wk 12]	NS
							Pain Description List [BL to Wk 12]	NS
							Neck Disability Index [BL to Wk 12]	NS
							Hospital Anxiety and Depression Scale [BL to Wk 12]	NS
							Short Form-36 [BL to Wk 12]	NS
Lauche, et al. (2016) [Germany, EURO] [31]	Randomized controlled trial	Osteoarthritis (knee)	Cabbage leaf wraps (CLW) (1-2 leaves applied as a poultice)	4 weeks: 2hrs per day	Diclofenac gel (TPG) and usual care (UC)	81 (27/27/27)	Pain intensity, Visual Analog Scale [BL to Wk 4, Wk 12]	**Reduced pain** UC Wk 4: Between group -12.2 pts (p=0.033) Wk 12: NS TPG Wk 4: NS Wk 12: NS

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							Western Ontario and McMaster Universities Arthritis Index [BL to Wk 4, Wk 12]	**Reduced disability** Pain Wk 4: Cabbage leaf -1.3; Usual care +0.2 Between group (UC) -1.3 (p=0.002) Between group (TPG) NS Wk 12: Cabbage leaf -1.0; Usual care +0.2 Between group (UC) -1.1 (p=0.009) Between group (TPG) NS Stiffness Wk 4: Cabbage leaf -1.0; Usual care +0.3 Between group (UC) -1.1 (p=0.031) Between group (TPG) NS Wk 12: Cabbage leaf -1.0; Usual care +0.4 Between group (UC) -1.1 (p=0.039) Between group (TPG) NS Physical function Wk 4: Cabbage leaf -0.9; Usual care +0.3 Between group (UC) -1.2 (p=0.002) Between group (TPG) NS Wk 12: Cabbage leaf -0.8; Usual care +0.3 Between group (UC) -1.0 (p=0.017) Between group (TPG) NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Short Form-36 [BL to Wk 4, Wk 12]	**Increased Quality of Life** Physical component Wk 4: Cabbage leaf +4.1; Usual care +1.3; Diclofenac -0.9 Between group (UC) NS Between group (TPG) +5.0 (p=0.004) Wk 12: Cabbage leaf +4.5; Usual care +0.1; Diclofenac -2.2 Between group (UC) +4.3 (p=0.007) Between group (TPG) +7.8 (p=0.0001) Physical functioning Wk 4: Cabbage leaf +7.2; Usual care -2.5 Between group (UC) +9.4 (p=0.004) Between group (TPG) NS Wk 12: Cabbage leaf +8.3; Usual care -0.9; Diclofenac -0.9 Between group (UC) +9.0 (p=0.019) Between group (TPG) +12.0 (p=0.026) Physical role functioning Wk 4: NS Wk 12: Cabbage leaf +5.5; Diclofenac -16.4 Between group (UC) NS Between group (TPG) +22.1 (p=0.024)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Bodily pain Wk 4: NS Wk 12: Cabbage leaf +9.0; Usual care -1.2; Diclofenac -1.7 Between group (UC) +10.7 (p=0.007) Between group (TPG) +13.7 (p=0.003) General health perception Wk 4: NS Wk 12: Cabbage leaf +3.7; Diclofenac -5.0 Between group (UC) NS Between group (TPG) +8.9 (p=0.024) Mental component: NS Vitality: NS Social role functioning: NS Emotional role functioning: NS Mental health: NS
							Arthritis-specific self-efficacy short-form scale [BL to Wk 4, Wk 12]	NS
							Physical Function (30 second Chair Stand Test) [BL to Wk 4]	**Reduced Pain** Number of sit ups: NS Pain: Cabbage leaf -1.2 Usual care -0.4 Between group (UC) -1.4 (p=0.003) Diclofenac -0.1 Between group (TPG) -1.3 (p=0.033)
							Pressure Pain Sensitivity Threshold [BL to Wk 4]	**Increased threshold to pressure pain** Maximum: NS Quadriceps muscle: Cabbage leaf, +16.5;

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Usual care -64.1; Diclofenac -53.2 Between group (UC) +77.8 (p=0.010) Between group (TPG) +90.2 (p=0.039) Pes anserinus: Cabbage leaf +59.1; Usual care -31.3 Between group (UC) +127.1 (p=0.010) Between group (TPG) NS Lateral joint line: NS
Lauche, et al. (2016) [Germany, EURO] [22]	Randomized controlled trial	Chronic non-specific neck pain	Group 1: Tai chi (Yang style): 5-10 minute warm up, Tai Chi form practice, and 5-10 minute relaxation; asked to practice 15 minutes per day outside of class Group 2: Neck exercises: rehabilitation exercises including education for a healthy back; ergonomic principles, proprioceptive exercises, isometric and dynamic stabilization, stretching, and strengthening neck and core exercises; 5-10 minute warm up and relaxation exercises at end; asked to execute exercises 15 minutes per day	12 weeks: Tai chi -75-90 min/wk Neck exercises 60-75 min/wk session	Waitlist	114 (38/37/39)	Visual Analogue Scale, intensity [BL to Wk 12]	**Reduced pain intensity** Tai chi: -18.0; Waitlist: -9.7 Between group (WL): -10.5 (p=0.033) Between group (Neck): NS
							Pain on Movement [BL to Wk 12]	**Reduced pain on movement** Tai chi: -14.9; Waitlist: -2.2 Between group (WL): -12.0 (95% CI -18.7 to -5.4) Between group (Neck): NS
							Neck Disability index [BL to Wk 12]	**Reduced neck disability** Tai chi: -9.3; Waitlist: -1.8 Between group (WL): -7.2 (95% CI -11.7 to -2.7) Between group (Neck): NS
							Disability in days [BL to Wk 12]	NS
							Everyday function, Visual Analogue Scale [BL to Wk 12]	**Reduced impact on everyday function** Tai chi: -12.8; Waitlist: -2.3 Between group (WL): -9.9 (95% CI -17.8 to -2.1) Between group (Neck): NS
							Leisure, Visual Analogue Scale [BL to Wk 12]	**Reduced impact on leisure** Tai chi: -16.9; Waitlist: -7.4 Between group (WL): -9.9 (95% CI -19.0 to -0.7) Between group (Neck): NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Short Form-36 [BL to Wk 12]	**Increased quality of life** Physical component Tai chi, +3.17; Waitlist, -0.7 Between group (WL), +4.1 (95% CI +1.1 to +7.0) Between group (Neck), NS Physical functioning Tai chi, +2.6; Waitlist, -4.5 Between group (WL), +7.0 (95% CI +0.1 to +13.9) Between group (Neck), NS Bodily pain: Tai chi, +12.2; Waitlist: -0.3 Between group (WL): +9.1 (95% CI +2.1 to +16.0) Between group (Neck): NS Vitality: Tai chi, +5.1; Waitlist: -0.2 Between group (WL): +5.5 (95% CI +0.5 to +10.5) Between group (Neck): NS Mental component: NS Physical role functioning: NS General health perception: NS Social role functioning: NS Emotional role functioning: NS Mental health: NS
							Hamilton Anxiety and Depression Score [BL to Wk 12]	NS
							General wellbeing [BL to Wk 12]	**Increased wellbeing** Ability to enjoy: Tai chi, +0.6; Waitlist: -0.6 Between group (WL): +1.1 (95% CI +0.1 to +2.0) Between group (Neck): NS Resilience: NS Vitality: NS Ease of mind: NS
							Perceived Stress Scale [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Multidimensional Assessment of Interoceptive awareness [BL to Wk 12]	**Increased interoceptive awareness** Trusting: Tai chi, +0.3; Waitlist: +0.0 Between group (WL): +0.3 (95% CI +0.0 to +0.6) Between group (Neck): NS Noticing: NS Not distracting: NS Not worrying: NS Attention regulation: NS Emotional awareness: NS Self-regulation: NS Body listening: NS
Lauche, et al. (2016) [Germany, EURO] [36]	Randomized controlled trial	Fibromyalgia Syndrome	Cupping therapy on upper and lower back	18 days: 30 min, 5 sessions	Sham cupping control, Usual care (as waitlist control)	141 (47/48/46)	Pain Visual Analog Scale [BL to Dy 18]	**Reduced pain** Between group (UC), -12.4 ($p<0.001$) Between group (Sham), NS
							Fibromyalgia Impact Questionnaire [BL to Dy 18]	NS
							Short Form-36 [BL to Dy 18]	**Increased quality of life** Bodily pain: Cupping, +9.4; Usual care, +7.0 Between group (UC), +4.7 Between group (Sham), NS Mental component: Cupping, +2.8; Usual care, +0.2 Between group (UC), +3.4 (95%CI 0.8-5.9) Between group (Sham), NS Vitality: Cupping, +5.4; Usual care, -0.6 Between group (UC), +6.3 (95%CI 0.9-11.7) Between group (Sham), NS Social role functioning: Cupping, +5.3; Usual care, -1.1 Between group (UC), +7.1 (95%CI 0.1-14.1) Between group (Sham), NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Mental health: Cupping, +4.2; Usual care, 10.2 Between group (UC), +4.5 (95%CI 0.0-8.9) Between group (Sham), NS Physical component: NS Physical functioning: NS Physical role functioning: NS General health perception: NS Emotional role functioning: NS
							Pain perception [BL to Dy 18]	NS
							Fatigue [BL to Dy 18]	**Reduced motivation** Reduced motivation: Cupping, -0.2; Usual care, -0.4 Between group (UC), -1.2 Between group (Sham), NS General fatigue: NS Physical fatigue: NS Reduced activity: NS Mental fatigue: NS
							Sleep [BL to Dy 18]	NS
							Pressure pain sensitivity [BL to Dy 18]	NS
Myers, et al. (2010) [Australia, WPRO] [32]	Randomized controlled trial	Osteoarthritis (knee)	Maritech seaweed extract	12 weeks: 1000 mg/day	100 mg/day	12 (5/7)	Comprehensive Arthritis Test (COAT) score [BL to Wk 12]	**Reduced arthritis symptoms** Average: 100mg, -0.91; 1000mg, -3.05 Between group, p=0.043 Physical difficulties 100mg, -0.138; 1000mg, -2.402 Between group, p=0.010 Overall: 100mg, -0.848; 1000mg, -2.455 Between group, p=0.044 Pain: NS Stiffness: NS
							Adverse events	No adverse events were due to the treatment

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Myers, et al. (2016) [Australia, WPRO] [34]	Randomized controlled trial	Osteoarthritis (hip and knee)	*Fucus vesiculosus* extract (85% fucoidan)	12 weeks: 300 mg/day	Placebo	96 (54/42)	Comprehensive Arthritis Test (COAT) score [BL to Wk 12]	NS
							Paracetamol Use [BL to Wk 12]	NS
							Body mass index (kg/m^2) [BL to Wk 12]	NS
							Adverse events	NS
Nandini, et al. (2018) [India, SEARO] [23]	Randomized controlled trial	Non-specific or common neck pain	Hot sand fomentation with yoga (stretching, *asanas*, *pranayama*, relaxation and meditation techniques, lecture on yoga philosophy), low fat and low salt vegetarian diet, and sesame seed oil topical application	5 days: 15 min/day	Yoga, dietary changes and sesame seed oil application only	60 (30/30)	Visual Analog Scale [BL to Dy 5]	**Reduced pain** Hot Sand: -5.18; Control: -1.54 Between group: p<0.001
							Neck Disability Index [BL to Dy 5]	**Reduced neck disability** Hot Sand: -23.27; Control: -11.07 Between group: p<0.001
							Pittsburg Sleep Quality Index [BL to Dy 5]	NS
							Short Form-36 health survey, version 2 [BL to Dy 5]	**Increased quality of life** Social Functioning Hot Sand: +26.5; Control: +15.25 Between group: p=0.035 Pain Hot Sand: +28.25; Control: +10.09 Between group: p<0.001 Physical functioning: NS Physical health: NS Emotional problem: NS Energy: NS Emotional wellbeing; NS General Health: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Perlman, et al. (2012) [USA, AMRO] [33]	Randomized controlled trial	Osteoarthritis (knee)	Swedish Massage Therapy	8 weeks: Group 1: 30 min massage/week Group 2: 4 weeks of 30 min massage twice a week + 4 weeks of 30 min massage once per week Group 3: 60 min massage/week Group 4: 4 weeks of 60 min massage twice a week + 4 weeks of 60 min massage once per week	Usual care (no massage)	125 (25/25/ 25/25/ 25)	Western Ontario and McMaster Universities Arthritis Index [BL to Wk 8]	**Reduced arthritis symptoms** Pain: Group 1, NS; Group 2, NS; Group 3, -27.2 Group 4, -27.7; Usual care, -5.6 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05 Functionality Group 1, NS; Group 2, NS; Group 3, -21.2; Group 4, -22.0; Usual care, -6.6 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05 Global Group 1, NS; Group 2, NS; Group 3, -24.0; Group 4, -24.0; Usual care, -6.3 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05 Stiffness: NS
							Visual Analog Scale [BL to Wk 8]	**Reduced pain** Group 1, NS; Group 2, NS; Group 3, -39.8; Group 4, -31.2; Usual care, -9.8 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05
							Flexion Range of Motion [BL to Wk 8]	NS
							Measured time to walk 50 feet [BL to Wk 8]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Pullan, et al. (2016) [India, SEARO] [24]	Randomized controlled trial	Chronic neck pain	Acupuncture (acu) (SI 1,3,6,14,15,GB-20,21,SJ-15,UB-10 naturopathy (hydrotherapy, bodywork, diet, yoga)	10 days	Moist heat (local application of heat or cold) and naturo- pathy (hydrotherapy, bodywork, diet, yoga)	60 (30/30)	Visual Analogue Scale [BL to Dy 10]	NS
							Neck Disability Index [BL to Dy 10]	NS
							State Trait Anxiety Inventory [BL to Dy 10]	**Reduced anxiety in hydrotherapy group** (2.20 – 1.83, p=0.02)
							Short Form-36 (SF-36) health survey – Physical functioning [BL to Dy 10]	NS
							SF-36 – limitations, physical health [BL to Dy 10]	NS
							SF-36 – limitations, emotional problems [BL to Dy 10]	**Reduced emotional problems** Between group: p=0.01
							SF-36 – emotional wellbeing [BL to Dy 10]	NS
							SF-36 – social functioning [BL to Dy 10]	NS
							SF-36 – energy/fatigue [BL to Dy 10]	NS
							SF-36 health survey – bodily pain [BL to Dy 10]	NS
							SF-36 – general health [BL to Dy 10]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Ritenbaugh, et al. (2008) [USA, AMRO] [38]	Randomized controlled trial	Temporomandibular disorder	Group 1: Traditional Chinese medicine (TCM) including acupuncture, herbal therapy, massage, relaxation tapes, 2 visits per week for 6 wks, then 1 per week for 5-6 mths. Group 2: Naturopathic medicine (NM) including herbal medicine, nutritional supplements, nutritional and lifestyle advice, stress-reduction advice,	6-8 mths (+ 3 mths follow up)	Speciality dental care for TMD treatment including education, bite splints, self-care counselling and pain management strategies, 2 hr class sessions plus optional referrals for massage, psychologic and counselling support. (9.5 hours)	128 (42/36/ 50)	Worst Facial Pain [BL to Mth 6/8, 9/11]	**Reduced worst facial pain** Mth 6/8: TCM, -2.2; NM: -2.3; Specialty: -1.2 Between group (Specialty vs TCM): p=0.010 Between group (Specialty vs NM): p=0.025 Mth 9/11: TCM, -2.5; NM: -3.2; Specialty: -1.7 Between group (Specialty vs TCM): p=0.037 Between group (Specialty vs NM): p=0.019
							Average Facial Pain [BL to Mth 6/8, 9/11]	**Reduced average facial pain** Mth 6/8: TCM, -1.9; NM: NS; Specialty: -0.9 Between group (Specialty vs TCM): p=0.004 Between group (Specialty vs NM): NS Mth 9/11: TCM, -2.3; NM: NS; Specialty: -1.5 Between group (Specialty vs TCM): p=0.017 Between group (Specialty vs NM): p=NS
							Impact on Social Life [BL to Mth 6/8, 9/11]	Mth 6/8: TCM, NS; NM: -1.2; Specialty: -0.5 Between group (Specialty vs TCM): NS Between group (Specialty vs NM): p=0.012 Mth 9/11: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Saha, et al. (2019) [Germany, EURO] [39]	Randomized controlled trial	Migraine and/or tension-type headache comorbid with temporomandibular disorder (TMD).	Occlusal splint therapy (plus usual care)	12 weeks	Usual care	60 (30/30)	Headache intensity (Visual Analogue Scale 0-100mm) [Wk 1 to Wk 12 and 24 (only intervention)]	**Reduced intensity** Wk 12 Occlusal splint -3.6 ($p<0.001$) vs +6.6 Between group: NS Wk 24 Occlusal splint -10.3 ($p<0.001$)
							Headache days (headache diary) [Wk 1 to Wk 12 and 24 (only intervention)]	NS
							Headache hours (headache diary) [Wk 1 to Wk 12 and 24 (only intervention)]	NS
							Short Form-36 [Wk 1 to Wk 12 and 24 (only intervention)]	**Increased physical quality of life** Wk 12 Occlusal splint 4.1 $p<0.001$) vs -0.6 (NS) Between group: NS Wk 24 Occlusal splint 4.1 ($p<0.001$)
Saha, et al. (2016) [Germany, EURO] [27]	Uncontrolled trial	Low back pain (chronic)	Mechanical needle stimulation pad	14 weeks: 45 minutes needle pad use per day	Nil	91	Visual Analogue Scale [BL to Wk 2, Wk 14]	NS
							Oswestry Disability Index [BL to Wk 2, Wk 14]	**Reduced disability** Wk 2: -4.6 ($p<0.001$) Wk 14: -4.3 ($p<0.001$)
							Short Form-36 [BL to Wk 2, Wk 14]	**Increased quality of life** Physical component: Wk 2, +3.8 ($p<0.001$); Wk 14, +2.5 ($p=0.008$) Physical functioning: Wk 2, +6.4 ($p=0.001$); Wk 14, +5.6 ($p=0.002$) Vitality: Wk 2: +3.3 ($p=0.045$); Wk 14: NS Mental component: NS Physical role functioning: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Bodily pain: NS General health perception: NS Social role functioning: NS Emotional role functioning: NS Mental health: NS
							Fear avoidance behavior [BL to Wk 2, Wk 14]	NS
							Days under medication per week [BL to Wk 2, Wk 14]	**Reduced days under medication per week** Wk 2: -1.2 (p=0.015) Wk 14: NS
Saha, et al. (2017) [Germany, EURO] [25]	Randomized controlled trial	Chronic non-specific neck pain	Cupping Massage	3 weeks: twice per week for a total of 5 treatments	Waitlist	50 (25/25)	Pain on Movement Questionnaire [BL to Wk 3]	**Reduced pain on movement** Cupping: -10.4; Waitlist: -2.7 Between group: -11.7 (p=0.019)
							Visual Analogue Scale, intensity [BL to Wk 3]	**Reduced pain intensity** Cupping: -29.9; Waitlist: -2.3 Between group: -14.3 (p=0.037)
							Neck Disability Index [BL to Wk 3]	**Reduced neck disability** Cupping: -3.6; Waitlist: -0.3 Between group: -4.1 (p < 0.0001)
							Short Form-36 [BL to Wk 3]	**Increased quality of life** Bodily pain: Cupping, +15.6; Waitlist, +0.5 Between group, +16.7 points (p = 0.002) Mental health: Cupping, +7.7; Waitlist, -0.5 Between group, +8.5 (p = 0.003) Mental component: Cupping, +4.3; Waitlist, +0.4 Between group, +4.3 (p = 0.036) Physical component: NS Physical functioning: NS Physical role functioning: NS General health perception: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Vitality: NS Social role functioning: NS Emotional role functioning: NS
							Pressure-pain threshold [BL to Wk 3]	**Increased threshold to pressure pain** Between group: improvement at site of maximal pain (p=0.022)
							Mechanical detection threshold [BL to Wk 3]	NS
							Vibration detection threshold [BL to Wk 3]	NS
							2-point discrimination threshold [BL to Wk 3]	NS
Saha, et al. (2019) [Germany, EURO] [26]	Randomized controlled trial	Low back pain (chronic non-specific)	*Gua Sha* Therapy	Two treatments 7 days apart (Dy 1 and Dy 7)	Waitlist control	50 (25/25)	Pain on Movement Questionnaire [BL to Day 12]	**Reduced pain on movement** Gua Sha: -24.55 Waitlist: -12.3 Between group: ($p < 0.001$)
							Oswestry Low Back Pain Disability Questionnaire [BL to Day 12]	NS
							Pressure-pain threshold [BL to Day 12]	NS
							Mechanical detection threshold [BL to Day 12]	NS
							Vibration detection threshold [BL to Day 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
Saper, et al. (2017) [USA, AMRO] [28]	Randomized controlled trial	Low back pain (chronic non-specific)	Yoga class (relaxation exercises, *pranayama*, discussion of yoga philosophy, *asanas*) supplemented with at-home daily practice materials. Following initial program, participants are re-randomized to a structured yoga maintenance program or no structured maintenance. OR Physical therapy class (specific exercises, or stabilization exercises) supplemented with at-home daily exercises. Following initial program, participants are re-randomized to a structured physical therapy maintenance program or no structured maintenance.	64 weeks: Yoga – (Week 1-12) 75-minute class per week; (Week 13-52) Structured maintenance or no structured maintenance Physical therapy – (Week 1-12) 60 minute class per week; (Week 13-52) Structured maintenance or no structured maintenance	Educational pamphlet – 'The Back Pain Helpbook" with assignment sheet	320 (127/129/64) Yoga – structured: 64/ not structured: 64 PT – structured: 64/ not structured: 64	Modified Roland Morris Disability Questionnaire [BL to Wk 12]	**Reduced disability** ⩾30% reduction in Score: Yoga v PT, NS Yoga v Education, 3.1 (95% CI 1.6 to 6.2) PT v Education, 2.0 (95% CI 1.0 to 4.0) ⩾30% reduction in back pain: Yoga v PT, NS Yoga v Education, NS PT v Education, 2.3 (95% CI 1.1 to 4.5)
							Back pain intensity score [BL to Wk 12]	**Reduced back pain** Yoga: -1.7; PT: -2.3; Education: -1.4 Between group (PT v Education): -0.84 (95% CI -1.5, -0.18) Between group (Yoga v PT): NS Between group (Yoga v Education): NS
							Self-reported Pain Scale [BL to Wk 12]	**Reduced pain** After 12 weeks, improvement in pain score for yoga intervention was non-inferior to that seen in control PT group (-1.7 and -2.3, respectively)
							Self-reported pain medication use in the past week [BL to Wk 12]	**Reduced medication use** Any pain medication: Yoga v PT, NS; Yoga v Education, 0.36 (95% CI 0.17 to 0.78); PT v Education, 0.31 (95% CI 0.14 to 0.67) Acetaminophen: Yoga v PT, 1.9 (95% CI 1.0 to 3.7); Yoga v Education, NS; PT v Education, 0.45 (95% CI 0.21 to 0.97) NSAIDs: NS Opioids: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Global improvements [BL to Wk 12]	NS
							Patient satisfaction with intervention [BL to Wk 12]	**Increased patient satisfaction** Yoga v PT, NS; Yoga v Education, 2.8 (95% CI 1.4 to 5.7); PT v Education, 3.6 (95% CI 1.8 to 7.4)
							Short Form-36 [BL to Wk 12]	NS
Szczurko, et al. (2007) [Canada, AMRO] [7]	Randomized controlled trial	Low back pain (chronic non-specific)	Naturopathic care consisting of acupuncture, breathing exercises, nutritional counseling and physical exercises	12 weeks: twice per week	Standardized educational booklet on exercise and relaxation exercises	75 (39/36)	Oswestry Low Back Pain Disability Questionnaire [BL to Wk 12]	**Reduced low back pain** NM: -5.0; Education: -0.0 Between group: p<0.0001
							Short Form-36 [BL to Wk 12]	**Increased quality of life** Physical component: NM, +9.25; Education, +0.78 Between group, +8.47 (p<0.0001) Mental component: NM, +4.26; Education, -2.74 Between group, +5.56 (p<0.0045) Physical functioning: NM, +7.12; Education, +1.56 Between group, +5.56 (p<0.0033) Physical role: NM, +8.67; Education, -2.81 Between group, +11.48 (p<0.001) Bodily pain: NM, +11.12; Education, +0.29 Between group, +10.83 (p<0.0001) General health: NM, +6.05; Education, -1.13 Between group, +7.18 (p=0.0002) Vitality: NS Social functioning. NM, +8.95; Education, -1.62

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
								Between group, +10.57 (p<0.0001) Emotional role: NM, +4.88; Education, -3.17 Between group, +8.05 (p=0.0090) Mental health: NM, +4.62; Education, -2.82 Between group, +7.44 (p=0.0003)
							Self-reported Pain Scale [BL to Wk 12]	**Reduced pain** NM: -1.0; Education: -0.0 Between group: p<0.0001
							Roland Morris Disability Questionnaire [BL to Wk 12]	**Reduced disability** NM: -4.0; Education: +2.0 Between group: p<0.0001
							Forward Lumbar Flexion Range of Motion (cm) [BL to Wk 12]	**Increased range of motion** NM: +4.5; Education: -0.5 Between group: p<0.0001
							Weight (kg) [BL to Wk 12]	**Reduced weight** NM: -1.51; Education: -0.05 Between group: p<0.0052
							Body Mass Index (kg/m^2) [BL to Wk 12]	**Reduced BMI** NM: -0.58; Education: -0.06 Between group: p<0.0106
							NSAID Use (pills per week) [BL to Wk 12]	**Reduced medication use** NM: -1.0; Education: +1.3 Between group: not reported
Szczurko, et al. (2009) [Canada, AMRO] [8]	Randomized controlled trial	Rotator cuff tendonitis	Naturopathic care: dietary counseling (increased consumption of fish, berries, fruits, vegetables, nuts and whole grains; reduced alcohol), standardized acupuncture (LI15, SJ14, SI 19, SI10-13, BL41-46), nutritional supplement (Phlogenzym – bromelain, 90mg; trypsin, 48mg; rutin, 100mg)	12 weeks: 30 minute visits per week including 10 minute acupuncture treatments; two tablets three times daily	Standardized physical exercise	85 (43/42)	Shoulder Pain and Disability Index [BL to Wk 12]	**Reduced pain and disability** Total: NM, -42.34; PE, -23.59 Between group, -29.66 (p<0.0001) Pain: NM, -18.70; PE, -5.7 Between group, -13.00 (p<0.0001) Disability: NM, -21.64; PE, -6.00 Between group, -15.64 (p=0.0002)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Pain Visual Analog Scale [BL to Wk 12]	**Reduced pain** NM: -2.34; PE: -0.67 Between group: -1.67 (p<0.0001)
							Short Form-36 [BL to Wk 12]	**Increased quality of life** Physical component; NM, +7.75; PE, +2.04 Between group, +5.71 (p=0.0004) Mental component: NM, +5.85; PE, +0.13 Between group, +5.73 (p=0.0107) Physical functioning: NM, +14.88; PE, +1.36 Between group, +13.52 (p=0.0025) Physical role: NM, +21.09; PE, +3.75 Between group, +17.34 (p=0.0015) Bodily pain: NM, +24.16; PE, +7.64 Between group, +16.52 (p=0.0004) General health: NM, +10.07; PE, -1.54 Between group, -11.62 (p=0.0029) Vitality: NM, +14.33; PE, +4.17 Between group, +10.16 (p=0.0047) Social function: NM, +14.02; PE, +3.65 Between group, +10.38 (p=0.0378) Emotional role: NM, +13.82; PE, -2.27 Between group, +16.09 (p=0.0020) Mental health: NM, +12.44; PE, -2.22 Between group, +14.66 (p=0.0015)

Author (year) [Country, World Region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or comparison group	No. participants (Intervention/ Control)	Measure of Outcome	Outcome
							Measure Yourself Medical Outcomes Profile [BL to Wk 12]	**Reduced symptoms** MYMOP Symptom 1: NM, -2.20; PE, -1.29 Between group, -0.91 (p=0.0225) MYMOP Symptom 2: NM, -3.13; PE, -0.66 Between group, -1.86 (p=0.0001)

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24 Neurological Conditions

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HIGHLIGHTS

- Neurological conditions are listed in the top 10 reasons patients seek naturopathic care.
- The main neurological conditions treated by naturopaths/NDs include headaches and migraines, neuralgia, ADD/ADHD, Parkinson's disease, memory loss, autism and disorders related to brain injuries.
- Naturopaths/NDs use a range of therapies in the treatment of neurological conditions.
- There is a growing body of research supporting the role of naturopathic care in the treatment of neurological conditions.
- 66.7% of clinical studies investigating naturopathic treatments for neurological conditions reported a positive outcome in at least one primary or secondary outcome measure.

According to the Global Burden of Disease Study, neurological conditions are the second leading cause of death after heart disease and the leading cause of disability worldwide [1]. Neurological conditions are emerging as an important treatment priority, with further substantial increases in absolute numbers of deaths and people with disabilities due to neurological diseases rising substantially as a result of population growth and ageing [2]. Neurological disorders are diseases of the central and peripheral nervous system. They can be categorized as general neurological conditions (e.g., nerve pain, attention deficit or hyperactivity disorder (ADD/ADHD), seizures, tinnitus), disorders of movement (e.g., Parkinson's Disease (PD)), neuropathies (e.g., neuralgia, optic neuropathy, peripheral neuropathy) and dementia-type disorders (e.g., memory loss, dementia, Alzheimer's Disease).

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=21) naturopathic clinicians undertook in the field of neurological research. This research includes a total of 1176 participants and was conducted in the United States of America (USA) (n=11), India (n=6), Germany (n=2), Australia (n=1) and Egypt (n=1). The study designs include randomized controlled trials (n=11), case reports (n=5), non-randomized controlled trials (n=2) and cohort studies (n=2). The studied interventions include clinical nutrition (n=7), complex naturopathic interventions (n=3), yoga (n=3), acupuncture (n=4) and one study each of herbal medicine, hydrotherapy, homeopathy, and bodywork (healing touch).

The main neurological conditions examined in these studies included adults with headaches and migraines (n=7), Parkinson Disease (n=4), attention deficit hyperactivity disorder (ADHD) (n=3), Alzheimer's disease (n=2), Traumatic Brain Injury (n=2), autism (n=2) and Transverse myelitis (n=1). Of all the naturopathic clinical studies examining neurological condition populations, 66.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 24.1: Clinical research investigating neurological conditions conducted by naturopathic researchers.* This body of naturopathic research on neurological conditions is also supported by more than 40 observational studies and 25 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Neurological conditions are listed in the top ten primary health conditions for which individuals consult with a naturopathic clinician globally [3]. The neurological conditions most often reported by patients seeking naturopathic care include headaches and migraines, neuralgia, ADD/ADHD, memory loss, PD, autism and disorders related to brain injuries. Naturopathic research has examined diverse neurologic conditions and used multiple therapies and interventions in the treatment and management of neurological disorders. Although the

research is limited, some studies show promising effects for neurological conditions that warrant further research and practice attention.

The paucity of research in this area meant that few interventions were investigated by more than one study in the same condition, and research has focused on single interventions rather than complex naturopathic whole practice. However, there is considerable breadth in the types of interventions examined by naturopathic researchers in neurological disorders, which suggests that the growing evidence-base for complementary and integrative medicine in the treatment of neurological disorders may also be relevant and transferable to naturopathic practice [4].

Neurological disorders are likely to be increasingly prevalent in clinical practice as the global population ages, with focus shifting not only to disease treatment but also preventive and health optimization approaches [5]. Such approaches to the neurological disorders align well with naturopathic approaches to treatment. The rise in absolute numbers of people affected by neurological disorders and associated disease burden suggests that advances in prevention and management of major neurological disorders are not sufficiently effective to counter global demographic changes [2]. This suggests an urgent need for innovative and integrative approaches to patient care. Emerging evidence of effectiveness and the high level of utilization of naturopathic care by the global population suggest that naturopaths/naturopathic doctors may be able to form an integral part of new innovative treatment models in neurological disorders. Given the impact of neurological conditions on global disease burden, and the high prevalence of utilization of naturopathic practitioners for neurological conditions globally, neurological conditions present a significant opportunity for future naturopathic research.

Studies based on specific conditions:

Migraine and Chronic Headaches

Seven studies, four from India [6-9], two from the USA [10, 11] and one from Germany [12] explored different naturopathic interventions for migraines and chronic headaches. A randomized controlled trial (n=60) conducted in India compared yoga exercises in a naturopathic setting, five days a week for six weeks, to usual conventional care (UC) in patients with migraines [7]. Results indicated significant improvement based on the Headache Impact Test (HIT-6) (Yoga -22.7, UC -6.8, $p<0.001$), decreased headache frequency (Yoga -9.5, UC -5.3) and intensity (Yoga -6.67, UC -1.57) and improvement in self-perceived benefit of treatment (Yoga 96.7%, UC 30%). Another randomized controlled trial conducted in India (n= 60) evaluated the impact of yoga practices such as saltwater nasal flush, water-induced self-emesis and postural and breathing exercises [6]. Of the seven scales used to measure outcomes, six showed significances in the treatment group including reduced migraine intensity (-13.0 Migraine Disability Assessment score), reduced pain (-3.2 Visual Analogue Scale (VAS)), reduced headache impact (-16.8 Headache Impact Test), and improvements on the World Health Organization Quality of Life (WHO QoL) BREF scale quality of life (+35.9), social relationships (+9.9) and environment (+4.8). A prospective matched control trial (n=60) conducted in India compared yoga in a naturopathic setting to standard Ayurvedic treatment over a ninety-day period [8]. The study indicated that the yoga group showed significant improvement in the reduction in pain (-5.1 $p<0.001$ VAS) and increased quality of life (+32.09 QoL Questionnaire).

Clinical finding

Yoga practice may decrease headache frequency, intensity and impact in individuals experiencing migraines.

A case report conducted in Germany with three subjects experiencing chronic migraines examined the impact of integrated migraine care including stress reduction, mindfulness and relaxation training, individualized nutritional advice, exercise guidance, hydrotherapy, acupuncture, and herbal medicine [12]. All three participants in the case studies demonstrated a decreased frequency and intensity of migraines. The case studies also indicated the need for each patient to become self-involved in their therapy to achieve clinical success. A single-case study conducted in USA involved a 45-year-old female with migraines, hypertension, pre-diabetes and a BMI of 30 kg/m2. The study involved an 8-week mindfulness training program lead by her naturopathic doctor and at the 11-week follow-up there was a significant decrease in both systolic and diastolic blood pressure (pre-meditation BL 149.2/97.3, Wk 11 114.5/68), migraine frequency and the ability to deal with caring for an ageing mother improved [10]. An uncontrolled study conducted in the USA (n=13) explored the impact of healing touch on chronic headaches. Following the intervention, 84.6% of the subjects showed improved frequency, intensity, and duration of pain with improvement ranging from 24 hours to 6 months, and 46% of the subjects indicated reduced need for medications and better relaxation and sleep [11].

Clinical finding

Hydrotherapy may reduce impact, frequency and intensity of headaches in individuals with chronic migraines already using standard pharmaceutical medications.

A randomized control trial conducted in India (n=40) compared the addition of hydrotherapy to pharmaceutical treatment of chronic migraines [9]. The hydrotherapy (HT) intervention (n=20) included hot arm and foot bath (103°F to 110°F) plus ice massage applied to the head along with standard pharmaceutical medication (Tx) (n=20). The intervention lasted 45 days with 20 minutes of daily treatment. The hydrotherapy group reported a reduction in the Headache Impact Test (HT -34.25, Tx -9.45, $p<0.001$), a reduction in pain frequency (HT -8.65, Tx -3.15, $p<0.001$), a reduction in pain intensity (HT -6.85, Tx -2.05, $p<0.001$) and a reduction in heart rate (HT -5.9, Tx +2.42, $p<0.05$).

Parkinson's Disease (PD)

Four studies researched Parkinson's Disease. Three of the studies from the USA examined the effects of intranasal reduced glutathione (GSH) [13-15] and one study from India explored complex naturopathic treatment which included electroacupuncture, dietary and lifestyle advice [16]. A cohort study conducted in the USA (n=15) prescribed 200 mg intranasal reduced glutathione for 45 minutes daily which led to significantly increased serum glutathione compared to baseline [14]. The other two studies were randomized trials that used a different dosing regimen and did not find any significant differences between intranasal reduced glutathione and placebo.

A single-case study conducted in India with a 56-year-old male diagnosed with stage III PD and presenting with slurred speech, right-sided bradykinesia, erectile dysfunction, rigidity, emotional instability, depression, postural instability, and a rating of 80% on the Schwab and England activities of daily living scale received 30-minute sessions of electroacupuncture 6 days/week, for 5 weeks [16]. Follow up assessment showed improvement in activities of daily living (-10 PDQ-39), improved balance (+2 Berg Balanced Scale) and a 20mmHg reduction in systolic blood pressure.

Other Neurological Conditions

Other neurological conditions researched in Germany, Egypt, India and the USA included ADHD [17-19], Alzheimer's disease [20, 21], autism spectrum disorders [22, 23], traumatic brain injury (TBI) [24, 25] and Transverse myelitis [26]. Five studies with a total population of 241 children with attention-related behavioural patterns or attention deficit hyperactive disorder addressed the following interventions – herbal medicine [19], omega-3 fish oils [18, 20, 21] and homeopathy [17]. A randomized controlled trial (n=144) conducted in Australia allocated participants to receive an omega-3 lipid extract of New Zealand green-lipped mussels or placebo for 14 weeks. [18]. While the study did not show any difference in the results of attention tests between groups, positive changes were observed in secondary outcome measures. These included increased mental performance including target memory ($p=0.04$), non-target memory ($p=0.02$) and picture recognition accuracy ($p=0.02$) based on the Computerised Mental Performance Assessment System. According to the Conners Parent Rating Scales, parents of participants in the intervention group also reported improvements, compared to placebo, in participants' symptoms such as hyperactivity (-10.2 vs-3.3, $p=0.04$), DSM inattention (-7.18, vs -3.3, $p=0.01$), DSM hyperactivity (-13.8 vs -4.1, $p=0.04$), learning problems (-5.9 vs -2.8, $p=0.05$) and impaired home life (-0.52 vs +0.05, $p=0.02$) with overall reduction in ADHD probability (-28.3 vs -13.1, $p=0.04$). However, participants in the intervention group also reported increased fatigue ($p=0.01$) while the placebo group reported reduced feelings of confusion ($p=0.01$).

Clinical finding

Omega-3 lipids may improve mental performance and reduce hyperactivity, inattention, learning problems and impaired home life in individuals with attention-deficit hyperactive disorder.

Two studies from the USA (n=441) explored the impact of fish oil on patients diagnosed with mild to moderate Alzheimer's disease [20, 21]. Participants in a placebo-controlled randomized study (n=39) conducted in the USA over 12 months were prescribed either omega 3 fish oil concentrate containing a daily dose of 675 mg DHA and 975 mg EPA or the same omega-3 fish oil concentrate plus alpha lipoic acid (ALA) at 600 mg per day [21]. Significant differences were seen in both treatment groups based on the Mini-Mental State Examination, with less cognitive decline observed in the active intervention groups when compared to placebo, and there was less decline in the Activities of Daily Living in both

treatment groups. Noticeable differences were observed in the combination treatment (omega-3 and ALA) when compared to placebo.

Clinical finding

Heavy metal chelation therapy may lessen maladaptive behaviours and increase adaptive behaviours as well as reduce total autism symptoms and severity in children with autism spectrum disorder.

A randomized control trial conducted in the USA involving 65 people with autism investigated the impact of heavy metal chelation therapy using meso-2,3-dimercaptosuccinic acid (DMSA) to aid the excretion of heavy metals and improve behaviours in children with autism [22, 23]. The study indicated that three rounds of DMSA resulted in increased excretion of toxic metals from baseline and normalized red blood cell glutathione and platelet counts [22]. Follow up analysis from this study also reported reduced occurrence of maladaptive behaviours [23]. After seven rounds of DMSA, there was a decrease in sensory/perceptual approach behaviours (-22%, $p<0.05$), ritualisms/resistance to change (-28%, $p<0.01$), arousal regulation problems (-22%, $p<0.01$), specific fears (-22%, $p<0.01$), and aggressiveness (-27%, $p<0.05$), with an overall reduction in the composite score of the Pervasive Developmental Disorder Behaviour Inventory – Maladaptive Behaviours (PDDBI-MB) of 24% ($p<0.001$). There was a concomitant increase in adaptive behaviours such as learning, memory and receptive language (+12%, $p<0.05$) but a corresponding decrease in social approach behaviours (-11%, $p<0.05$). Reductions were also observed in total autism symptoms measured by the Autism Treatment Evaluation Checklist (-26%, $p<0.001$) and symptom severity (Severity of Autism Scale: -19%, $p<0.001$).

A case study conducted in India reported the outcomes of a 32-year-old male who presented with transverse myelitis, paraplegia, sensory disturbances, pain, exertional dyspnea, poor sleep, emotional liability, and depression [8]. The patient received 15 sessions of 30 minutes of electro-acupuncture treatments daily over 3 weeks. By the end of treatment, the patient had significant improvement in quality of life across four domains of the WHO QoL BREF instrument: physical health (33 vs 94), psychological health (13 vs 56), social health (69 vs 75), and environmental health (14 vs 63). The patient also reported reduced insomnia (Pittsburgh Sleep Quality Index: 18 vs 9) and pain (VAS: 8 vs 1) as well as subjective improvement in symptoms such as dyspnea, fatigue, and ability to express happiness.

Table 24.1 Clinical research investigating neurological conditions conducted by naturopathic researchers

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Adams, et al. (2009) [USA, AMRO] [22] Adams, et al. (2009) [USA, AMRO] [23]	Randomized controlled trial	Autism spectrum disorders	Phase 1 & 2: dimercapto succinic acid (DMSA) 10 mg/kg TID or placebo	Phase 1: 3 days. Phase 2: 11 days	Placebo (topical cream)	106 Part A: 65 (31/33) Part B 2: 41 (26/15)	Urinary excretion of toxic metals after Phase 1 [BL to Dose 1, Dose 9]	**Increased urinary excretion** Lead: Dose 1 +713% ($p<0.001$) Dose 9 +638% ($p<0.001$) Tin: Dose 1 +241% ($p<0.001$) Dose 9 +314% ($p<0.05$) Bismuth: Dose 1 NS Dose 9 +128% ($p<0.05$) Uranium: Dose 1 +0.021 (<0.001) Dose2 +0.016 ($p<0.05$) Mercury Dose 1 +70% (<0.01) Dose 9 NS Titanium: Dose 1 +67% ($p<0.001$) Dose 9 +42% ($p<0.01$) Antimony: Dose 1 +49% ($p<0.05$) Dose 9 NS Tungsten: Dose 1 +51% ($p<0.01$) Dose 9 +18% ($p<0.05$) Nickel: Dose 1 -18% ($p<0.05$) Dose 9 NS Cadmium: Dose 1 NS Dose 9 NS Arsenic: Dose 1 NS Dose 9 -19% ($p<0.05$)

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Urinary excretion of toxic metals after Phase 2 [BL to Dose 1, Dose 9, Round 2, Round 4, Round 6]	**Increased urinary excretion** Lead: Dose 1 +935% (p<0.001) Dose 9 +1562% (p<0.001) Round 2 +1001% (p<0.001) Round 4 +1063% (p<0.001) Round 6 +1005% (p<0.001) Tin: Dose 1 +118% (p<0.05) Dose 9 NS Round 2, 4 and 6 NS Bismuth: NS Uranium: NS Mercury: Dose 1, +120% (<0.05) Dose 9 NS Round 2 +98% Round 4 and 6 NS Titanium: Dose 1 +54% (p<0.01) Dose 9 +44% (p<0.05) Round 2, 4 and 6 NS Antimony: Dose 1 +49% (p<0.05) Dose 9 NS Round 2, 4 and 6 NS Tungsten: Dose 1 +51% (p<0.01) Dose 1 +18% (p<0.05) Round 2, 4 and 6 NS Nickel: Dose 1 -18% (p<0.05) Dose 9 NS Round 2, 4 and 6 NS Cadmium: Dose 1 NS Dose 9 -32% (p<0.05) Round 2, 4 and 6 NS Arsenic: Dose 1, NS Dose 9 -19% (p<0.05) Round 2 -39% (p<0.001) Round 4 -42% (p<0.001) Round 6 -31% (p<0.1)

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Red blood cell (RBC) Glutathione [BL to Dose 1, Dose 9, Round 2, Round 4, Round 6]	**Normalized RBC glutathione**
							Platelet count [BL to Dose 1, Dose 9, Round 2, Round 4, Round 6]	**Normalized platelet counts**
							Pervasive Developmental Disorder Behavior Inventory (Maladaptive behaviors) [BL to Round 6]	**Reduced maladaptive behaviors** Sensory/Perceptual Approach Behaviors: 7 rounds -22% ($p<0.05$) 1 round -31% ($p<0.01$) Ritualisms/Resistance to Change: 7 rounds -28% ($p<0.01$) 1 round -23% ($p<0.01$) Arousal Regulation Problems: 7 rounds -22% ($p<0.01$) 1 round NS Specific fears: 7 rounds -22% ($p<0.01$) 1 round NS Aggressiveness: 7 rounds -27% ($p<0.05$) 1 round -26% ($p<0.05$) Social pragmatic problems: 7 rounds NS 1 round -29% ($p<0.01$) Semantic/Pragmatic problems: NS Composite: 7 rounds -24% ($p<0.001$) 1 round -24% ($p<0.001$)
							Pervasive Developmental Disorder Behavior Inventory (Adaptive behaviors) [BL to Round 6]	**Increased adaptive behaviors** Social approach behaviors: 7 rounds -11% ($p<0.05$) 1 round + 6% Express (Phonological and

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
								Semantic Pragmatic): 7 rounds +5% 1 round +17% (p<0.05) Learning, Memory and Receptive Language: 7 rounds +12% (p<0.05) 1 round +14% (p<0.05) Composite: 7 rounds +12% 1 round +11%
							Autism Treatment Evaluation Checklist [BL to Round 6]	**Reduced autism symptoms** SPLC: 7 rounds -21% (p<0.001) 1 round NS Sociability: 7 rounds -27% (p<0.001) 1 round -25% (p<0.05) Sensory/Cognitive Awareness: 7 rounds -27% (p<0.001) 1 round -26% (p<0.05) Health/Physical/Behaviors: 7 rounds -28% (p<0.01) 1 round NS Total: 7 rounds -26% (p<0.001) 1 round -19% (p<0.01)
							Severity of Autism Scale [BL to Round 6]	**Reduced autism severity** 7 rounds -19% (p<0.001) 1 round -18% (p<0.01)
							Autism Diagnostic Observation Schedule [BL to Round 6]	**Reduced autism symptoms** Communication: NS Sociability: 7 rounds -10% (p<0.01) 1 round NS Communication and sociability: 7 rounds -9% (p<0.001) 1 round NS Play: NS SBRI: NS

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Parent Global Impression [BL to Round 6]	NS
Arankalle, et al. (2013) [India, SEARO] [16]	Case report	Parkinson's Disease (stage III)	Electroacupuncture (specific points and scalp); dietary and lifestyle advice	4 weeks: 24 sessions over 4 weeks with 7-day rest period after 12 sessions.	Nil	1	Resting Heart rate (bpm) [BL to Wk 4]	**Reduced resting heart rate** – 4bpm
							Blood pressure (mmHg) [BL to Wk 4]	**Reduced blood pressure** Systolic: -20
							Berg Balance Scale [BL to Wk 4]	**Increased balance** +2
							Parkinson's Disease Questionaire-39 impact on quality of life [BL to Wk 4]	**Reduced impact on quality of life** -10
Geethanjali, et al (2016) [India, SEARO] [6]	Randomized controlled trial	Migraine without aura	Yogis kriyas – *Jaleneti* (saltwater nasal flush), *Vamanakriya* (water-induced self-emesis), *Kaplabhathi* (postures and breathing with back erect)	30 days – *Jaleneti:* 5 days in a week; *Vamanakriya:* 2 days in a week followed by *Kaplabhathi*	Waitlist	60 (30/30)	Migraine Disability Assessment score [BL to Dy 30]	**Reduced disability** Yoga: -13.0; Waitlist: -8.0 Between group: p<0.0001
							Pain Visual Analogue Score [BL to Dy 30]	**Reduced pain** Yoga: -3.2; Waitlist: -1.5 Between group: p=0.008
							Headache Impact Test [BL to Dy 30]	**Reduced impact** Yoga: -16.8; Waitlist: -12.1 Between group: p<0.0001
							Physical Health – WHO Quality of Life-BREF (WHO QoL-BREF) [BL to Dy 30]	**Increased physical health** Yoga: +35.9; Waitlist: +27.0 Between group: p<0.07
							Psychological Health – WHO QoL-BREF [BL to Dy 30]	NS
							Social relationships – WHO QoL-BREF [BL to Dy 30]	**Increased social relationships** Yoga: +9.9; Waitlist: +6.6 Between group: p<0.0001
							Environment – WHO QoL-BREF [BL to Dy 30]	**Increased environment** Yoga: +4.8; Waitlist: +2.8 Between group: p<0.0001
Haller, et al. (2015) [Germany, EURO] [24]	Case report	Traumatic Brain Injury	Inpatient treatment: craniosacral therapy (CST) and auricular acupuncture, cupping massage, hydrotherapy (cold affusions),	2 weeks: CST five 1-hour sessions	Nil	1	Visual Analogue Scale – Headache intensity [BL to Wk 2]	**Reduced intensity** 6-9cm to 2-4cm
							VAS – Vertigo [BL to Wk 2]	**Reduced vertigo** 6-10cm to 2cm

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
			Thermotherapy (hot and cold cataplasms), exercise, nutritional therapy, and phytotherapy with *Bryophyllum* species and *Avena sativa*. Relaxation, stress reduction, mindfulness, and cognitive restructuring training were also provided				CST assessment [BL to Wk 2]	**Increased** flexibility of cranial bones, atlanto-occipital joint leading to improved cervical rotation. **Reduced** tension in abdomen and neck muscles, release of sacrum and thoracic restrictions normalized posture and improved breathing, sleeping pattern, sensitivity to noise. Hands no longer numb
							General functioning/ well-being [BL to Wk 2]	**Increased wellbeing** Subjective 60% improvement, persisting at 6 months post treatment.
Jacobs, et al. (2005) [USA, AMRO] [17]	Randomized controlled trial (pilot)	Attention deficit-hyperactivity disorder (6 to 12 years)	Individualized single homeopathic remedy	6 weeks for 18 weeks	Placebo	43 (22/21)	Connors Global Index – Parents [BL to Wk 18]	NS
							Connors Global Index – Teacher [BL to Wk 18]	NS
							Connors Global Rating Scale – Revised [BL to Wk 18]	NS
							Continuous Performance Test [BL to Wk 18]	NS
Kean, et al. (2017) [Australia, WPRO] [18]	Randomized controlled trial	Attention deficit-hyperactivity disorder (6 to 14 years)	Omega-3 anti-inflammatory extract PCSO-524® (lipid extract of New Zealand green-lipped mussel)	14 weeks: QD	placebo	144 (74/70)	Test of Variables of Attention [BL to Wk 14]	NS
							Computerised Mental Performance Assessment System [BL to Wk 14]	**Increased mental performance** PCSO: Improved target memory (p=0.05) PCSO: Improved non-target memory (p=0.02) PCSO: Improved picture recognition accuracy (p=0.02)
							Brunel Mood Scale for adolescents [BL to Wk 14]	**Increased fatigue** PCSO: increased fatigue (p=0.01) Placebo: reduced feelings of confusion (p=0.01)

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Conners Parent Rating Scale [BL to Wk 14]	**Reduced parent-reported symptoms** Aggression NS Peer relations NS Global ADHD index NS Impaired school life NS Impaired relationships NS Inattention NS Conduct disorder NS Oppositional defiant disorder NS Executive function NS ADHD probability: PCSO -28.3; Placebo -13.1 Between group p=0.04 Impaired home life: PCSO -0.52; Placebo +0.05 Between group p=0.02 Hyperactivity: PCSO -10.2; Placebo -3.3 Between group p=0.04 DSM inattention: PCSO -7.18; Placebo -3.3 Between group p=0.01 DSM hyperactivity: PCSO -13.8; Placebo -4.1 Between group p=0.04 Learning problems: PCSO -5.9; Placebo -2.8 Between group p=0.05
Kisan, et al. (2014) [India, SEARO] [7]	Randomized controlled trial	Migraine (frequent, with or without aura)	Yoga (loosening and breathing exercises, *asanas*) and usual care	6 weeks: 1-hour sessions, five days a week	Usual care only	60 (30/30)	Headache impact test (HIT-6) [BL to Wk 6]	**Reduced impact** Yoga: -27.7 (p<0.001); Usual care: -6.8 (p<0.001) Between group: p<0.001
							Headache frequency (per Mth) [BL to Wk 6]	**Reduced frequency** Yoga: -9.5 (p<0.001); Usual care: -5.3 (p<0.001) Between group: p<0.001
							Visual Analogue Scale – Headache intensity [BL to Wk 6]	**Reduced intensity** Yoga: -6.67 (p<0.001); Usual care: -1.57 (p<0.001) Between group: p<0.001

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Self-perceived benefit scale [BL to Wk 6]	**'Greatly improved my clinical condition'** Yoga: 96.7%; Usual care: 30.0% **'More helpful than harmful'** Yoga: 100.0%; Usual care: 73.3%
							Heart rate [BL to Wk 6]	NS
							Heart rate variability (HRV) [BL to Wk 6]	NS
Lauche, et al. (2012) [Germany, EURO] [12]	Case reports	Chronic migraine	Integrative integrated migraine care (IIMC) 4 Modules that include integrated conventional medicine, physiotherapy, evidence- based complementary medicine and mind body therapy. (Acupuncture, cupping, hydrotherapy and different kinds of massage, TCM herbal medicine, regular exercise, relaxation training and mindfulness)	12 weeks (+ 6 and 12 month Follow up) Inpatient/ Outpatient care for 14 days; Day care for 6 hours, 1 day per week over 10 weeks	Nil	3	Migraine relief [BL to Wk 2, 6, Mth 6 and 12)	**Increased relief** Case 1: (outpatient) von Korff grade III migraine relief at first acupuncture session and ceased entirely by end of treatment Case 2: (outpatient) von Korff Grade not reported. Migraine relief at first acupuncture treatment and maintained. Follow -up MBSR course, six weeks post treatment migraines had return, declined for acupuncture management. Case 3: (outpatient) von Korff grade II. migraine frequency and intensity relieved by acupuncture, increased energy. Follow up 10 week, day care clinic.
Mischley, et al. (2015) [USA, AMRO] [13]	Randomized controlled trial (phase I/IIa)	Parkinson's Disease (Hoehn Yahr stage <3)	Intranasal reduced glutathione (GSH) 100mg and 200mg	12 weeks: 100mg TID 200mg TID	Control (saline) and placebo (watchful waiting)	34 (10/10/ 10/4)	Complete blood count [BL to Wk 12]	NS
							Alanine aminotransferase (ALT) [BL to Wk 12]	NS
							Aspartate aminotransferase (AST) [BL to Wk 12]	NS
							Blood urea nitrogen (BUN) [BL to Wk 12]	NS
							Creatine [BL to Wk 12]	NS
							Urinalysis [BL to Wk 12]	NS

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Monitoring of Side Effects Scale [BL to Wk 12]	NS
							SNOT-20 [BL to Wk 12]	NS
							Unified Parkinson's Disease Rating Scale (UPDRS) [BL to Wk 12]	Mild clinical improvements in both treatment arms compared to placebo (NS)
Mischley, et al. (2016) [USA, AMRO] [14]	Cohort	Parkinson's Disease	Intranasal reduced glutathione (GSH) 200mg	45 minutes (same time of day for each participant)	Nil	15	GSH and GSH/Cr concentrations (H-MRS) [BL to Min 45]	**Increased glutathione concentrations** GSH/Cr: +269% GSH: +240% 7.5 min: +0.03 (0.008-0.06) 19.9 min: +0.04 (0.01-0.08) 32.0 min: +0.04 (0.01-0.08) 44.7 min: +0.05 (0.01-0.11)
Mischley, et al. (2017) [USA AMRO] [15]	Randomized controlled trial	Parkinson's Disease (Hoehn Yahr stage 1-3)	Intranasal reduced glutathione (GSH) 100mg and 200mg TID	12 weeks: 100mg and 200mg TID (4-week washout period)	Control (saline)	39 (11/14/14)	Unified Parkinson's Disease Rating Scale (UPDRS) [BL to and Wk 4, 8, 12 and 16 (at same appointment time for each participant)]	NS
							GSH and GSH/Cr concentrations (H-MRS) [BL to and Wk 4, 8, 12 and 16]	NS trend toward increasing brain GSH concentrations in the 600 mg/d cohort
Mohamed, et al. (2017) [Egypt, EMRO] [25]	Non-randomized controlled trial	Severe Traumatic Brain Injury (STBI)	Clinical pathway (multidisciplinary care)	15 days	Control (usual care) routine nursing, medical and ancillary care in the trauma ICU of the hospital.	60 (30/30)	Complications related to hospitalization (patient #'s) [BL to day 15]	**Reduced complications** Fever (12 vs 24, p=0.04) (adjusted for age, NS) Procedural pain (0 vs 13, p=0.002) (adjusted for age, p=0.024) Hyperglycemia (4 vs 13, p=0.022) (adjusted for age, NS)
							Clinical variances [BL to day 15]	Most frequent variance were observed in nursing care (circulating air-cooling blankets, air matrices and graduated stockings, 4- day tracheostomy target) and professional consultation (rehabilitation and social worker)

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Invasive devices duration [BL to day 15]	**Reduced duration of invasive devices** Central venous catheter (-1.6, p=0.28)
							Length of ICU stay (# of days) [mean difference between groups]	**Reduced length of stay** (15 vs 17, p=0.07) (adjusted for age, p=0.009)
							ICU readmission rate (# of days) [mean difference between groups]	**Reduced readmission rate** (7 vs 13, p=0.001) (adjusted for age NS)
							Patient/family satisfaction in care structure and processes	**Increased satisfaction** 80-89%: 16 vs 0 70-79% 24 vs 0 60-69% 0 vs 13 <60% 0 vs 17 (p=0.01)
Mohanty and Shrestha (2017) [India, SEARO] [26]	Case report	Transverse Myelitis	Electroacupuncture	3 weeks: 15 x 30-minute treatments	Nil	1	WHO Brief QOL [BL to Day 21]	**Increased quality of life** Physical health (33 vs. 94) Psychological health (13 vs. 56) social health (69 vs 75) environmental health (14 vs. 63)
							Pittsburgh Sleep Quality Index [BL to Day 21]	**Reduced insomnia** 18 vs 9
							Visual Analogue Scale [BL to Day 21]	**Reduced pain** 8 vs. 1
							Disease-specific measure of subjective health status [BL to Day 21]	Not reported
Oberg, et al. (2013) [USA, AMRO] [10]	Case report	Migraine	Mindfulness meditation	8 weeks: self-directed program of 45 min sessions/wk	Nil	1	Blood pressure (BP), systolic/diastolic (pre- and post-meditation) [Weekly from Wk 1 to Wk 11]	**Reduced BP** Wk 1 BP: 149.2/97.3 vs. 132/84.6; Wk 11 BP: 114.5/68 vs. 112.7/72.7. Systolic (p<0.0001) Diastolic (p<0.0004)

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Migraine frequency (subjective) [BL to Wk 11]	**Reduced migraine frequency** Reduction until week 17 of migraine headache and use of associated medication
Quinn, et al. (2010) [USA, AMRO] [20]	Randomized controlled trial	Alzheimer disease (mild to moderate)	Algal-derived DHA 2g daily	18 months 2g daily	placebo	402 (238/164)	Alzheimer's Disease Assessment Scale [BL to Mth 18]	NS
							Clinical Dementia Rating [BL to Mth 18]	NS
							Mini-Mental State Examination [BL to Mth 18]	NS
							Alzheimer's Disease Cooperative Study activity of daily living scale [BL to Mth 18]	NS
							Neuropsychiatric inventory [BL to Mth 18]	NS
							Adverse events [BL to Mth 18]	NS
Sharma, et al. (2018) [India SEARO] [8]	Non-randomized controlled trial	Migraine headache (adults)	Yoga: *asana* postures, *pranayama* breathing, relaxation techniques, chanting	90 days: 40 min, daily for 1 week, then 5 days per week home practice until day 90	Control: usual care	60 (30/30)	Comprehensive Headache-related Quality of Life Questionnaire [BL to Dy 90]	**Increased quality of life** Yoga: +32.09; Usual care: -1.61 Between group: p<0.001
							Visual Analogue Scale [BL to Dy 90]	**Reduced pain** Yoga: -5.1; Usual care: +0.24 Between group: p<0.05
Shinto, et al. (2014) [USA, AMRO] [21]	Randomized controlled trial	Alzheimer's disease	Omega-3 fish oil concentrate containing a daily dose of 675mg DHA and 975mg EPA OR Omega-3 fish oil concentrate plus alpha-lipoic acid (ALA) 600 mg/day	12 months	placebo	39 (13/13/13)	Peripheral F2-isoprostane levels [BL to Mth 12]	NS
							Mini-Mental State Examination [BL to Mth 12]	**Reduced mental state** Omega-3: -4.3 Omega-3 + ALA: -1.0 Placebo: -4.6 Between group (Placebo vs ALA): p<0.01
							Activities of Daily Living [BL to Mth 12]	NS

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Instrumental Activities of Daily Living [BL to Mth 12]	**Increased activities** Omega-3: -0.7 Omega-3 + ALA: -0.9 Placebo: -4.2 Between group (Placebo vs ALA): p<0.01 Between group (Placebo vs Omega-3): p<0.01
Sujan, et al (2016) [India, SEARO] [9]	Randomized controlled trial	Chronic migraine	Hydrotherapy (hot arm and foot bath [103°F to 110°F]; ice massage to head) plus pharmaceutical medication	45 days; 20 minutes daily	Pharmaceutical medication only	40 (20/20)	Headache Impact Test [BL to Dy 45]	**Reduced impact** Hydrotherapy: -34.25 Pharmaceutical: -9.45 Between group: p<0.001
							Pain frequency (daily diary) [BL to Dy 45]	**Reduced pain frequency** Hydrotherapy: -8.65 Pharmaceutical: -3.15 Between group: p<0.001
							Visual Analogue Scale – intensity [BL to Dy 45]	**Reduced pain intensity** Hydrotherapy: -6.85 Pharmaceutical: -2.05 Between group: p<0.001
							Heart rate (beats per min) [BL to Dy 45]	**Reduced heart rate** Hydrotherapy: -5.9 Pharmaceutical: +2.42 Between group: p<0.05
							Standard Deviation of NN interval [BL to Dy 45]	NS
							Root mean square of the successive differences [BL to Dy 45]	NS
							Heart rate variability – total frequency (ms^2) [BL to Dy 45]	NS
							Low-frequency power (ms^2) [BL to Dy 45]	**No change** Hydrotherapy: -0.97 Pharmaceutical: -2.62 Between group: p<0.05

Author (year) [Country, world region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							High-frequency power (ms^2) [BL to Dy 45]	**Increased high-frequency power** Hydrotherapy: +1.28 Pharmaceutical: -0.80 Between group: $p<0.05$
							Low-frequency/ high-frequency ratio [BL to Dy 45]	**Reduced ratio between frequency** Hydrotherapy: -0.27 Pharmaceutical: -0.09 Between group: $p<0.01$
Sutherland (2009) [USA AMRO] [11]	cohort	Chronic headache	Healing Touch Therapy	3 weeks – minimum 3 treatment sessions 1 week apart, 30-40 minutes each.	Nil	13	Reduced duration of headaches, self-reported [BL to Wk 3]	**Reduced duration** 2 out of 13
							Reduced intensity of headaches, self-reported [BL to Wk 3]	**Reduced intensity** 12 out of 13
							Reduced frequency of headaches, self-reported [BL to Wk 3]	**Reduced frequency** 5 out of 13
							Reduced need for pain medication, self-reported [BL to Wk 3]	**Reduced need for pain medication** 6 out of 13
							Improved relaxation, self-reported [BL to Wk 3]	**Increased relaxation** 6 out of 13
							Improved sleep, self-reported [BL to Wk 3]	**Increased sleep** 5 out of 13
Weber, et al. (2008) [USA AMRO] [19]	Randomized controlled trial	Attention-Deficit Hyperactivity Disorder (Children and young adults 6 to 17yo who met DSM IV Edition criteria for ADHD by structured interview	8 weeks: 300mg of *Hypericum perforatum* standardized to 0.3% hypericin TID	8 weeks TID	Placebo	54 (27/27)	ADHD Rating Scale – IV [BL to Wk 8]	NS
							Clinical Global Impression Improvement Scale [BL to Wk 8]	NS
							Adverse effects	NS

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25 Skin Conditions

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HIGHLIGHTS

- Skin conditions are among the top 10 reasons patients seek naturopathic care.
- Naturopaths/NDs often treat common skin conditions such as acne vulgaris, dermatitis, dry skin, eczema, herpes simplex, herpes zoster, psoriasis, rosacea, urticaria and others.
- In naturopathic practice, the skin is viewed as an essential organ of detoxification and many skin conditions reflect internal imbalances or dysfunctions.
- Naturopaths/NDs use both internal and external therapies in the treatment of skin conditions.
- 62.5% of clinical studies investigating naturopathic treatments for skin conditions reported a positive outcome in at least one primary or secondary outcome measure.

The skin is a very complex organ with a vast array of functions. It is the largest organ in the body and from a naturopathic perspective, it is linked to and reflective of a person's inner state of health [1]. There are a diverse range of conditions that are associated with the skin such as common ailments: acne vulgaris, boils, bruises, burns, canker sores, conjunctivitis, dermatitis, eczema, herpes simplex (cold sores), pruritis, psoriasis, rosacea, urticaria, warts and more significant pathologies including herpes zoster (shingles), skin cancers, pemphigus vulgaris, and yeast infections.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=8) focused on skin conditions conducted by naturopathic researchers. This research includes a total of 92 participants and was conducted in the United States of America (USA) (n=3), Canada (n=2), India (n=2) and Australia (n=1). The research includes case reports/series (n=5), uncontrolled trials (n=2), and a randomized clinical trial (n=1). Herbal medicine (n=4) was the most studied intervention of which two studies involved ingestible herbal medicine, two the topical application of herbs, and one provided herbal medicine along with homeopathy. Other interventions were clinical nutrition (n=2), and a complex naturopathic intervention including dietary fasting along with generally naturopathic care and yoga (n=1).

The skin conditions examined in these studies include acne (n=3), vitiligo (n=1), psoriasis (n=1), dermatitis (n=1), plantar warts (n=1), and a facial rash (n=1). Of all the naturopathic clinical studies examining skin condition populations, 100% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 25.1: Original research on skin conditions conducted by naturopathic researchers.*

Implications

Skin conditions are listed in the top primary health conditions for which individuals consult with a naturopath/naturopathic doctor [2]. They are also the fourth leading cause of non-fatal disease burden globally [3], with multidimensional psychological, social and financial consequences as well as clinical implications [4]. Based on these preliminary results, a variety of naturopathic treatments may have clinical benefit for a diverse range of skin conditions. The majority (62.5%) of the naturopathic research studies on skin conditions involves case reports or case studies. Although all studies indicated positive outcomes, naturopathic research focused on dermatological conditions needs to be expanded.

The unique perspective of skin as a detoxification organ of the body and naturopaths/naturopathic doctors broad treatment approach when managing skin conditions also warrant consideration. The naturopathic Emunctory Theory (outlined further in Chapter 3) states that proper elimination of toxins is essential to overall health and that eliminating toxins is often the first required treatment focus, especially for chronic disease.

Elimination of toxins assists vitality and its corollary, lack of elimination blocks vitality or vital force. The primary emunctory pathways include the lungs (breath), kidneys (urine), bowels (stool), skin (sweating), menses/ejaculation and voice (speaking) [1]. Not only do naturopaths/naturopathic doctors acknowledge the importance of healthy skin for overall physical health, but equally the naturopathic approach recognizes that skin conditions often manifest due to dysfunction in other organs and systems. As an example, an international survey has found naturopaths/naturopathic doctors are more likely to consider the digestive system or endocrine system as important factors when providing care to patients presenting with skin conditions as their primary concern [5]. Naturopathic care for skin conditions often involves interventions that address a patient's internal state of health and topical interventions to address the manifestation of the skin condition.

The perspective and naturopathic approach to skin conditions have results in an expanded understanding of the role of the gastrointestinal system [6], the nervous system [7], the environment [8], immune function [9] and nutritional status [10] on skin health with much of this contribution considering the inter-relationship of more than one of these factors on the pathogenesis and treatment of skin conditions [6-8, 10]. As such, research examining naturopathic treatment of skin conditions needs to reflect the complexity with which naturopaths/naturopathic doctors approach this important organ.

Studies based on specific conditions:

Acne vulgaris

Three studies, conducted in India, the USA and Canada, examined naturopathic interventions in the treatment of acne. Two of these were case reports and one an uncontrolled trial. The interventions included general naturopathic care (dietary interventions, hydrotherapy, and yoga) [11], human monoclonal antibody MABp1 [12] and vitamin-mineral supplementation [13]. All studies showed significant results. The case report conducted in Canada presented the results of a series of five cases treated over approximately two months [13]. The patients were prescribed daily intake of a multi-nutrient formula containing essential fatty acids (EPA, 1000mg), zinc gluconate (15mg), selenium (200mcg), chromium (200mcg) and epigallocatechin-3-gallate from green tea (200g). After treatment, the patients had an average decrease of 40 acne lesions and 15 inflammatory papules. They also had an average score increase of 24% across all domains on the Arizona Integrative Outcomes Scale.

Psoriasis

A randomized controlled trial conducted in India (n=60) investigated the effectiveness of a starch-fortified turmeric bath combined with other naturopathic interventions including diet therapy, massage, yoga and hydrotherapy in the treatment of psoriasis [14]. The turmeric bath intervention group were compared with a group receiving the other naturopathic interventions but without the turmeric bath. Both groups received treatment for 10 days and, while both groups had a reduction in Psoriasis Area and Severity Index scores, a significantly greater reduction was reported for the turmeric bath group (-13.9 vs -0.15, $p<0.01$).

Clinical finding

Hydrotherapy involving a turmeric bath may reduce the symptoms and severity of psoriasis.

Vitiligo vulgaris

A single-armed clinical trial conducted in Canada investigated *Ginkgo biloba* as a treatment for Vitiligo vulgaris in 12- to 35-year-olds (n=12) [15]. Participants were administered one capsule containing 60mg of standardized *Ginkgo biloba* twice per day for 12 weeks. Compared to baseline, the participants reported changes in both outcome measures. The Vitiligo Area Scoring Index reduced by -0.05 ($p=0.02$) and the disease activity domain of the Vitiligo European Task Force Score reduced by -3.9 ($p<0.001$) with no change in the area or staging domains.

Other skin conditions

Three remaining studies investigated herbal and homeopathic intervention in the management of topical steroid refractory dermatitis [16]; a herbal intervention for plantar warts demonstrating total resolution at day 90 [17]; and an unknown skin condition was managed with herbal medicine with a focus on nervous system support over 6 weeks resulting in reduced lesions (-36%), improved digestive symptoms, reduced anxiety and decreased perception of negative body image [7].

Table 25.1 Clinical research investigating skin conditions conducted by naturopathic researchers

Author (date) [Country, World region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Ameya and Nair (2017) [India, SEARO] [11]	Case report	Acne vulgaris	Day 1 to 5: Diet plan including Holy Basil decoction, fresh carrot juice, mosambi (sweet lime) juice, non-spicy vegetably curry and bhakri (sorghum preparation). Day 6 to 16: Alternating daily between therapeutic fasting, and lemon honey juice and tender coconut water. Swedish massage, steam bath, warm water enema and hip bath. Yoga 45 minutes per day on non-fasting days	16 days (+14 and 30 day follow up)	Nil	1	Acne lesions and inflammation (BL to Dy 30, 60]	**Reduced lesions and inflammation** Dy 30: noticeable reduction in lesions, with no noticeable inflammation or swelling Dy 60: No relapse of symptoms reported.
Canavan and Yarnell (2005) [USA, AMRO] [16]	Case report	Dermatitis not responsive to topical steroids (51-year-old white healthy female)	(1) Initial treatment: chlorine/water wash (2) Second treatment: *Calendula officinalis* and *Ocimum tenuiflorum* ointment, homeopathic rhus toxicodendron 30C (3) Third treatment: topical corticosteroid (specific drug and concentration unknown), homeopathic causticum 30C and arsenicum album 30C (4) Fourth treatment: *Impatiens capensis* tincture and *Calendula officinalis* cream topically, homeopathic sulfur 30C (5) Fifth treatment: *Grindelia spp* tincture topically and *Grindelia spp/Calendula officinalis* cream	(1) unknown (2) unknown (3) unknown (4) several applications of cream (timeline unknown) (5) applied 25hr after (4) within 1 week affected areas resolved	Nil	1	Skin area affected by rash, self- and physician-assessed	**Reduced affected area** 1: reduction on left arm, no change on right 2: spread from arms to supra-pubic region, lower legs, and forearms 3: stable 4: stable 5: rash area stopped oozing and shrank gradually to total resolution

Author (date) [Country, World region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Carrasco, et al (2015) [USA, AMRO] [12]	Uncontrolled trial	Acne vulgaris with psychiatric comorbidity	True human monoclonal antibody MABp1	6 weeks	Nil	11	Inflammatory lesion counts [BL to Wk 6]	**Reduced lesions** -36%
							Hospital Anxiety and Depression Scale [BL to Wk 6]	**Reduced anxiety** Anxiety: -5 Depression: NS
							Body Image Disturbance Score [BL to Wk 6]	**Reduced negative body image** -0.2
Gerontakos and Casteleijn (2018) [Australia, WPRO] [7]	Case report	Facial skin condition (unknown atiology) association to nervous system	Herbal medicine *(Avena sativa, Cynara scolymus, Passiflora incarnata, Asparagus racemosus. Zingiber officinale, Gentian luteum. Ulmus rubra)* plus daily mediation and Australian Bush Flower Essence	6-10 weeks	Nil	1	Presentation of skin condition; digestion (presence of constipation and/or bloating); mental well-being (perceived stress levels)	**Reduced symptoms** At 10 weeks there was no return of skin condition. Improved digestive symptoms at 4 weeks. Patient self-reported association of skin condition with stress and mental and physical wellbeing.
Nelson, et al. (2017) [USA, AMRO] [17]	Case report	Plantar warts of the left hallux unresponsive to cryotherapy	*Hypericum perforatum* aerial parts 2.5%, *Lavandula officinalis* leaf 10%, *Glycyrrhiza glabra* root 2.5%, *Melissa officinalis* leaf 6%, *Eleutherococcus senticosus* root 4%, and *Sarracenia* spp. aerial parts 25% gel with allantoin applied 1 – 2 times daily after application of a pumice stone to the lesions	63 days (+ 30 days follow-up)	Nil	1	Extent of visible lesion	**Reduced lesions** *Day 5:* 'remarkable' reduction *Day 17:* return of epidermal ridges in the affected toe *Day 27:* no further progress *Day 36:* no further progress *Day 46:* appearance of keratotic debris and superficial epidermal necrosis *Day 56:* same as day 46 *Day 63:* changes from day 46 resolved, wart largely resolved; benign, painless petechial hemorrhages on medial margin *Day 90:* total resolution
Rubin, et al. (2008) [Canada, AMRO] [13]	Case report	Acne vulgaris	1000 mg of EPA (from sardines and anchovies), zinc gluconate 15mg, selenium 200 mcg, chromium 200 mcg and epigallocatechin-3-gallate (EGCG) 200 mg (from green tea extract)	2 months minimum	Nil	5	Inflammatory acne lesions	**Reduced lesions** Lesions (average): -40 Inflammatory papule lesions (average): -15
							Arizona Integrative Outcomes Scale	**Improved outcomes** +24% average across domains

Author (date) [Country, World region]	Design	Study Population	Intervention	Dose and Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Shathirapathiy et al. (2015) [India, SEARO] [14]	Randomized clinical trial	Psoriasis	Starch-fortified turmeric bath with naturopathy interventions (massage, yoga, hydrotherapy, diet therapy)	10 days	Naturopathy interventions (massage, yoga, hydrotherapy, diet therapy)	60 (30/30)	Psoriasis Area and Severity Index [BL to Dy 10]	**Reduced severity** Turmeric Bath: -13.9 Naturopathy only: -0.15 Between group: p<0.01
Szczurko, et al. (2011) [Canada, AMRO] [15]	Uncontrolled trial	Vitiligo vulgaris (12 – 35 years)	Ginkgo biloba 60mg (standardised to 15mg gingkoflavonglycosides and 4mg terpene lactones per pill), 1 capsule twice per day	12 weeks	Nil	12	Vitiligo Area Scoring Index [BL to Wk 12]	**Reduced area** Total: -0.05 (p=0.02)
							Vitiligo European Task Force Score [BL to Wk 12]	**Reduced disease activity** Area: NS Staging: NS Disease activity: -3.9 (p<0.001)

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26 Women's Health Conditions

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HIGHLIGHTS

- Women represent over 70% of the patients that seek naturopathic care.
- Women's health concerns affect a substantial proportion of the population and include premenstrual syndrome, polycystic ovarian syndrome, endometriosis and problematic symptoms associated with reproductive life stages such as pregnancy, childbirth, and menopause or perimenopause.
- The holistic person-centered approach of naturopathic care is well suited to addressing women's health concerns.
- Naturopaths/NDs use a wide range of therapies in treating women's health concerns.
- 81.8% of clinical studies investigating naturopathic treatments for skin conditions reported a positive outcome in at least one primary or secondary outcome measure.

Female reproductive health conditions include illnesses such as endometriosis and urinary tract infections; syndromes such as premenstrual syndrome and polycystic ovarian syndrome; and reproductive life stages which may cause problematic symptoms for some women, such as pregnancy, childbirth, and menopause or perimenopause. Women's health conditions impact a substantial proportion of the global population, with at least three quarters of women experiencing painful menstruation [1] and menopausal symptoms [2] alone. Historically women's health concerns have not been well represented in allopathic medical practice or research, with women's complaints routinely dismissed, and female participants largely absent from clinical research [3].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=11) naturopathic clinicians undertook in the field of women's health conditions. This research includes a total of 1,196 participants and was conducted in Australia (n=6), India (n=3), the United States of America (USA) (n=1), and Canada (n=1). The study designs include randomized control trials (n=8), case reports (n=2) and an uncontrolled trial (n=1). The studied interventions featured a range of therapeutics including herbal medicine (n=6) dietary and lifestyle changes (n=3), acupuncture (n=2), hydrotherapy (n=2), and yoga (n=1) and included five studies that employed interventions involving more than one therapeutic category.

The women's health conditions examined in these studies include menopausal symptoms (n=4), menstrual disorders (n=2), polycystic ovarian syndrome (n=2), candidiasis (n=1), interstitial cystitis (n=1), and recurrent pregnancy loss (n=1). Of all the naturopathic clinical studies examining women's health populations, 81.8% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 26.1: Clinical research investigating women's health conditions conducted by naturopathic researchers.* This body of naturopathic research on women's health conditions is also supported by more than 40 observational studies and more than 30 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 28.

Implications

Female reproductive health conditions are diverse in etiology, pathophysiology, and symptomatology and are listed in the top five primary health condition for which individuals consult with a naturopath/naturopathic doctor [4]. Females are more likely than men to consult with a naturopath/naturopathic doctor and represent approximately three quarters of naturopathic patients. This includes women with chronic pelvic pain [5], women attempting to conceive [6], pregnant women [7] and women experiencing menopausal symptoms [8]. Naturopathic research indicates that the types of conditions for which women seek naturopathic care may benefit from naturopathic clinical treatments.

The most common female reproductive health conditions reported by patients seeking naturopathic care are dysmenorrhea and other menstrual complaints, polycystic ovarian syndrome and endometriosis, as well as support during menopause/perimenopause, preconception, pregnancy, and the postnatal period [4, 9]. The naturopathic focus on wellness, health promotion and disease prevention, working with the healing power of nature, and providing care to the whole person is particularly important for these women as it enables naturopaths/naturopathic doctors to support women during these normal life stages with a focus on health and wellness rather than illness. Moreover, women with reproductive health care needs commonly report valuing holistic care that is empowering and acknowledges their experiences and the impact of any symptoms on their quality of life [10-12]; features that characterize patient experiences of naturopathic care [13, 14].

Women with reproductive disorders such as those investigated in the naturopathic research also report being dissatisfied with the standard medical treatment and care options available to them (e.g. polycystic ovarian syndrome [15], interstitial cystitis [16, 17]). Given the positive outcomes identified for these conditions, naturopathic treatments are a valuable addition to the available treatments for women. To date, the research has primarily focused on herbal and dietary interventions with herbal treatments having the most notable clinical effects. It is also interesting to note that several herbal interventions employed multi-botanical formulas and, in some instances, combined herbal treatments with dietary and lifestyle changes. These characteristics of naturopathic treatments highlight naturopaths'/naturopathic doctors' application of complex, whole person treatments for women's health conditions.

As such, women's health is an important focus area for both naturopathic practice and naturopathic research. In part, this may be driven by the number of women seeking naturopathic care due to the high proportion of the naturopathic workforce in some countries that are female [18], and the appeal of the egalitarian, empowering and holistic model of care that characterizes naturopathic consultations [19]. Specifically, naturopathic consultations are, on average, 30 minutes to one hour in duration and this time is dedicated to collecting a range of information vital to undertaking a naturopathic assessment including understanding the patient's mental and emotional status and sense of wellbeing (see Chapter 1). These features provide support to the patient that extends beyond the immediate issues associated with their primary complaint and may facilitate whole-person healing [20]. Given the high proportion of women consulting with a naturopath/naturopathic doctor internationally, and the needs of women's health in conventional medicine, the results of these studies highlight the potential contribution of naturopathic care to women's health in the community and the need for further research.

Studies based on specific conditions:

Menopausal symptoms

Four studies, three from Australia and one from the USA, sampled women experiencing menopausal symptoms [21-24] with a primary focus on vasomotor symptoms (e.g., hot flushes, night sweats). Three studies examined the effects of a herbal medicine product [22-24], two of which constituted a combination of herbal medicines [22, 23] and one contained a single herbal medicine [24]. One of the herbal medicine studies also included a study arm in which dietary changes were studied [22]. A further study tested the effects of acupuncture on menopausal symptoms [21].

Clinical finding

Fenugreek *(Trigonella foenum-graecum)* may reduce symptoms of menopause.

A randomized controlled trial conducted in Australia (n=104) of women 40-65 years old, experiencing menopausal/perimenopausal symptoms examined the effects of a proprietary herbal medicine product containing 300mg of *Trigonella foenum-graecum* L. (fenugreek) de-husked seed extract, standardized for a minimum of 50% content of forustanol saponins [24]. Participants in the intervention group (n=54) ingested one capsule twice daily, delivering an equivalent of 600mg/day of *Trigonella foenum-graecum*, for 12 weeks. Their results were compared with participants (n=50) using a maltodextrin capsule placebo. The study outcomes were measured by the change from baseline in Menopause-Specific Quality of Life (MENQOL) questionnaire scores at Week 4, 8 and 12. Women in the intervention group had lower symptom scores, indicating reduced symptoms, across all domains of MENQOL – vasomotor, psychosocial, physical, sexual and total quality of life – at all time points compared to baseline. Compared with the placebo group, these reductions in menopausal symptoms were statistically significant for all domains ($p<0.001$).

A second randomized controlled trial conducted in Australian study of women (n=104) experiencing menopausal symptoms scoring greater than 'mild' on MENQOL examined the effects of a multi-botanical capsule comprising of 100mg *Tinospora cardiofolia* (stem), 100mg *Asparagus racemosus* (root), 100mg *Withania somnifera* (root) and 225mg *Commiphora mukul* (gum exudate) [22, 23]. Throughout the study period of 12 weeks, participants in the intervention group (n=54) ingested

one capsule twice daily and the placebo group (n=50) were given an identical capsule containing maltodextrin. Similar to the previous study, change from baseline at Week 4, 8 and 12 for all symptom domains of the MENQOL questionnaire was used to measure study outcomes. A statistically significant difference in change in symptom scores for each domain was reported between groups, with a greater reduction in symptoms reported for the intervention group compared to placebo ($p \leqslant 0.002$). The study also measured changes from baseline in the 7-day incidence of hot flushes, night sweats and total vasomotor symptoms at Week 4, 8 and 12. The intervention group reported a reduction in hot flushes (-30%), night sweats (-50%), and total vasomotor symptoms (-43%) at Week 4, and these reductions increased in magnitude through to Week 12 (Hot flushes: -64%; night sweats: -71%; total flushes: -67%). The difference in change in 7-day incidence of vasomotor symptoms between the intervention and placebo groups was statistically significant across all time points for all symptom categories ($p<0.001$). Safety data collected in this study found no difference between groups.

Clinical finding

A combination herbal medicine containing *Tinospora cardiofolia, Asparagus racemosus, Withania somnifera* and *Commiphora mukul* may reduce hot flushes and night sweats in women experiencing menopausal symptoms.

Menstrual disorders

Two studies investigated the potential impact on primary dysmenorrhea with hydrotherapy and acupuncture [25, 26]. An uncontrolled pilot study conducted in India examined the use of hydrotherapy in the form of a hot hip-bath immersion from day 20 of the menstrual cycle. The study measured the effects of the hydrotherapy intervention on menstrual pain, absenteeism from work and non-steroidal anti-inflammatory drug (NSAID) use over a three month period [25]. Participants reported being absent from work between seven and eight days fewer per month and having a reduction in pain on the first day of the period (month 1 -2.7, month 2 -2.8 and month 3 -3.2 points) based on a Visual Analogue Scale. They also reported a concomitant reduction in use of NSAID use over the same time.

A randomized controlled trial conducted in India evaluated an acupuncture protocol in a naturopathic setting on pain, muscle cramping, and systemic symptoms (e.g., headache, nausea, mood changes) over a 90-day period [26]. The study utilizing acupuncture as a treatment approach recruited women between the ages of 17-23 years [26]. Participants were required to have a history of primary dysmenorrhea for at least 1- year, regular periods and no use of contraceptive devices or pills and no pain medication use for 6 months prior to the commencement of the study. Participants were randomized to either the study group (n=30) or control (n=30) and assessments for pain intensity, muscle cramping and systemic symptoms (headache, dizziness, diarrhea, faint feeling, mood changes, tiredness, nausea and vomiting) were conducted at baseline (Day 1), Day 30, Day 60 and Day 90. A 12-point acupuncture protocol was used, and needles were in place for 20 minutes/session. Each participant in the intervention group received 45 acupuncture sessions (15 sessions in 30 days over 90 days), while the control group received no treatment. Results of the treatment demonstrated a significant reduction in all outcome measures at Day 30, Day 60, and Day 90 except for headaches, which was only significant after the intervention period. None of participants reported adverse effects during the study.

Clinical finding

Acupuncture may reduce pain intensity, muscle cramping, and other systemic symptoms in individuals with primary dysmenorrhea.

Polycystic Ovarian Syndrome

Two studies, one from Australia and one from India, examined outcomes of complex interventions for women with polycystic ovarian syndrome (PCOS) [27, 28].

The randomized controlled trial conducted in Australia sampled women (n=122) between 18 and 44 years old with PCOS diagnosis confirmed according to the Rotterdam criteria [27, 28]. The study compared a lifestyle intervention with a combined lifestyle and herbal intervention for three months. The lifestyle intervention consisted of lifestyle counselling, inclusive of dietary and exercise behaviours, delivered through a structured personalized plan and fortnightly follow-up support. The herbal medicine intervention constituted administration of two herbal medicine products: (1) Three tablets administered daily containing combined extracts equivalent to 750mg *Glychyrrhiza glabra* (root), 750mg *Paeonia lactiflora* (root), 750 mg *Cinnamomum verum* (stem bark) and 750mg *Hypericum perforatum* (flowering herb); (2) Three tablets per day for ten consecutive days – commencing either on Day 5 of the menstrual cycle of women with oligomenorrhea or within one week of trial commencement for women with amenorrhea- containing a single herbal extract equivalent to 13 500mg *Tribulus terrestris* (aerial parts) standardized to 100 mg furostanol saponins (protodioscin). There were 60 participants in the herbal

and lifestyle (HL) intervention arm and 62 participants in the lifestyle only (LO) arm. At the end of the 3-month study period, a significant ($p<0.01$) difference in number of days between menstrual periods (Mean difference: -42.9 days), body weight (-2.95 kg), body mass index (-1.0), waist circumference (-3.41 cm) in favor of the HL group compared to LO was reported. Comparatively greater reductions in luteinizing hormone (-1.82 IU/L), fasting insulin (-0.44 mU/L) and systolic (-3.6 mmHg) and diastolic (-5.13) blood pressure, as well as increased estradiol (+68.9 pmol/L) were also reported in the HL group. The quality-of-life scores, as measured by the Polycystic Ovarian Syndrome Questionnaire (PCOSQ), were also lower in the HL group compared with the LO group, indicating an improved quality of life in participants receiving HL. Depression, anxiety, and stress levels were also significantly reduced for participants in the HL group compared to those receiving LO. There was no difference in the proportional rates of miscarriage reported between groups, but pregnancy rates were higher (RR 3.9) for women in the HL group compared with the control.

Clinical finding

Naturopathic care involving individualised lifestyle modification, dietary counselling, and herbal medicine may reduce menstrual irregularity, body weight, waist circumference, depression, anxiety while improving hormone levels, blood pressure and quality of life in individuals with polycystic ovarian syndrome.

Other women's health conditions

Three additional studies two from Australia and one from Canada investigated the use of herbal medicines for other women's health conditions: the first for recurrent pregnancy loss [29], the second as an aid in the resolution of vaginal candidiasis [30], and the third for the treatment of interstitial candidiasis [31].

A randomized double blind placebo control trial conducted in Australia sought to investigate the efficacy of garlic tablets (Garlicin™ tablets at 3 tablets, twice per day [equivalent to 2100mg garlic powder, 19.2mg allicin]) on vaginal colony counts of candida in the two week prior to menstruation in asymptomatic women with colonized *Candida spp* (n=59) [30]. The outcomes were 1) the proportion of cases where women with Candida colony counts >100 CFU/ml in any given day during the last 7 days before menstruation, 2) quantitative counts of *Candida spp.* on daily vaginal swabs taken 2 weeks prior to menstruation, 3) itch (mild, moderate, severe) and 4) abnormal discharge (Yes/No). Sixty-three eligible women were randomized into the trial and 59 completed the study. No differences in the proportion of "cases" within the garlic group versus the placebo group. No difference in quantitative vaginal counts (daily swabs) or symptoms (itch and vaginal discharge) was found between the two groups. The study was powered to identify a 40% effect size between the treated and control, whereas a smaller effect size of 14% was achieved.

A case report conducted in Canada presented the outcome of the use of *Vitex agnus-castus* during the first trimester of pregnancy [29]. A woman with a history of recurrent pregnancy loss and demonstrated low progesterone levels (22.1 nm/L [1st trimester normal range: 18-250 nm/L]) was given 166.6 mg of 6:1 *Vitex agnus-castus* fruit extract from 1000 mg of fruit per day. After one month, a home pregnancy test was positive. Subsequent laboratory and ultrasound assessments at 5 weeks plus 2 days confirmed bHCG of 1200 IU/ml and progesterone of 85 nm/L and a singleton uterine pregnancy. The patient's obstetrician/gynecologist recommended discontinuation of the *Vitex agnus-castus* and prescribed progesterone suppositories. Subsequent ultrasounds and screening testing were normal, and the patient had a healthy pregnancy, resulting in the delivery of a full-term infant. At 15 months postpartum, the *Vitex agnus-castus* was restarted and one month later a second pregnancy was confirmed via a positive pregnancy test. The *Vitex agnus-castus* was continued until the 8th week of pregnancy and then discontinued. Ultrasounds at weeks 12, 20 and 28 reveal a healthy singleton uterine pregnancy. At the time of publication, the patient was 38 weeks pregnant.

Table 26.1 Clinical research investigating women's health conditions conducted by naturopathic researchers

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Arentz, et al. (2017) [Australia, WPRO] [27]	Randomized controlled trial	Polycystic ovarian syndrome (Women, 18-44 years, BMI >24.5 kg/m^2)	Herbal medicine: Tableted extracts of *Glycyrrhiza glabra* root 2.25 g, *Paeonia lactiflora* root without bark 2.25 g, *Cinnamomum verum* bark 2.25 g, *Hypericum perforatum* flowering tops 2.25 g (throughout the cycle), *Tribulus terrestris* aerial parts (standardized to 110 mg protodioscin/tablet) 40.5 g (follicular phase of menstrual cycle only) once per day. Lifestyle change: calorie-controlled, low-glycemic, nutrient-dense diet; 150 min exercise per week including 90 min aerobic activity (60 – 90% of maximum heart rate) with optional occasional supervised exercise sessions	3 months	Lifestyle change only	122 (60/62)	Time between menstrual periods (days) [BL to Mth 3]	**Reduced time between menstrual periods** Herbal and Lifestyle: 63.7 Lifestyle only: 106.6 Between group: p<0.01
							Women with normal menstrual cycle length defined as 20 – 34 days (%) [BL to Mth 3]	**Increased proportion** Herbal and Lifestyle: 55% Lifestyle only: 24.2% Between group: p<0.01
							Body weight (kg) [BL to Mth 3]	**Reduced body weight** Herbal and Lifestyle: 90.2 Lifestyle only: 97.2 Between group: p<0.01
							Body mass index (kg/m^2) [BL to Mth 3]	**Reduced body mass index** Herbal and Lifestyle: 33 Lifestyle only: 35 Between group: p<0.01
							Waist-to-hip ratio [BL to Mth 3]	NS
							Serum luteinizing hormone (LH) level (IU/L) [BL to Mth 3]	**Reduced LH** Herbal and Lifestyle: 5.84 Lifestyle only: 7.4 Between group: p=0.04
							Serum FSH (IU/L) [BL to Mth 3]	NS
							Serum estradiol (pmol/L) [BL to Mth 3]	**Increased estradiol** Herbal and Lifestyle: 217 Lifestyle only: 148.1 Between group: p=0.03
							Serum testosterone, total (nmol/L) [BL to Mth 3]	NS
							Serum sex hormone-binding globulin (nmol/L) [BL to Mth 3]	NS
							Serum fasting glucose (nmol/L) [BL to Mth 3]	NS

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Serum insulin (mU/L) [BL to Mth 3]	**Reduced insulin** Herbal and Lifestyle: 12.3 Lifestyle only: 20.3 Between group: p=0.02
							Blood pressure (BP), systolic (mmHg) [BL to Mth 3]	**Reduced BP** Herbal and Lifestyle: 114.3 Lifestyle only: 118 Between group: p=0.01
							Blood pressure (BP), diastolic (mmHg) [BL to Mth 3]	**Reduced BP** Herbal and Lifestyle: 69.3 Lifestyle only: 74.6 Between group: p<0.01
							Impact on health-related quality of life (total PCOS score) [BL to Mth 3]	**Reduced impact** Herbal and Lifestyle: 81.5 Lifestyle only: 109.3 Between group: p<0.01
							Depression, Anxiety and Stress Scale [BL to Mth 3]	**Reduced depression** Herbal and Lifestyle: 3.5 Lifestyle only: 7.5 Between group: p<0.01 Reduced anxiety Herbal and Lifestyle: 2.4 Lifestyle only: 6.3 Between group: p<0.01 Reduced stress Herbal and Lifestyle: 4.9 Lifestyle only: 9.6 Between group: p<0.01
Aucoin (2018) [Canada, AMRO] [29]	Case report	Recurrent pregnancy loss (Female, 29 years)	*Vitex agnus-castus* fruit extract 166.6 mg, 2 capsules per day (fifth and six pregnancies) Progesterone 200 mg vaginal pessary twice daily (from week 5 to week 10 of fifth pregnancy only)	First trimester for two consecutive pregnancies	First pregnancy on presentation (fourth pregnancy in case received no treatment)	1	Serum β-human chorionic gonadotropic (HcG) (IU/ml)	**Increased HcG** 4th pregnancy: 459 5th pregnancy: 1200 6th pregnancy: Not reported

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Serum progesterone (nmol/ml)	**Increased progesterone** 4th pregnancy: 22.1 5th pregnancy: 85.0 6th pregnancy: not reported
							Pregnancy outcome	**Live births** 4th pregnancy: spontaneous abortion at 5 weeks, 6 days 5th pregnancy: full-term live birth 6th pregnancy: 38 weeks' pregnancy with normal, live, singleton expected
Bharthis, et al. (2012) [India, SEARO] [25]	Uncontrolled trial	Primary dysmenorrhea	Hot hip bath with cold compress on the head	3 menstrual cycles + 2 months follow-up	Nil	17	Absenteeism due to pain (days) [BL to Mth 5]	**Reduced absentees** Mth 1: -7 ($p < 0.01$) Mth 2: -8 ($p<0.01$) Mth 3: -8 ($p<0.01$)
							Pain on before onset of menstruation, Visual Analogue Score [BL to Mth 1, Mth 2, Mth 3]	NS
							Pain on first day of menstruation, Visual Analogue Score [BL to Mth 1, Mth 2, Mth 3]	**Reduced pain** Mth 1: -2.7 ($p=0.03$) Mth 2: -2.8 ($p=0.04$) Mth 3: -3.2 ($p=0.01$)
							Conventional analgesic medication use [BL to Mth 3]	**Reduced analgesic medication use**
Ee, et al (2016) [Australia, WPRO] [21]	Randomized controlled trial	Menopause, hot flushes (women, >40 years)	Standardized needle acupuncture to treat kidney yin deficiency.	8 weeks (10 treatments; 2 per week for 2 weeks, then weekly)	Non-insertive sham acupuncture	327 (163/ 164)	Hot flush score (mean) [BL to Wk 8]	NS
							Hospital Anxiety and Depression Scale [BL to Wk 8]	NS
							Quality of life (MENQoL) [BL to Wk 8]	NS

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Newton, et al. (2006) [USA, AMRO] [22]	Randomized controlled trial	Menopausal hot flushes	(1) *Actaea racemosa* (160mg/day) plus diet counselling (1 phone call; fruit and vegetable booklet (2) Multibotanical: *Actaea racemosa* (200mg/day), *Medicago sativa* (400mg), boron (4mg), *Vitex agnus-castus* (200mg), *Angelica sinensis* (400mg), *Chamaelirium luteum* (200mg), *Glycyrrhiza glabra* (200mg), *Avena sativa* (400mg), *Punica gratum* (400mg), *Eleuthrococcus senticosus* (stand. 0.8% eleuthrosides E and B; 400mg) plus diet counselling (1 phone call; fruit and vegetable booklet). (3) Multibotanical plus soy diet counselling – 5 phone calls from a clinical dietician and a 34-page booklet recommending 2 soy food servings/day (equiv. 12-20g soy protein) (4) Conjugated equine estrogen 0.625mg; + medroxy-progesterone acetate (2.5mg) for women with a uterus plus diet counselling (1 phone call; fruit and vegetable booklet).	12 months	Lactose capsules plus dietary counselling (1 phone call from a clinical dietician and a 34-page booklet reinforcing fruit and vegetable intake).	N=351 (257/77) 1: n=77 2: n=74 3: n=77 4: n=29	Frequency of vasomotor symptoms [BL to Mth 3, 6, 12]	Group 1, 2 & 3: NS Group 4: Mth 3 -4.55 ($p<0.001$) Mth 6 -3.86 ($p<0.001$) Mth 12 -3.76 ($p<0.001$) Overall, -4.06 ($p<0.001$)
							Intensity of vasomotor symptoms [BL to Mth 3, 6, 12]	Group 1, 2, 3 & 4: NS
							Wiklund Menopause Symptom Scale score [BL to Mth 3, 6, 12]	Group 1, 2 & 3: NS Group 4: Mth 3 -2.60 ($p<0.001$) Mth 6 -1.78 ($p<0.001$) Mth 12 -1.77 ($p<0.001$) Overall, -2.05 ($p<0.001$)

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
Ratnakumari, et al. (2018) [India, SEARO] [28]	Randomized controlled trial	Polycystic ovarian syndrome	Complex intervention comprising: (a) Cold abdominal mud pack (b) Cold water enema (c) Cold hip bath; (d) Hot foot immersion bath; (e) Partial massage to abdomen; (f) Partial massage to back; (g) Dietary changes: Fasting using fruit and vegetable juices and fluids; (h) Dietary changes: Raw vegetables, fruits, sprouts, vegetable soup for breakfast, and short vegetarian lunch meal; (i) Dietary changes: Boiled vegetables, steamed food; (j) yogic practice: *Asanas [supine: uttanapadasana, pawanmuktasana, naukasana, setu bandhasana; prone: bhujangasana, dhanurasana; sitting: vakrasana, baddha konasana; standing: katichakrasana, ardhakatichakrasana, dwikonasana, padahastasana], Pranayama [bhramari pranayama, surya bhedana pranayama, nadi shodhana pranayama], Kriya [kapalhati], Mudra [yoni mudra], Relaxation [savasana]*	12 weeks: (a) 10 mins, 6 days/wk; (b) once in 4 wks; (c) 15 mins, 6 days/wk; (d) 10 mins, twice in one week; (e) 10 mins, 3 days/wk; (f) 10 mins, 3 days/wk; (g) initial 3 days/ month; (h) next 18 days/ month; (i) final 7 days/ month; (j) 20mins, 6 days/wk excluding menstruation days	Waitlist	50 (25/25)	Ovarian volume [BL to Wk 12]	**Increased ovarian volume (left)** Right: NS Left: Intervention +3.68 Control -0.79 Between group p=0.032
							Ovarian size (cm) [BL to Wk 12]	Right: NS Left: NS
							Follicles antrum [BL to Wk 12]	**Increased follicle antrum (right)** Right: Intervention +5; Control -4 Between group p<0.001 Left: NS
							Largest follicle size (cm) [BL to Wk 12]	**Reduced follicle length** Right, Length: Intervention -0.1; Control +0.15 Between group p=0.016 Right, Width: NS Left, Length & Width: NS
							Total ovarian assessment (instrument not specified) [BL to Wk 12]	**Increased ovarian** Intervention: +6; Control: -3.5 Between group: p<0.001
							Body weight (kg) [BL to Wk 12]	**Increased body weight** Intervention: +6; Control: +0.0 Between group: p<0.001
							Body mass index (BMI) (kg/m^2) [BL to Wk 12]	**Increased BMI** Intervention: +2.36; Control: 0.0 Between group: p<0.001
							Chest circumference (cm) [BL to Wk 12]	**Increased chest circumference** Intervention: +4.25; Control: +0.75 Between group: p<0.001

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Waist circumference (cm) [BL to Wk 12]	**Increased waist circumference** Intervention: +5; Control: -1.25 Between group: p<0.001
							Hip circumference (cm) [BL to Wk 12]	**Increased hip circumference** Intervention: +6.75; Control: -0.25 Between group: p<0.001
							Mid-arm circumference (cm) [BL to Wk 12]	**Increased mid-arm circumference** Intervention: +3; Control: +0.0 Between group: p<0.001
							Waist-hip ratio [BL to Wk 12]	NS
							Cycle length [days] [BL to Wk 12]	Last menstrual period and first cycle: NS First and second cycle: NS Second and third cycle: NS
Shetty, et al. (2018) [India, SEARO] [26]	Randomized controlled trial	Primary dysmenorrhea (age 17-23 years old)	Needle stimulation of 12 acupuncture points. *Single needle stim.:* CV-4, CV-6. *Bilateral needle stim.:* KI-3, SP-8, ST-25, ST-29, ST-30, ST-36, BL-62, HT-7, LI-4, PC-6. *Needles:* 0.2 x 30mm. *Stimulation:* undisturbed. (*Duration*: 20 minutes. *Sessions*: 45 [1 per day; 15 per 30 days]. *Treatment initiation:* 6th day of menstrual cycle [not performed during menstruation])	90 days	Usual care	60 (30/30)	Pain intensity [10-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced pain** Dy 30: Acupuncture -2.86 Control -0.39 Between group, p<0.05 Dy 60: Acupuncture -4.75 Control -0.34 Between group, p<0.05 Dy 90: Acupuncture -4.76 Control +0.05 Between group, p<0.05

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Muscle/menstrual cramping [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced cramping** Dy 30: Acupuncture -1.20 Control +0.10 Between group, p<0.05 Dy 60: Acupuncture 1.43 Control +0.17 Between group, p<0.05 Dy 90: Acupuncture -1.60 Control +0.10 Between group, p<0.05
							Headache [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced headache** Dy 30 & 60: NS Dy 90: Acupuncture -0.30 Control -0.03 Between group, p<0.05
							Dizziness [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced dizziness** Dy 30: Acupuncture -0.84 Control -0.10 Between group p<0.05 Dy 60: Acupuncture -1.00 Control +0.03 Between group p<0.05 Dy 90: Acupuncture -1.00 Control +0.06 Between group p<0.05
							Diarrhea [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced diarrhea** Dy 30: Acupuncture -0.46 Control +0.20 Between group p<0.05 Dy 60: Acupuncture -0.53 Control +0.07 Between group p<0.05 Dy 90: Acupuncture -0.56 Control +0.20 Between group p<0.05

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Faint [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced faint** Dy 30: Acupuncture -0.40 Control -0.03 Between group p<0.05 Dy 60: Acupuncture -0.40 Control -0.16 Between group p<0.05 Dy 90: Acupuncture -0.43 Control +0.10 Between group p<0.05
							Mood changes [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced negative mood** Dy 30: Acupuncture -1.00 Control -0.04 Between group p<0.05 Dy 60: Acupuncture -0.90 Control -0.17 Between group p<0.05 Dy 90: Acupuncture -0.97 Control -0.10 Between group p<0.05
							Tiredness [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced tiredness** Dy 30: Acupuncture -1.00 Control -0.04 Between group p<0.05 Dy 60: Acupuncture -1.27 Control -0.04 Between group p<0.05 Dy 90: Acupuncture -1.27 Control -0.24 Between group, p<0.05
							Nausea [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced nausea** Dy 30: Acupuncture -0.70; Control -0.07 Between group p<0.05 Dy 60: Acupuncture -0.73 Control +0.13 Between group p<0.05 Dy 90: Acupuncture -0.87 Control +0.16 Between group, p<0.05

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Vomiting [4-point numerical rating scale] [BL to Dy 30, 60, 90]	**Reduced vomiting** Dy 30: Acupuncture -0.47 Control +0.03 Between group p<0.05 Dy 60: Acupuncture -0.47 Control +0.07 Between group p<0.05 Dy 90: Acupuncture -0.47 Control -0.00 Between group, p<0.05
Steels, et al. (2017) [Australia, WPRO] [24]	Randomized controlled trial	Menopausal symptoms	*Capsule: Trigonella foenum-graecum* L. de-husked seed extract (Libifem®), 300mg extract equiv. 9.9g dry herb, standardized for a minimum of 50% conent of forustanol saponins. Dose: 1 capsule twice daily, equivalent 600mg/day extract; with food at breakfast and evening meal	12 weeks	Placebo: Maltodextrin in identical capsule	104 (54/50)	Vasomotor symptoms (Menopause-Specific Quality of Life Questionnaire – MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced vasomotor symptoms** Herbal: Wk 4, -1.3; Wk 8, -1.7. Wk 12, -2.1 Placebo: Wk 4, +0.3; Wk 8, +0.2; Wk 12, +0.2 Between group, p<0.001
							Psychosocial symptoms (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced psychosocial symptoms** Herbal: Wk 4, -0.7; Wk 8, -1.1; Wk 12, -1.0 Placebo: Wk 4, +0.1; Wk 8, -0.1; Wk 12, -0.1 Between group, p<0.001
							Physical symptoms (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced physical symptoms** Herbal: Wk 4, -0.7; Wk 8, -1.0; Wk 12, -1.0 Placebo: Wk 4, -0.2; Wk 8, -0.4; Wk 12, -0.3 Between group, p<0.001

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Sexual symptoms (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced sexual symptoms** Herbal: Wk 4, -0.8; Wk 8, -1.4; Wk 12, -1.4 Placebo: Wk 4, +0.1; Wk 8, -0.3; Wk 12, -0.2 Between group, p<0.001
							Impact on Total Quality of Life (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced impact on quality of life** Herbal: Wk 4, -3.5; Wk 8, -5.2; Wk 12, -5.4 Placebo: Wk 4, -0.3; Wk 8, -0.6; Wk 12, -0.4 Between group, p<0.001
Steels, et al. (2018) [Australia, WPRO] [23]	Randomized controlled trial	Menopausal hot flushes	Capsule: *Tinospora cardifolia* (stem), 100mg; *Asparagus racemosus* (root), 100mg; *Withania somnifera* (root), 100mg; *Commiphora mukul* (gum exudate), 225g. Dose: 1 capsule twice daily with breakfast and evening meal.	12 weeks	Placebo: Maltodextrin in identical capsule	104 (54/50)	Vasomotor symptoms [Menopause-Specific Quality of Life Questionnaire – MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced vasomotor symptoms** Herbal: Wk 4, -1.4; Wk 8, -1.9; Wk 12, -1.6 Placebo: Wk 4, +0.3; Wk 8, +0.2; Wk 12, +0.2 Between group, p<0.001
							Psychosocial symptoms [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced psychosocial symptoms** Herbal: Wk 4, -0.9; Wk 8, -1.1; Wk 12, -0.9 Placebo: Wk 4, +0.3; Wk 8, -0.1; Wk 12, -0.1 Between group, p<0.001

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Physical symptoms [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced physical symptoms** Herbal: Wk 4, -0.8; Wk 8, -1.2; Wk 12, -0.9 Placebo: Wk 4, -0.2; Wk 8, -0.4; Wk 12, -0.3 Between group, p=0.002
							Sexual symptoms [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced sexual symptoms** Herbal: Wk 4, -0.7; Wk 8, -1.0; Wk 12, -1.3 Placebo: Wk 4, +0.1; Wk 8, -0.3; Wk 12, -0.2 Between group, p<0.001
							Impact on Total Quality of Life [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced impact on quality of life** Herbal: Wk 4, -3.8; Wk 8, -5.2; Wk 12, -4.8 Placebo: Wk 4, +0.3; Wk 8, -0.6; Wk 12, -0.4 Between group, p<0.001
							7-day incidence of daytime hot flushes [BL to Wk4, Wk 8, Wk 12]	**Reduced incidence of hot flushes** Herbal: Wk 4, -8 (-30%); Wk 8, -14 (-50%); Wk 12, -18 (-64%) Placebo: Wk 4, -1 (-6%); Wk 8, -0.0 (0%); Wk 12, +4 (+22%) Between group, p<0.001

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
							7-day incidence of night sweats [BL to Wk4, Wk 8, Wk 12]	**Reduced incidence of night sweats** Herbal: Wk 4, -7 (-50%); Wk 8, -7 (-50%); Wk 12, -10 (-71%) Placebo: Wk 4, -4 (-36%); Wk 8, -3 (-27%); Wk 12, -1 (-9%) Between group, p<0.001
							7-day incidence of total flushes [BL to Wk4, Wk 8, Wk 12]	**Reduced incidence of total flushes** Herbal: Wk 4, -18 (-43%); Wk 8, -22 (-52%); Wk 12, -28 (-67%) Placebo: Wk 4, -17 (-19%); Wk 8, -17 (-19%); Wk 12, +1 (+3%) Between group, p<0.001
							Safety measurements – Blood pressure, weight (kg), fasting blood glucose, serum cholesterol, red cell count, hematocrit, mean cell volume, mean cell hemoglobin, total protein, albumin [BL to Wk4, Wk 8, Wk 12]	NS
Taylor, et al. (2018) [Australia, WPRO] [31]	Case report	Interstitial Cystitis	Naturopathic care including liquid herbal formula containing *Hypericum perforatum, Eleutherococcus senticosus, Scutellaria lateriflora, Schisandra chinensis, Crocus sativus,* (7.5ml BD), herbal tablet containing *Boswellia serrata, Curcuma longa, Apium*	2 weeks	Nil	1	Client self-reported symptom reduction	Increased energy and vitality, marked reduction in frequency and urgency of urinary symptoms, improved sleep onset and quality, reduction in edema in feet and ankles.

Author (Year) [Country, World Region]	Design	Study Population	Intervention	Dose/ Duration of Treatment	Control or Comparison group	No. Participants (Intervention/ Control)	Measure of Outcome	Outcome
			graveolens, Zingiber officinale, (2 tables BD); lifestyle counseling including sleep hygiene, stress reduction techniques; dietary advice including increased water consumption and reduction of aggravating foods.					
Watson, et al. (2014) [Australia, WPRO] [30]	Randomized controlled trial	Candidiasis	Tablet: Garlic powder, 350mg (allicin: 3200mcg)	14 days; 3 tablets twice daily	Placebo: tablets containing lactose, povidone, maize starch, talc, magnesium stearate	59 (29/30)	Proportion of 'cases' (women with colony counts of candida >100 CFU/ml in any given day during the last 7 days before menstruation) [BL to Wk4, Wk 8, Wk 12]	NS
							Vaginal quantitative counts (daily swabs for 2 weeks prior to menstruation) [BL to Wk4, Wk 8, Wk 12]	NS
							Vaginal itch (moderate to severe, compared to mild) [BL to Wk4, Wk 8, Wk 12]	NS
							Abnormal discharge (yes/no) [BL to Wk4, Wk 8, Wk 12]	NS
							Self-reported change in experienced symptoms of vaginitis (same, better, or worse than usual) [BL to Wk4, Wk 8, Wk 12]	NS

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27 Other Conditions

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HIGHLIGHTS

- Naturopaths/naturopathic doctors treat diverse health conditions through all stages of life.
- While patients seeking naturopathic care primarily present with chronic conditions, naturopaths/NDs also provide acute care as well as preventive and palliative care.
- Research suggests that naturopathic care may be beneficial in the treatment of obesity, respiratory and genitourinary conditions.
- Further research investigating the role of naturopathic care in acute conditions is warranted.
- 85.7% of clinical studies investigating naturopathic treatment for other conditions report a positive outcome in at least one primary or secondary outcome measure.

Primary health care presents health professionals with diverse populations experiencing diverse health conditions ranging from chronic, lifestyle-related health concerns such as overweight and obesity, everyday illnesses such as colds and flu, and non-life-threatening conditions which have significant impact on an individual's quality of life such as urinary incontinence and sexual dysfunction. In line with their training as primary care practitioners, naturopaths/naturopathic doctors (NDs) provide care to the patients through all stages of life including preventive, acute, chronic and palliative care.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=14) conducted by naturopathic clinicians on conditions not presented elsewhere in this section. This research includes a total of 510 participants and was conducted in India (n=6), the United States of America (USA) (n=4), Germany (n=1), Australia (n=1), Canada (n=1), and Puerto Rico (n=1). The study designs include randomized control trials (n=7), case reports (n=5), and uncontrolled trials (n=2). There was a range of interventions investigated in these studies including yoga (n=5), applied nutrition (n=3), herbal medicine (n=2), acupuncture (n=2), clinical nutrition (n=2), homeopathy (n=1), hydrotherapy (n=1), bodywork (n=1), and mindfulness meditation (n=1). One study combined more than two types of treatment within a complex naturopathic intervention. The conditions examined in the studies include overweight and/or obesity (n=6), respiratory conditions (n=6), and genitourinary conditions (n=2). Of all the naturopathic clinical studies examining populations with other health conditions, 85.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 27.1: Clinical research investigating other conditions conducted by naturopathic researchers.*

Implications

There is emerging evidence across a range of conditions to suggest that naturopathic interventions may be beneficial for patients with overweight and obesity, respiratory conditions and genitourinary conditions. While some research is based on case reports, there is a substantial and growing body of evidence from clinical trials using standardized measures that report favorable outcomes.

Naturopaths/naturopathic doctors treat diverse health conditions through all stages of life. While patients primarily present with chronic health conditions, naturopaths/naturopathic doctors also provide care to patients during acute phases of illness as well as providing preventive and palliative care [1]. The wellness orientation of naturopaths/naturopathic doctors and the focus on lifestyle and preventive behaviours supports their ability to provide care to patients irrespective of their health condition; in some instances, with the aim to resolving the condition, while in others reducing symptoms and improving quality of life. The holistic approach to healthcare and the inter-systems approach to treatment facilitated by naturopathy's philosophical

and principles-based approach to care supports patients with multiple morbidities or pathologies, which is seldom captured by research studies.

The breadth of treatments employed by naturopaths/naturopathic doctors combined with the variability in each patient's health needs and the imperatives of the naturopathic philosophies and principles to deliver individualized patient care results in different treatments approaches being considered for the same condition. Such variations in treatment can be seen within the practices of individual naturopaths/naturopathic doctors as well as between naturopathic clinicians, also likely to be the result of the patient-centered and individualized focus of naturopathic practice. Additional research is required to fully understand the effectiveness of the range of naturopathic treatments across different symptoms and conditions.

Studies based on specific conditions:

Overweight or obesity

Treatments for overweight or obesity are examined in six clinical studies, two conducted in the USA [2, 3], three in India [4-6] and one in Germany [7]. The study interventions include yoga (n=2) [6, 7], applied nutrition (n=3) [2, 5, 6] clinical nutrition (n=1) [3] and a complex intervention (n=1) [4]. A randomized, controlled trial conducted in Germany examined the impact of a yoga intervention on a range of self-reported and anthropometric outcomes among females with abdominal obesity, compared to a waitlist control group [7]. The women participated in a 12-week intervention involving a full day yoga workshop at the beginning of the study followed by 90-minute yoga classes twice weekly. Compared to the control group, participants in the yoga group reported an improved quality of life (Short Form-23: -3.8; p=0.001), self-esteem (Rosenberg's Self Esteem Scale: -0.02; p=0.03), body awareness (Body Awareness Questionnaire: +9.3; p=0.001) and trust in their bodily sensation (Body Responsiveness Scale: +4.4; p<0.001) at the end of the study period. Favorable improvements from baseline were also recorded for anthropometric measurements in the yoga group, compared to control, including waist circumference (-3.7cm; p=0.001), waist-hip ratio (-0.02; p=0.03), body weight (-2.4kg; p=0.003), body mass index (-0.8 kg/m2; p=0.008), body fat (-1.7%; p=0.01) and muscle mass (+0.8%; p=0.01).

A randomized controlled trial conducted in India employed lemon juice containing lemon seeds combined with a calorie-restricted diet, compared with lemon juice without seeds and the same diet, for individuals with obesity (n=30) [5]. By the end of the study period (7 days), participants in the group consuming lemon juice with lemon seeds had a greater reduction in body mass index (-2.0 vs -1.4 kg/m2; p=0.0001), weight (-4.9 vs -3.3 kg; p=0.004), waist circumference (-11.3 vs -3.4; p=0.004), and hip circumference (-3.5 vs -2.9; p=0.004) but no difference in change to waist-hip ratio.

Clinical finding

Yoga practice may improve quality of life, self-esteem, body awareness, trust in bodily sensation, waist circumference, waist-hip ratio, body weight, body mass index, body fat and muscle mass in women with abdominal obesity.

An uncontrolled study conducted in India involving 47 patients with obesity examined the impact of a low fat, high fiber, vegetarian diet along with daily yoga practice [6]. The study lasted for 6 days and resulted in a reduction of BMI -0.57 (p<0.01), a reduction in waist circumference -1.69 (p<0.01), reduction in hip circumference -1.69 (p<0.01), reduced HDL -2.88 <p<0.01) a reduction in leptin -23.75 (p<0.01), an increase in hand grip strength and postural stability.

Respiratory Conditions

Six clinical studies have examined naturopathic treatments for respiratory conditions including pulmonary tuberculosis [8], asthma [9-11], chronic rhinosinusitis [12], and recurrent symptoms related to the common cold [13]. The studies were in India (n=2) [8, 12], USA (n=2) [10, 11], Australia (n=1) [13], and Puerto Rico (n=1) [9]. A review of 21 patients with asthma from a clinic in Puerto Rico revealed that 94% of patients <21 years of age and 86% of patients >21 years of age experienced improvement in their asthma symptoms [9]. The treatment intervention included bromelain 250 mg TID, an herbal product individualized for each patient, a cough elixir 10 or 30 gtt QID and an individualized homeopathic remedy.

Clinical finding

Yoga combined with breath awareness may improve sputum microscopy and postero-anterior chest x-ray results in individuals with pulmonary tuberculosis.

Naturopathic treatment of pulmonary tuberculosis was examined through a randomized controlled trial conducted in India. The study compared a yoga intervention in a naturopathic setting with breath awareness over

60 days among 48 individuals with confirmed pulmonary tuberculosis [8]. A greater proportion of participants in the yoga group had improved sputum microscopy at day 30 (19/25 vs 10/23; p=0.045), day 45 (24/25 vs 12/23; p=0.002), and day 60 (10/13 vs 4/19; p=0.005) compared to the breath awareness group. Similarly, more of the yoga group than the breath awareness group had an improved postero-anterior chest x-ray at the end of the study period (19/25 vs 3/22; p=0.001).

Clinical finding

High-lactoferrin and immunoglobulin whey protein may reduce the total occurrence of the common cold and cold-associated symptoms in individuals with frequent symptoms related to the common cold.

A randomized controlled trial (n=60) conducted in a naturopathic hospital in India examining the effects of a 10-day acupuncture intervention compared with a steam inhalation intervention for individuals with chronic rhinosinusitis [12]. The acupuncture group received a standardized acupuncture treatment for 20 minutes per day while the steam inhalation group underwent a daily 20-minute protocol involving cycles of steam inhalation. Both groups reported a statistically significant change in symptoms. However, the acupuncture group had a greater reduction in symptom frequency (-1.20 vs -1.03) but a lesser reduction in Sino-Nasal Outcome Test scores (-3.47 vs -4.83). An 90-day placebo-controlled randomized trial conducted in Australia investigated the effects of high-lactoferrin and immunoglobulin whey protein in individuals with frequent symptoms related to the common cold (n=105) [13]. Although no differences in cold duration or severity were reported between groups, the lactoferrin group reported a lower number of total occurrences of the common cold at Day 45 (0.67 vs 1.40; p<0.001) and Day 90 (0.93 vs 2.26; p<0.001). They also had a lower number of cold-associated symptoms compared to placebo (208 vs 288; p<0.05).

Genitourinary Conditions

Two clinical studies investigated genitourinary conditions: one examining acupuncture treatment for sexual dysfunction (n=1) [14]; and a case report describing treatment of urinary incontinence conducted in India (n=1) [15]. The former, an uncontrolled trial conducted in Canada, used acupuncture alongside antidepressant medications to treat individuals with secondary sexual dysfunction (n=35) [14]. The acupuncture was administered in a naturopathic setting weekly for 12 weeks, and participants were followed for an additional 4 weeks to measure any sustained effects after treatment ceased. The study found participants had reduced anxiety (-2.8; p=0.01) but reported no change to depression scores. Participants also reported improved total Sexual Function Visual Analogue Scale of +62.28 (p=0.01), as well as significant increases in all domains (desire/libido, erection, ejaculation delay, orgasm delay, frequency of sex). In addition to the improvement in function, participants also reported improved sexual experience (Arizona Sexual Experience Questionnaire: -1.59; p=0.027).

Table 27.1 Original research on other conditions conducted by naturopathic researchers

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Cramer, et al. (2016) [Germany, EURO] [7]	Randomized controlled trial	Obesity (females with abdominal obesity)	Traditional hatha yoga	12 weeks: full day workshop followed by 2 x weekly 90-minute classes of traditional hatha yoga	Wait list	60 (40/20)	Short form-23 [BL to Wk 12]	**Reduced impact on quality of life** Yoga: -3.7; Wait list: +0.01 Between group: -3.8 (p=0.001)
							Rosenberg Self Esteem Scale [BL to Wk 12]	**Reduced impact on self-esteem** Yoga: -0.02; Wait list: -0.0 Between group: -0.02 (p=0.03)
							Perceived Stress Scale [BL to Wk 12]	**Reduced stress** Yoga: -3.1; Wait list: -1.7 Between group: -3.1 (p=0.016)
							Body Awareness Questionnaire [BL to Wk 12]	**Increased body awareness** Yoga: +6.1; Wait list: -1.0 Between group: +9.3 (p=0.001)
							Body Responsiveness Scale [BL to Wk 12]	**Increased body responsiveness** Trust in bodily sensations Yoga: +3.5; Wait list: -0.5 Between group: +4.4 (p<0.001)
							Waist circumference (cm) [BL to Wk 12]	**Reduced waist circumference** Yoga: -3.7; Wait list: +.01 Between group: -3.8 (p=0.001)
							Waist-hip ratio [BL to Wk 12]	**Reduced waist-hip ratio** Yoga: -0.02; Wait list: -0.0 Between group: -0.02 (p=0.03)
							Body weight (kg) [BL to Wk 12]	**Reduced body weight** Yoga: -1.5; Wait list: +0.7 Between group: -2.4 (p=0.003)
							Body mass index [BL to Wk 12]	**Reduced BMI** Yoga: -0.5; Wait list: +0.3 Between group: -0.8 (p=0.008)
							Percentage of body fat (%) [BL to Wk 12]	**Reduced body fat** Yoga: -1.4; Wait list: -0.1 Between group: -1.7 (p=0.01)

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Percentage of body muscle mass (%) [BL to Wk 12]	**Increased muscle mass** Yoga: +0.6; Wait list: -0.0 Between group: +0.8 (p=0.01)
							Blood pressure (mmHg) [BL to Wk 12]	NS
Frances (1998) [USA, AMRO] [11]	Case reports	Asthma (adults)	Concomitant therapeutics highly variable but included: *Passiflora incarnata* tincture, *Piper methysticum* tincture, *Verbascum thapsus* spp tincture, *Eriodictyon* spp tincture, *Aspidosperma quebracho* tincture, *Oplopanax horridus* tincture, *Eleutherococcus senticosus* tincture, *Glycyrrhiza glabra* glycerite, *Echinacea* spp tablets, *Astragalus propinquus* tincture, *Eupatorium perfoliatum* tincture, B complex, antioxidants, homeopathic remedies, *Chelidonium majus* tincture, *Taraxacum officinale* tincture, *Silybum marianum* tincture, *Cynara scolymus* tincture, *Bupleurum falcatum* tincture, *Berberis* spp tincture, *Althaea officinalis* tincture, *Foeniculum vulgare* tincture, *Hypericum perforatum* tincture, *Actaea racemosa* tincture, *Panax ginseng* tincture, *Trifolium pratense* tincture	Weeks to years	Nil	6	Beta-agonist inhaler use	**Elimination or substantial reduction in use**

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Jisha Mol, et al. (2017) [India, SEARO] [12]	Randomized controlled trial	Rhinosinusitis (chronic)	Acupuncture (bilateral LI4, LI20, ST2 and ST36; unilateral EX-1 and GV23): 20 minutes daily	10 days Group 1: 20 minutes; 4 cycles of steam (3 minutes) and withdraw (1 – 2 minutes) Group 2: 20 minutes daily	Steam inhalation: 20 minutes daily; 4 cycles of steam (3 minutes) and withdraw (1 – 2 minutes)	60 (30/30)	Sino-Nasal Outcome Test [BL to Dy 10]	**Reduced symptoms** Inhalation: -4.83 (p=0.05) Acupuncture: -3.47 (p=0.005)
							Symptom frequency [BL to Dy 10]	**Reduced frequency** Inhalation: -1.03 (p=0.05) Acupuncture: -1.20 (p=0.001)
Khamba, et al. (2013) [Canada, AMRO] [14]	Uncontrolled trial	Secondary sexual dysfunction (adults)	Acupuncture (Kd3, GV4, UB23, Ht7, PC6). Intervention delivered as protocol for Heart *Yin* Deficiency and Kidney *Qi* Deficiency. Adjunctive to antidepressant medication (SSRIs and SNRIs)	12 weeks (+ 4 week follow up) – intervention administered weekly	Nil	35	Beck Anxiety Inventory (BAI)	**Reduced anxiety** -2.8 (p=0.01)
							Beck Depression Inventory, Second Edition (BDI-II)	NS
							The Sexual Function Visual Analogue Scale (SFVAS)	**Increased sexual function** Total: +62.28 (p=0.01) Desire/Libido: +13.9 (p=0.030) Erection: +12.0 (p=0.012) Ejaculation delay: +19.2 (p=0.03) Orgasm delay: +17.0 (p=0.025) Frequency of sex: +12.4 (p=0.04)
							The Arizona Sexual Experience Questionnaire (ASEX)	**Reduced impact on sexual experience** Total: -1.59 (p=0.027) Drive: -0.6 (p=0.014) Arousal: NS Erection: -0.5 (p=0.015) Ability to reach orgasm: -0.5 (p=0.027) Satisfaction from orgasm: NS
Neuendorf, et al. (2019) [USA, AMRO] [2]	Randomized controlled trial	Overweight/ obese (adults)	Elimination of foods in response to IgG test result	12 weeks	Waitlist	30 (20/10)	Serum IgG titres	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Rodriguez Malavé (1991) [Puerto Rico, AMRO] [9]	Case reports	Asthma	Bromelain (>20 year only): Ma huang compound (>20 year only): extracts of *Ephedra sinica* 200 mg (standardized to 12 mg ephedrine), *Zingiber officinale* 65 mg, *Glycyrrhiza glabra* 50 mg (standardized to 5% glycyrrhizic acid), *Althaea officinalis* 50 mg (standardized to mucilage content of 30 – 40%) 50 mg, *Drosera rotundifolia* 40 mg, *Euphorbia hirta* 40 mg, *Polygala senega* 40 mg, *Hydrastis canadensis* 20 mg (standardized to 5% total alkaloids; Compound herbal cough elixir (<21 yr only): *Glycyrrhiza glabra* root, *Inula helenium* root, *Trifolium pratense* flower, *Prunus serotina* bark, *Marrubium vulgare* aerial parts, *Grindelia robusta* aerial parts, *Lobelia inflata* leaf and seed, *Foeniculum vulgare* fruit, *Lomatium dissectum* root, *Pinus strobus* bark, *Populus* spp. bud; Constitutional homeopathic remedy	Bromelain: 250mg three times daily Herbal product: 1 tablet four times daily Cough elixir: 10 or 30 drops four times daily Homeopathic remedy: individualised	Nil	21 yrs (1) 51 yrs (2) 27 yrs (3) underage (4) 21 yrs (5) 24 yrs (6)	Number of subjects improved (compared to baseline)	**Greater number of improved subjects** <21 yr: 16/17 (94%) >20 yr: 25/29 (86.2%)

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Shetty and Mooventhan (2015) [India, SEARO] [4]	Case report	Obesity	Initial 15-day admission: yoga sessions (60 mins day), naturopathic treatment (90 – 120 minutes per day) involving hydrotherapy, diet and fasting, mud therapy and massage therapy. Following 2 years of self-care patient was admitted for 10 days every 2 years (2010, 2012, 2014).	15 days (+10 days every 2 years for 6 years)	None	1	Body weight (kg) (BL to Dy 15, Yr 2, Yr 6)	**Reduced body weight** Dy 15: -6.1; Yr 2: Weight maintained; Yr 6: -22.7 (101 kg to 94.9 kg)
							Body mass index (BMI) (kg/m^2) [BL to Dy 15, Yr 2, Yr 6]	**Reduced BMI** Dy 15: -2.35; Yr 2: Changed from Class-II Obesity to Class-I Obesity; Yr 6: Changed to Overweight or Pre-obese (-8.61)
Sowmya (2018) [India, SEARO] [5]	Randomized controlled trial	Obesity	Group 1: Lemon juice with lemon seeds and calorie restricted diet	7 days	Group 2: Lemon juice alone with calorie restricted diet	30 (15/15)	C-Reactive Protein (mg/dL) [BL to Dy 7]	NS
							Body mass index (kg/m^2) [BL to Dy 7]	**Reduced BMI** Lemon seeds: -2.0; Lemon juice only: -1.4 Between group: p=0.0001
							Weight (kg) [BL to Dy 7]	**Reduced body weight** Lemon seeds: -4.9; Lemon juice only: -3.3 Between group: p=0.0001
							Waist circumference (cm) [BL to Dy 7]	**Reduced waist circumference** Lemon seeds: -11.3; Lemon juice only: -3.4 Between group: p=0.004
							Hip circumference (cm) [BL to Dy 7]	**Reduced hip circumference** Lemon seeds: -3.5; Lemon juice only: -2.9 Between group: p=0.004
							Waist-hip ratio [BL to Dy 7]	NS
Telles, et al (2009) [India, SEARO] [6]	Uncontrolled trial	Obesity	Low fat, high fiber, vegetarian diet and 5 hours of daily yoga practice	6 days	Nil	47	Body mass index (kg/m^2) [BL to Dy 6]	**Reduced BMI** -0.57 ($p<0.01$)
							Waist circumference (cm) [BL to Dy 6]	**Reduced waist circumference** -1.72 ($p<0.01$)
							Hip circumference (cm) [BL to Dy 6]	**Reduced hip circumference** -1.69 ($p<0.01$)

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							High density lipoprotein (HDL) cholesterol (mg/dl) [BL to Dy 6]	**Reduced HDL cholesterol** -2.88 ($p<0.01$)
							Fasting serum leptin (ng/ml) [BL to Dy 6]	**Reduced leptin** -23.75 ($p<0.01$)
							Total cholesterol (mg/dl) [BL to Dy 6]	NS
							Low-density lipoprotein (LDL) cholesterol (mg/dl) [BL to Dy 6]	NS
							Serum triglycerides (mg/dl) [BL to Dy 6]	NS
							Hand grip strength (kg) [BL to Dy 6]	**Increased hand grip strength** Right: +2.09 ($p<0.001$); Left: +2.00 ($p<0.01$)
							Postural stability (sec) [BL to Dy 6]	**Increased postural stability** At 20 sec: +11.03 ($p<0.001$) At 40 sec: +24.41 ($p<0.001$) At 60 sec: +33.91 ($p<0.001$)
Vinchurkar and Arankalle (2015) [India, SEARO] [15]	Case Report	Urinary incontinence	Yoga Asanas (postures) – *Uttanapadasana* (raised leg pose), *vipartiakaranai* (legs up the wall pose), *Naukasana* (boat pose) Yoga *pranayamas* (breathing) – *Nadi shodhana* (alternative nostril breathing), *Bhramari* (Humming bee breath) Yoga *bandhas* and *mudras* – *Moolabandha* (perineal lock), *Ashwini mudra* (anal lock) Yoga meditation – mindfulness meditation	21 days – twice daily practice: *uttanapadasana* (5 x 30 seconds with 2 – minute rest periods), *Vipartiakarani* (5 x 15 seconds with 2 minute rest periods), *Naukasana* (5 x 10 seconds with 2 minute rest	Nil	1	Resting heart rate (beats/min) [BL to Dy 21]	**Reduced resting heart rate** -2
							Blood pressure (mmHg) [BL to Dy 21]	**Reduced (systolic) blood pressure** Systolic: -6; Diastolic: -0.0
							Weight (kg) [BL to Dy 21]	**Reduced weight** -1.9
							Body mass index (kg/m^2)	**Reduced BMI** -0.7
							Frequency volume chart score	**Reduced frequency** -2
							International Consultation on Incontinence Modular Questionnaire – Urinary Incontinence Short Form	**Reduced incontinence** -7

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
				periods), *Nadi shodhana* (10 rounds), *Bhramari* (5 rounds), *Moolabandha* (10 – 15 rounds), *Ashwini mudra* (5 rounds), Meditation (10 min)				
Virdee, et al. (2015) [USA, AMRO] [10]	Case report	Asthma	Elimination diet informed by individualized results of enzyme-linked immunosorbent assay (ELISA) for IgG antibody assessment. Trial period of complete avoidance of potential allergens while monitoring for symptom changes	90 days	Nil	1	Medication [BL to Dy 90]	**Reduced medication use** Patient A Fluticasone-salmeterol: twice daily vs none Albuterol: twice daily vs occasional use in cold weather Patient B: Montelukast sodium: At bedtime vs none Fluticasone-salmeterol: Twice a day (Wk 19) vs occasionally Albuterol: Every night vs at least every night Cetirizine hydrochloride: daily vs none
							Asthma attack	**Reduced frequency** Patient B: 2 – 3 attacks per week vs one in first 21 days of treatment and then none
							Pulse Oxygen	Patient B: 86-95% vs 96%
							Physical exam	**Reduced wheezing** Patient B: audible wheezing vs clear lungs from 21 days
							Subjective asthma symptom severity	**Reduced severity** Patient A: 9/10 vs 0/10

Author (year) [Country, World region]	Design	Study Population	Intervention	Duration and dose	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Viswesw-araiah and Telles (2004) [India, SEARO] [8]	Randomized controlled trial	Pulmonary tuberculosis	Yoga	60 days, 6 x 1 hr sessions per week	Breath awareness	48 (25/23)	Improved sputum microscopy [BL to Dy 30, Dy 45, Dy 60]	**Greater incidence of improved microscopy** Dy 30: Yoga, 19/25; Breath, 10/23 Between group, p=0.045 Dy 45: Yoga, 24/25; Breath, 12/23 Between group, p=0.002 Dy 60: Yoga, 10/13; Breath, 4/19 Between group, p=0.005
							Improved postero-anterior chest x-ray	**Greater incidence of improved chest x-ray** Yoga: 19/25; Breath: 3/22 Between group: p=0.001
Vitetta, et al. (2013) [Australia, WPRO] [13]	Randomized controlled trial	Cold- related symptoms (frequency)	Bovine lactoferrin (Lf) 400mg and whey protein Ig rich fraction (IgF) 200mg daily	90 days	Placebo	105 (53/52)	Total cold events [BL to Dy 45, Dy 90]	**Reduced cold events** **Dy 1 – 45:** Lactoferrin, 0.67; Placebo, 1.40 Between group, p<0.001 **Dy 46 – 90:** Lactoferrin, 0.38; Placebo, 1.02 Between group, p<0.001 **Dy 1 – 90:** Lactoferrin, 0.93; Placebo, 2.26 Between group: p<0.001
							Total number of cold associated symptoms [BL to Dy 90]	**Reduced symptoms** Lactoferrin: 208; Placebo: 288 Between group: p<0.05
							Cold duration [BL to Dy 90]	NS
							Cold severity [BL to Dy 90]	NS
Yazaki, et al. (2010) [USA, AMRO] [3]	Randomized controlled trial	Overweight	1000 mcg of chromium picolinate/day	6 months	Placebo	80 (40/40)	Body mass index [BL to Mth 6]	NS
							Fasting glucose (mg/dl)	NS
							Fasting serum insulin (u/ml)	NS
							Cholesterol (mg/dl)	NS
							High-sensitivity C-reactive protein (mg/dl)	NS

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28 Other Research Publications Related to Health Conditions

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HIGHLIGHTS

- Naturopathic researchers have published over 1,456 journal articles in indexed peer-reviewed journals related to health conditions.
- Observational studies have an important role in understanding the etiology, progression and management of health conditions.
- Naturopathic researchers have published over 363 observational studies in the last 30 years.
- Reviews and meta-analyses are an important avenue for researchers to synthesize existing evidence related to a specific health condition. As such, reviews and meta-analyses assist readers in having a more comprehensive understanding of the evidence-base, and support evidence-informed policy and practice as well as identifying gaps in the existing evidence to direct new research.
- Naturopathic researchers have published over 357 reviews and metanalysis related to health conditions in the last 30 years.

Naturopathic researchers have published over 1,456 journal articles in indexed peer-reviewed journals related to health conditions and roughly half of these are reviews and meta-analyses (n=357; 24.5%) or observational studies (n=363; 24.9%). These types of articles present an important contribution in the healthcare field to the understanding of health, illness, and its management. Information contained in these articles not only adds to naturopathic clinicians' knowledge, but these studies also provide important summaries and insights for other stakeholders including policymakers, educators, other healthcare practitioners and the patient community.

This chapter provides an overview of the topics covered in the reviews and meta-analyses and the observational studies related to health conditions that have been written by naturopathic researchers. Due to the substantial number of papers across these two categories of research publications, it is not possible to provide a comprehensive description of the studies produced by naturopathic researchers. Instead, this chapter also provides an indicative overview of the topic areas that may be covered by these articles, by presenting a more detailed description of the two most frequently discussed health conditions within each article type.

Observational studies

Observational studies have an important role in understanding the etiology, progression and management of health conditions. Through epidemiological research, observational studies can uncover potential risk factors and protective behaviors that influence disease onset or prognosis. Survey research is used to identify the health behaviors and health service use among patient populations with the condition of interest, or practice behaviors and clinical experience among clinicians treating patients for the condition. Qualitative research can also be used to describe the experience of patients living with the health condition.

Naturopathic researchers have conducted observational studies in USA (n=184), Australia (n=70), Canada (n=39), India (n=37), Germany (n=13), Saudi Arabia (n=8), the United Kingdom (n=4), New Zealand (n=3), Sub-Saharan Africa (n=3), South Africa (n=2), France (n=1), Japan (n=1), and Uganda (n=1). This research encompassed health conditions related to cancer (n=113), musculoskeletal health (n=55), mental health (n=52), neurological condition (n=43), women's health (n=44), urogenital conditions (n=24), cardiovascular health (n=21), infectious disease (n=17), endocrine conditions

(n=15), weight management (n=15), gastrointestinal conditions (n=13), wellness and preventive health (n=11), respiratory health (n=8), among other conditions (n=9).

The observational studies focused on cancer-related health conditions covered a broad range of sub-topics. One important topic area examined in these studies is cancer pathophysiology [1-3], symptom presentation [4-7] and etiology including genetic factors [2, 8-15] and the role of immunity in cancer care [16-20]. Naturopathic researchers are also conducting observational studies to understand treatments used by patients [21-44], and the Traditional and Complementary Medicine (T&CM) health providers they are accessing for their cancer care [21, 22, 27, 29, 34, 40, 41, 43-46]. Naturopathic researchers are also employing observational study designs to describe the treatments used by naturopaths/naturopathic doctors for the management of cancer-related conditions to inform future research and practice [47-52]. The naturopathic research in this area is also providing insights into the attitudes of individuals with cancer [22, 23, 38, 43, 53, 54] and health professionals [47, 48, 55] towards T&CM. In addition to understanding cancer pathophysiology and patterns of use, naturopathic researchers have also used observational research to collect safety data associated with pharmaceutical [25, 56, 57] and T&CM treatments [25, 33, 37, 42, 58] for cancer-related conditions.

Naturopathic researchers have employed observational study designs to explore musculoskeletal conditions such as osteoarthritis [59-61], neck pain [62-65], back pain [65, 66], and acute injuries [67-78]. The research covers a variety of topics related to musculoskeletal health conditions, including the associations between naturopathic interventions and musculoskeletal health [62, 79-82] and comorbidities and risk factors associated with musculoskeletal health conditions [4, 69, 70, 73, 74, 77, 83-99]. A notable number of studies also examined the economic implications of musculoskeletal conditions and their management [100-102], and provided innovative contributions to outcome evaluation which advance musculoskeletal clinical research methods [63, 72, 76, 78, 92, 103-105]. They have also explored the use of complementary medicines and other health services by individuals with musculoskeletal health conditions [60, 80, 106-108].

Reviews and Meta-Analyses

Reviews and meta-analyses are an important avenue for researchers to synthesize existing evidence related to a specific health condition. As such, reviews and meta-analyses assist readers in having a more comprehensive understanding of the evidence-base, and support evidence-informed policy and practice as well as identifying gaps in the existing evidence to direct new research. Naturopathic researchers have published reviews and meta-analyses in Australia (n=109), Canada (n=93), USA (n=86), Germany (n=57), India (n=10), Saudi Arabia (n=1) and New Zealand (n=1). These reviews and meta-analyses focused on numerous health conditions including mental health (n=81), cancer (n=67), musculoskeletal (n=51), gastrointestinal (n=39), women's health (n=39), neurological (n=25), cardiovascular (n=21), endocrine (n=17), infectious (n=12), respiratory (n=10), skin conditions (n=9), weight management (n=8), among other conditions (n=12).

Within the category of mental health conditions, naturopathic researchers have published reviews and meta-analyses commonly focused on depression [109-127], anxiety [117, 121, 124, 128-138], schizophrenia and psychosis [139-144], bipolar disorder [118, 145, 146], insomnia [147, 148], and other psychiatric conditions [149-151]. The majority of these articles explored naturopathic treatment options for mental health conditions, with attention given to herbal medicines [115, 117, 124, 128, 133, 138, 148, 152-163], clinical nutrition [109-111, 113, 118, 141, 144, 164-170], yoga [120, 127, 136, 139, 150, 151, 171-173], mind-body medicine [140, 171, 174], acupuncture[149], diet [114, 129, 142, 175] and lifestyle medicine [119, 122, 129, 135, 176-178]. Naturopathic researchers also conducted reviews examining the etiology and pathophysiology of mental health conditions, including environmental causes [179-181], the role of behaviors such as use of devices (e.g. smartphones) [135, 137, 178], and the importance of other physiological factors such as the microbiome [168-170, 175, 179, 181, 182]. Many of these reviews and meta-analyses targeted the mechanisms [109, 117, 161, 163, 165] or efficacy/effectiveness [109, 111, 112, 114, 115, 117, 120, 121, 123, 124, 126, 127, 129, 130, 132, 133, 136, 138-142, 146-151, 153, 155, 159, 161, 164-167, 171-174, 176, 178, 183-185] of these treatments for mental health conditions.

Naturopathic researchers have also published reviews and meta-analyses focused on specific cancer-related conditions (e.g. breast cancer [121, 172, 186-201], lung cancer [202-207], colorectal cancer [208-211]) as well as cancer more generally [188, 212-231]. These reviews encompass all points along the cancer journey including prevention [212, 213, 218, 225, 232], treatment [188, 189, 199, 201, 213, 217, 219, 222, 232-238], survivorship [191, 227] and palliative care [223, 228]. A broad range of treatments are investigated in these papers including herbal medicines [186-188, 193, 195, 202, 206, 207, 217, 222, 226, 229, 233, 235, 239, 240], clinical nutrition [189, 194, 203, 204, 208, 209, 213, 215, 219-221, 230, 232, 234, 241-243], mind-body medicine [200], acupuncture [223] and yoga [172, 191, 228]. As well as investigating the efficacy/effectiveness of these treatments, a number of studies also explored their pharmacokinetics [220, 224] and safety [188, 220, 233, 236, 241, 244]. Reviews also examined the

available evidence regarding the experiences of cancer patients [228, 231] and the role of health professionals in supporting cancer patients [196, 201, 214], particularly within the context of T&CM use.

Implications

Naturopathic researchers have produced a considerably volume of research to contribute to the wider understanding of the pathophysiology, treatment, and context of diverse health conditions. While the observational research and reviews/meta-analyses published by naturopathic researchers commonly focus on treatments used in naturopathic practice, it is also important to note that a substantial proportion of this research also examines the etiology and pathophysiology of health conditions from both a macro (e.g., environmental causes) and micro (e.g., genetic influences) viewpoint. Equally, naturopathic researchers are exploring both prevention and treatment, and in doing so, they ensure the naturopathic principle of *Prevention* is supported by the research they produce. The breadth of information reflected in the numerous papers published by naturopathic researchers assist in mapping the landscape of care provided to patients, translating existing knowledge into policy and practice, and opening new avenues for future research; all of which support better patient outcomes and health in the community.

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Section 6: Research on Naturopathic Therapeutics and Practices

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HIGHLIGHTS

- There is strong consensus on the core naturopathic treatments with a typical naturopathic visit generally involving the prescription, recommendation or use of an average of four different naturopathic therapeutic modalities or practices.
- Naturopathic care is known for its diverse and flexible therapeutic approach to healthcare. It includes the prescription of internal and topical substances; counselling with respect to diet, lifestyle, and mind-body medicine; naturopathic physical medicine and other therapies.
- The use of a complex intervention approach to care allows naturopaths/NDs to utilize the synergistic properties of various treatments and to individualize the treatment of each patient.
- The naturopathic workforce can play an essential role in addressing non-communicable diseases and other diseases that are strongly influenced by lifestyle factors.
- Dietary and nutritional factors are foundational to naturopathic care and herbal medicine is one of the most common therapies used globally by naturopaths/NDs.
- The naturopathic multi-modal, complex intervention approach warrants further investigation.

Naturopathic practice is known for its complexity and flexibility with a range of treatments, therapies, and practices. There is strong consensus on seven core naturopathic modalities used in practice including applied nutrition and diet modifications, clinical nutrition and the use of natural health products, herbal medicines, lifestyle counselling, hydrotherapy, homeopathic remedies, and various physical modalities such as yoga, naturopathic manipulation, and muscle release techniques.

This Section highlights the original naturopathic research on naturopathic therapeutic modalities and practices with a focus on how they are employed – singularly and in combination – in clinical interventions. The clinical research presented in this section is based on work undertaken by naturopathic researchers across five WHO Regions. However, it is important to note that this is not the summation of research investigating naturopathic treatments accessed and used by the naturopathic workforce. The diversity of knowledge and information used, shared, and produced by naturopaths/NDs is described in more detail in Chapters 13 and 16.

Overall this section presents the results of 304 original clinical research articles covering over 140 conditions and including randomized controlled trials (n=165), case reports (n=52), uncontrolled trials (n=37), secondary analyses (n=20), cohort studies (n=6), comparative controlled trials (n=6), pilot studies (n=3), non-randomized controlled studies (n=3), observational studies (n=2), and one each of non-randomized control trial and an exploratory analysis. It features clinical studies that commonly employ pragmatic elements such as multi-modal interventions, flexibility in administration, and real-world settings and demonstrates a positive response to at least one primary or secondary outcome measure in 77.6% of clinical studies.

The chapter on **Complex Naturopathic Interventions (Chapter 29)** highlights the evidence associated with the holistic, patient-centered, multi-modal treatment approach central to naturopathic care. This chapter provides an overview of 25 clinical research papers investigating complex interventions, with 85.7% reporting a positive outcome in at least one primary or secondary outcome measure. This clinical research is supplemented by over 70 observational studies and 19 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The complex interventions studied include:

- Ingestive medicine-based interventions
- Non-ingestive medicine-based interventions

The chapter on **Applied Nutrition (Chapter 30)** highlights the essential and foundational role of dietary counselling and prescription in naturopathic care. Naturopathic applied nutritional interventions include diet therapy (therapeutic diets, fasting and individualized

diet modification), therapeutic application of specific foods and behavioral or lifestyle counselling related to eating behaviors. This chapter provides an overview of 31 clinical research papers, with 88% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research is supplemented by over 20 observational studies and more than 30 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The applied interventions studied include:

- Food as medicine
- Diet programs
- Food intolerance testing and support
- Dietary education

The chapter on **Clinical Nutrition (Chapter 31)** outlines one of the top therapeutic modalities used by naturopaths/NDs. Clinical nutrition includes vitamins and minerals, nutrients that have physiological effects such as amino acids and other amino-based compounds, food-based constituents, and other compounds that are important to foundational human biochemistry and physiology. This section provides an overview of 59 clinical research papers with 62.5% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on clinical nutrition is also supported by over 50 observational studies and more than 90 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The clinical nutrition interventions studied include:

- Essential fatty acids
- Multivitamin and/or mineral formulas
- Single vitamins, minerals, and non-essential nutrients
- Medicinal foods and nutraceutical interventions

The chapter on **Herbal Medicine (Chapter 32)** outlines the importance of herbal medicine in naturopathic practice with more than half of naturopathic visits including some form of herbal prescription. Naturopaths/NDs are trained to use a wide range of herbs from mild herbs to extremely powerful herbs that arguably are the basis of modern pharmacological medicine. The range of herbs and the form and dosage, vary based on access to specific herbal medicines in a region as well as the education and scope of practice in a jurisdiction. This section provides an overview of 48 clinical research papers with 71.7% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on herbal medicine is also supported by over 30 observational studies and more than 120 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The herbal medicine interventions studied include:

- Single-herb interventions
- Complex herbal formulations
- Essential oils
- Topical applications

The chapter on **Lifestyle Modifications (Chapter 33)** outlines that early naturopath were among the first health professionals to formally acknowledge lifestyle modifications as an important element of care. The importance of lifestyle counselling in naturopathic practice is considered one of the core therapeutic elements. This section provides an overview of three clinical research papers with 100% reporting a positive outcome in at least one primary or secondary outcome. The lifestyle interventions studied include:

- Lifestyle interventions
- Lifestyle-based risk factor identification

The chapter on **Mind-Body Medicine (MBM) Counselling (Chapter 34)** is prescribed and practiced by naturopaths/NDs with patients of all ages presenting with functional disorders (e.g., gastrointestinal, endocrine, neurological or cardiovascular conditions), structural disorders (e.g., musculoskeletal conditions, chronic pain), psychological conditions (anxiety, depression, ADHD), and as part of preventive and palliative care. This section provides an overview of nine clinical research papers with 88.9% reporting a positive outcome in at least one primary or secondary outcome. The MBM interventions studied include:

- Mindfulness-based stress reduction and meditation
- Other MBM Interventions

The chapter on **Naturopathic Physical Medicine (Chapter 35)** describes how addressing or correcting structural integrity is considered an essential step of the Naturopathic Therapeutic Order. Naturopaths/NDs recognize a correlation between an individual's alignment and structure, the functioning of internal organs and a person's psychological state. Naturopathic physical medicine includes various forms of bodywork ranging from muscle release and massage techniques, naturopathic manipulation, and techniques including yoga and acupuncture which are covered off in other chapters. This section provides an overview of nine clinical research papers with 66.7% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on naturopathic physical medicine is also supported by over 20 observational studies and seven reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The physical medicine interventions studied include:

- Massage
- Other manual therapies including osteopathy, breathing techniques, and craniosacral therapy.

The chapter on **Hydrotherapy (Chapter 36)** outlines that hydrotherapy – the application of water for therapeutic purposes – has been used for thousands of years and has been part of naturopathic care since its inception. This section provides an overview of 17 clinical

research papers with 84.2% reporting a positive outcome in at least one primary or secondary outcome. The hydrotherapy interventions studied include:

- Hydrotherapy baths
- Topical compresses
- Complex hydrotherapy

The chapter on **Acupuncture (Chapter 37)** outlines that acupuncture is included in the curriculum in some naturopathic educational programs and is part of the scope of naturopathic care in countries such as Canada, the USA, South Africa, India, Germany, Switzerland, and Brazil. Various acupuncture techniques are practiced by naturopaths/NDs including needling, electroacupuncture, auricular acupuncture, acupressure, cupping and moxibustion. This section provides an overview of 32 clinical research papers with 84.8% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on acupuncture is also supported by 10 observational studies and 15 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The acupuncture interventions studied include:

- Combination acupuncture interventions
- Standalone acupuncture
- Standalone cupping therapy
- Other forms of standalone acupuncture-related treatments including electroacupuncture, self-administered needle pads, acupressure, *gua sha therapy* and auricular acupuncture.

The chapter on **Yoga (Chapter 38)** outlines the significant role of yoga in naturopathic care, especially in India. In India, yoga and naturopathy are integrated in naturopathic educational programs and practice. Naturopaths/NDs use a variety of yogic practices, such as *asanas*, *pranayama*, and meditation to achieve demonstrable improvements in patient health and wellbeing. This section provides an overview of 58 clinical research papers with 86.3% reporting a positive outcome in at least one primary or secondary outcome. This body of naturopathic research on yoga is supplemented by over 20 observational studies and more than 50 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40. The interventions studied include:

- Combination yoga practices
- Yoga breathing
- Yoga meditation

The chapter on **Optimizing Pharmaceutical-Based Interventions (Chapter 39)** outlines the importance of naturopaths/NDs being well-informed on drug-herb and nutrient interactions, and the comparison of pharmaceutical and naturopathic-based interventions. It also highlights that in some jurisdictions, primarily with North America, naturopathic doctors have prescribing rights as part of their defined scope of practice. This section provides an overview of 8 clinical research papers. The pharmaceutical-based interventions studied include:

- Pharmaceuticals and adjunctive treatments for disease or symptom management
- Pharmaceuticals and adjunctive treatments for pharmaceutical side-effect management
- Pharmaceuticals compared to non-pharmaceutical treatments

The chapter on **Other Research Publications Regarding Naturopathic Therapies and Practices (Chapter 40)** highlights the immense volume of research additional to clinical studies produced by the naturopathic research community. A substantial proportion of observational studies including research using survey, interview or focus group methods (n=195; 16.2%), and reviews and meta-analyses (n=297; 24.6%) have been published by naturopathic researchers. These articles present an important contribution to the understanding of clinical treatment options for the management of health and illness. This reinforces the knowledge translation behaviours of naturopaths/NDs (outlined in Chapter 13) through which research from many areas of health and medicine may be used by naturopaths/NDs to inform clinical decisions.

29 Complex Naturopathic Interventions

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HIGHLIGHTS

- Naturopathic care is known for its diverse and flexible therapeutic approach to healthcare which incorporates a range of therapeutic interventions that can be customized to each patient's needs.
- The use of a complex intervention approach to care allows naturopaths/NDs to utilize the synergistic properties of various treatments and to treat patients holistically.
- Complex interventions may be based on ingestive or non-ingestive treatments, or a combination of both.
- Clinical research examining complex interventions delivered by a naturopath/ND involve an average of five types of treatment, which aligns with naturopathic practice behaviours.
- Complex interventions often include dietary counselling, lifestyle modification, herbal medicine, and clinical nutrition.
- In line with the role of primary care, naturopathic researchers have investigated complex interventions in individuals with endocrine conditions, cardiovascular conditions, mental health conditions, musculoskeletal conditions, gastrointestinal conditions, and a range of other conditions.

The holistic, patient-centered, multi-modal treatment approach that is central to naturopathic philosophy comprises the clinical application of different forms of naturopathic therapeutic modalities and practices [1] such as applied nutrition (dietary advice and food as medicine), clinical nutrition (use of vitamins, minerals and other natural health products), herbal medicine, hydrotherapy, lifestyle counselling, acupuncture, bodywork and homeopathy. In some countries naturopathic care may also include intravenous therapies, the prescribing of prescription medicines (i.e., bioidentical hormones or high-dose nutrients), regenerative injective therapies, and minor surgery [2].

Naturopaths/naturopathic doctors aim to alleviate suffering, prevent and/or treat illness, prevent the progression of disease conditions, and to educate and empower patients to facilitate optimal health. These objectives are realized through a combination of behavioural-based counselling and treatments individualized to each patient and their presenting symptoms and condition in a collaborative and patient-centered process. An international study of naturopathic practice confirmed that on average naturopaths and naturopathic doctors use four or more naturopathic treatments or practices during each patient visit [3].

The tendency for naturopathic practice to employ complex interventions follows the naturopathic principle of *treating the whole person.* An example of a complex intervention is the combination of two or more types of treatments, such as herbal medicine and dietary advice, or exercise and nutritional supplementation, along with lifestyle counselling or recommendations with the goal of addressing the lifestyle, external and environmental factors that are impacting a patient's health with the aim of supporting healing and overall wellness. This multi-modal, complex intervention, and whole-practice approach deserves and indeed needs to be researched to better understand its importance in naturopathic practice [4]. Research demonstrates considerable evidence of benefit of complex naturopathic interventions in several conditions and disease states [5] some of which have considerable importance globally, including for example: cardiovascular disease and type II diabetes mellitus [6].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=25) naturopathic clinicians undertook in the field of complex naturopathic interventions. This research includes a total of 1,424 participants and was conducted in the United States of America (USA) (n=9), India (n=7), Canada (n=5), Australia (n=3), and Germany (n=1). The study designs include case reports (n=10), randomized controlled trials (n=6), retrospective cohort studies (n=4), uncontrolled studies (n=4) and

a non-randomized trial (n=1). The interventions used include dietary counselling (n=22), lifestyle counselling (n=19), herbal medicine (n=15), nutritional medicine (n=14), yoga (n=8), massage/self-massage (n=8), hydrotherapy (n=8), mud therapy (n=7), exercise (n=6), and acupuncture (n=5).

The number of therapeutics prescribed ranged from two to twelve with an average of five interventions prescribed across all studies. Naturopaths/naturopathic doctors from the South-East Asian and European WHO Regions employed an average of eight types of treatment in their interventions whereas naturopaths/naturopathic doctors from other Regions used an average of four treatment types. Average duration of treatment across the studies was approximately 13 weeks. The shortest intervention was five days of treatment and the longest was 18 months.

The conditions treated in the studies using complex interventions varied significantly and included endocrine conditions (type II diabetes, thyroid dysfunctions, polycystic ovary syndrome, metabolic syndrome, pancreatitis) (n=8), cardiovascular conditions (cardiovascular disease, hypertension) (n=4), mental health conditions (anxiety, depression) (n=3), musculoskeletal conditions (low back pain, tendonitis) (n=3), gastrointestinal conditions (n=2), and a range of other conditions (eating disorders, obesity, ovarian cancer, HIV, Hepatitis C, interstitial cystitis) (n=6). Of all the naturopathic clinical studies examining populations receiving complex interventions, 85.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 29.1: Original research on complex naturopathic interventions conducted by naturopathic researchers*. This body of naturopathic research employing complex interventions is also supported by more than 70 observational studies and 19 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

The research to date indicates that naturopaths/naturopathic doctors provide complex intervention care for a range of symptoms and conditions, choosing a variety of treatments in combination to produce the best outcomes for individual patients. There is no one standard treatment applied for a particular set of symptoms or conditions, which is consistent with the person-centered focus of naturopathic practice in accordance with key naturopathic philosophies and principles. Almost all studies involved dietary counselling, more than half involved lifestyle counselling, and around half of all studies prescribed nutritional and/or herbal medicines. These treatments form the basis of naturopathic complex interventions. However, naturopaths/naturopathic doctors frequently employed a variety of other treatments, acupuncture, relaxation/stress reduction techniques, yoga, exercise recommendations, and/or hydrotherapy/mud therapy, depending on the presenting case. Some naturopathic interventions were directed at supporting mental and emotional aspects of health, while others supported elimination and detoxification pathways. Most often though, a variety of different types of naturopathic treatments were combined to treat the entirety of the patient; psychological, functional and structural. This multi-modal approach to patient treatment is the hallmark of naturopathic clinical practice.

Within conventional primary care, most efforts to address chronic disease have historically focused on development of standardized forms of care involving individual therapies or practices, yet it is increasingly recognized that this approach has disadvantages for patients with multimorbidity or complex conditions [7-9]. Moreover, failure to embrace such complexity in primary care practice can also result in additional costs, adverse events, lower satisfaction with care and resource implications in managing patients with complex care needs [10]. Despite this acknowledgement, most primary care is still not appropriately tailored to those with complex health needs in a person-centered multi-modal or multi-disciplinary way, and difficulties in making health care more person-centered persist [11].

The historical basis of naturopathic care has been based on treating each individual and hence the naturopathic workforce has a history of delivering person-centered care in practice, and routinely incorporates factors associated with managing multi-morbidity and complex conditions [12]. While further research is needed to confirm the findings of uncontrolled studies and case reports presented in this review there is sufficient evidence that the complex intervention approach taken by naturopathic practitioners in every day clinical practice provides improvements in patient health and wellbeing. As a whole system of care, there are many conditions that would benefit from additional research to comprehensively evaluate this system of care using a research approach that reflects the complexity of naturopathic practice.

Studies investigating specific interventions:

Ingestive Medicine-based Interventions

Sixteen studies involving a total of 1,186 participants focused on complex naturopathic interventions with a focus on ingestive components, most frequently herbal medicines (n=14) [13-26] and nutritional supplements (n=12) [17-28] prescribed in combination with each other

and/or with dietary counselling (n=13) [13, 15-20, 22-25, 27, 28], lifestyle and exercise counselling (n=12) [13, 15, 16, 18-20, 22-25, 27, 28], pharmaceuticals (n=2) [21, 24], acupuncture (n=1) [28] and homeopathics (n=1) [21]. Studies were predominantly case reports (n=5) [13, 15-17, 22] and controlled trials (n=5) [20, 23, 25, 27, 28], with four retrospective cohort studies [18, 19, 24, 26] and two uncontrolled trials [14, 21].

A randomized controlled trial (n=246) conducted in Canada assessed the application of individualized naturopathic care, primarily involving diet, nutritional supplements, exercise, and deep breathing for the prevention of cardiovascular disease risk [27]. The interventions provided over the course of a year were semi-standardized with respect to supplementation, whereas lifestyle-based recommendations were individually crafted based on the participant. Results from this study found that compared to usual care controls there were significant reductions in metabolic syndrome (p=0.002) and projected 10-year associated cardiovascular event risk (p<0.001) after one year of treatment.

A randomized controlled trial (n=85) conducted in Canada investigating rotator cuff tendinitis found that 12 weeks of acupuncture, individualized dietary counselling, and a standardized encapsulated supplement containing bromelain, trypsin and rutin resulted in significant improvements in pain and disability (Shoulder Pain and Disability Index [SPADI] total: -29.66, p<0.0001); pain: -13.00, p<0.0001; disability: -15.64, p=0.0002), pain score (Visual Analog Scale: -1.67, p<0.0001), quality of life measures for physical (SF-36 physical component: +5.71, p=0.0004; functioning: +13.52, p=0.0025; physical role: +17.34, p=0.0015) and mental (SF-36 mental component: +5.73, p<0.0107; emotional role: +16.09, p=0.002; mental health: +14.66, p=0.0015) domains, as well as improved shoulder extension, flexion and abduction (all p<0.0001), but not adduction [28].

A pilot 3-armed randomized controlled trial conducted in the USA with patients with temporomandibular disorder (n=160) [25] compared Traditional Chinese Medicine, specialty dental care and naturopathic care (NM) (consisting of herbal medicine, nutritional supplements, lifestyle, and stress reduction counselling). Naturopathic care group demonstrated greater reductions in worst facial pain during the treatment intervention period (6-8 months: TCM -2.2; NM -2.3; Specialty -1.2 NM/Speciality, p=0.025) and at end of treatment, naturopathic care provided significantly greater decrease in the impact of symptoms on social life (9-11 months: TCM -2.5; NM -3.2; Specialty -1.7 NM/Specialty, p=0.019).

A randomized controlled trial (n=75) conducted in Canada evaluated the use of naturopathic treatment, consisting of individualized diet and lifestyle counselling, exercise advice, a standard extract of the herb *Withania somnifera* and a multivitamin/mineral formula, compared to controls given psychotherapy, diet and lifestyle education, exercise advice and matched placebo for individuals with severe anxiety [23]. Results showed significantly greater declines in anxiety scores in the naturopathic care group (Beck Anxiety Inventory -6.16, p<0.0036). This study also reported significantly greater improvements in domains of fatigue, measured by The Fatigue Questionnaire compared to controls (subjective: -18.01, p<0.0001; physical: -13.19, p=0.0033; motivation: -20.32, p<0.0001; concentration: -17.51, p<0.0001). Furthermore, participants receiving naturopathic care had reduced weight (-1.47 kg, p=0.00146) and body mass index (-0.56 kg/m2, p=0.0128) compared to controls.

An open label intervention trial (n=60) conducted in the USA of patients with depression and anxiety found that individualized naturopathic care consisting of nutritional, pharmaceutical, homeopathic and/or herbal medicine led to significant reduction in anxiety (-5.2, p<0.0001 based on the Generalized Anxiety Disorder 7-item Scale) and depression (-7.8, p<0.0001 based on the Patient Health Questionnaire) with 50% of participants achieving more than 50% improvement in both scores [21]. A second open label study (n=30) conducted in the USA determined that naturopathic care involving an herbal-mineral combination significantly reduced systolic and diastolic blood pressure (both p<0.0001), and significantly improved serum potassium (p<0.019) without altering liver and kidney enzyme markers or calcium and magnesium readings [14] .

Several observational studies found that naturopathic care – all of which included nutritional and herbal supplementation as well as dietary education and counselling, plus various combinations of stress reduction techniques, exercise, and other lifestyle advice relevant to the particular condition – improved markers of type II diabetes mellitus [18, 20], hypertension [19], and hepatitis C virus [24].

An uncontrolled study (n=14) conducted in the USA with adults with hepatitis C investigated the effect of a naturopathic intervention encompassing a standardized extract of silymarin (from *Silybum marianum*), a multivitamin and mineral formula, n-acetyl cysteine, dietary and lifestyle advice, and pharmaceutical medications (colchicine and ursodeoxycholic acid) [24]. Some participants also received deglycyrrhizinated licorice and a complex herbal formula containing 12 Ayurvedic herbs. All participants received treatment for a minimum of one month by which time 50% of participants had a greater than 25% reduction in the liver enzyme alanine aminotransferase (average reduction -35U/L, p=0.026). None of the participants reported any symptoms of advanced liver disease by the end of their treatment and most reported an increased sense of well-being.

A case report conducted in India with a patient with metabolic syndrome demonstrated improvements

in anthropometric measures (weight, -9.5kg; BMI, -3.2 kg/m2), blood pressure (systolic, -38mmHg; diastolic, -10mmHg), blood glucose levels (fasting, -130mg/dL; postprandial, -192mg/dL) and lipid levels (triglycerides,-6mg/dL; total cholesterol, -41mg/dL; HDL, -3mg/dL; LDL -36 mg/dL; VLDL -2mg/dL) as well as a reduction in insulin use following three weeks of herbal and nutritional treatment, yoga, hydrotherapy, massage therapy, and mud therapy [29]. Further case studies described patient reported improvements using combined naturopathic treatments involving herbal and/or nutritional supplementation along with dietary counselling and various lifestyle interventions in conditions as varied as depression and anxiety [17], gastrointestinal disorders [22], pancreatitis [15], ulcerative colitis, chronic ischemic heart disease [13], and interstitial cystitis [16], as well as greater acceptance, coping and self-efficacy scores in pain conditions [13].

Non-ingestive Medicine-based Interventions

Nine studies with a total of 238 participants involved complex interventions focused primarily on non-ingestive treatments, which were typically delivered as programs integrating naturopathic approaches with dietary interventions (n=9) [29-36], yoga (n=7) [29-32, 34, 35, 37], hydrotherapy (n=7) [29-32, 34, 35, 37], mud therapy (n=5) [29-31, 34, 37], acupuncture (n=3) [30, 32, 36], massage (n=3) [29, 30, 35] and lifestyle interventions (n=3) [31, 33, 36]. The studies were predominantly case reports (n=5) [29, 30, 32, 35, 37] with two uncontrolled trials [31, 33] and two randomized controlled trials [34, 36].

A randomized controlled trial (n=75) conducted in Canada investigated a semi-standardized intervention for chronic low back pain and found that compared to standard physiotherapy, naturopathic treatment comprising acupuncture, dietary counselling, deep breathing, and relaxation techniques over 12 weeks significantly improved lower back pain (Oswestry Low Back Pain Disability Questionnaire: -5.0 vs -0.0, $p<0.0001$), disability (Roland Morris Disability Questionnaire: -6.0; $p<0.0001$), range of motion (forward lumbar flexion: +5.0, $p<0.0001$) and quality-of-life (SF-36 physical component: +8.47, $p<0.0001$; mental component: +5.56, $p<0.0045$) [36].

A single blind clinical trial (n=50) conducted in India with patients with polycystic ovary syndrome found that compared to waitlisted controls, naturopathic care encompassing hydrotherapy, mud therapy, manipulative therapy, fasting, dietary counselling, and yoga significantly increased ovarian quality (+6.0 vs -3.5, $p<0.001$) however there was no significant difference in consecutive menstrual cycle days [34]. An open label four-arm study (n=96) conducted in India demonstrated that hydrotherapy, mud therapy, dietary counselling, raw juices, sunbathing, counselling, deep relaxation techniques, and yoga treatment for HIV patients improved CD4 counts after 30 days of treatment ($p=0.00038$) [31].

An observational study conducted in the USA found that nutrition counselling and education together with lifestyle advice improved markers of type II diabetes [33]. A number of case studies reported clinical improvements in markers of non-alcoholic fatty liver disease [30], metabolic syndrome [37], hypothyroidism [32, 37], hyperprolactinemia [32], and obesity [35] when patients were prescribed various combinations of acupuncture, manipulative therapy, hydrotherapy, chromotherapy, mud therapy, reflexology, yoga, dietary therapy, and fasting treatments. Additionally cessation or reduction of medication was noted following naturopathic treatment in case reports of metabolic syndrome [37] and hypothyroidism [32, 37], and in one randomized controlled trial examining chronic low back pain [36].

Table 29.1 Clinical research investigating complex naturopathic interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Aucoin. (2017) [Canada, AMRO] [17]	Case report	Major depressive disorder and social anxiety disorder	Breakfast smoothies, increased vegetable intake, herbal formula *(Hypericum perfortum*, *Passiflora incarnata*, *Valeriana officinalis)* and fish oil supplement (4 weeks)	Nil	Nil	1	Subjective mood and anxiety symptoms	**Improved mood at each return visit, increased tolerance to anxiety provoking situations, increased energy, and no headaches**
Bradley and Oberg. (2006) [USA, AMRO] [18]	Retrospective cohort study	Type II Diabetes Mellitus	Adjunctive or primary naturopathic care over at least 6 months. 81% received adjunctive naturopathic care, 100% received dietary counseling, 69% were instructed in stress reduction techniques, 94% were prescribed exercise, 100% received nutritional supplements, botanical supplements included *Gymnema* sp., *Trigonella* sp., *Momordica* sp., or Cinnamon.	81% received adjunctive medication including one or more of oral anti-diabetic, insulin, lipid-lowering, anti-hypertensive, or aspirin	Nil	16	HbA1c	**Improved control** Good control: 31% Making improvement: 60%
							LDL Cholesterol	**Improved LDL-cholesterol control** Good control: 13% Making improvement: 63%
							HDL Cholesterol	**Improved HDL-cholesterol control** Good control: 80% Making improvement: 63%
							Triglycerides (TG)	**Improved triglyceride control** Good control: 43% Making improvement: 57%
							Blood Pressure (BP)	**Improved BP control** Good control: 44% Making improvement: 60%
Bradley, et al. (2011) [USA, AMRO] [19]	Retrospective cohort study	Hypertension	Adjunctive or primary naturopathic care over at least 6 months. 76.5% received adjunctive naturopathic care, 97.6% received dietary advice, 68.2% exercise advice, 56.5% preventive advice regarding alcohol, 47.1% preventive advice regarding tobacco, 100% recommended dietary supplementation including omega-3 oil from fish, magnesium, coenzyme Q10, vitamin B6, resveratrol potassium, botanical	Nil	Nil	85	Proportion with systolic blood pressure (BP) <140mmHg (%)	**Increased proportion with <140mmHg systolic BP** +34.1 (p=0.038)
							Proportion with diastolic blood pressure <90mmHg (%)	**Increased proportion with <90mmHg diastolic BP** +26 (p=0.026)
							Neither systolic nor diastolic <140/90mmHg	**Reduced proportion with neither systolic nor diastolic BP <140/90mmHg** -35.3 (p=0.033)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
			supplements including *Rauwolfia, Arjuna, Convolvulus, Tribulus, Crataegus, Allium sativa, Taraxacum, Leonurus, Passiflora.*				Either systolic or diastolic blood pressure <140/90mmHg	**Increased proportion with either systolic or diastolic BP <140/90mmHg** +5.9 (p=0.033)
							Both systolic and diastolic blood pressure <140/90mmHg	**Increased proportion with both systolic and diastolic blood pressure <140/90mmHg** +29.3 (p=0.033)
Bradley, et al. (2012) [USA, AMRO] [20]	Non-randomized controlled trial	Type II Diabetes (Inadequately controlled)	12 months: Up to eight naturopathic visits for up to one year, or usual care. - 95% received dietary advice - 100% exercise advice - 59% stress management advice - 74% received dietary supplementation including omega-3 fatty acids, chromium, multivitamin with B-complex, vitamin C and E fiber, coenzyme Q10, probiotics, bioflavonoid/polyphenol - Botanical supplements; 18% received *Cinnamomum cassia, 13% Gymnema sylvestre*	95% diabetes glucose self-monitoring and reinforcement of medication adherence (sulfonylurea, metformin, or insulin). Oral medication (prescription refills) increased in the intervention group	Usual care	369 (40/329)	Summary of Diabetes Self-Care Activities [BL to Mth 6, Mth 12]	**Increased self-care activities** Mth 6: Glucose checking, improved (p = 0.001); Diet quality, improved (p = 0.001); Physical activity, improved (p = 0.02) Mth 12: Glucose testing, improved (p=0.003); Physical activity, NS; Diet quality, NS
							Personal Health Depression Scale [BL to Mth 6, Mth 12]	**Increased mood** Mth 6: Mood, improved (p = 0.001); % non-depressed, NS Mth 12: NS
							Self-Efficacy Scale [BL to Mth 6, Mth 12]	**Increased self-efficacy** Mth 6: Self- efficacy, improved (p = 0.0001) Mth 12: Self-efficacy, improved (p=0.002)
							Readiness Index [BL to Mth 6, Mth 12]	**Increased** Mth 6 Lifestyle change: improved (p=0.003) Commitment to change: NS Mth 12 Lifestyle change: improved (p=0.004) Commitment to change: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Perceived Stress Scale [BL to Mth 6, Mth 12]	NS
							Problem Areas in Diabetes [BL to Mth 6, Mth 12]	NS
							Subjective rating of satisfaction with and self-perceived effectiveness of ANC [BL to Mth 6, Mth 12]	NS
							Hemoglobin AIC (%) [BL to Mth 6, Mth 12]	NS
							Total cholesterol: HDL ratio [BL to Mth 6, Mth 12]	NS
							Blood pressure [BL to Mth 6, Mth 12]	NS
							Number of new prescriptions for insulin, sulfonylureas, and metformin per year [BL to Mth 12]	**Increased number of new prescriptions**
							Number of prescription refills for insulin, sulfonylureas, and metformin per year [BL to Mth 12]	**Increased prescription refills** ANC: +1.2; UC: -0.2

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Number of primary care visits, per year [BL to Mth 12]	**Increased number of primary care visits** ANC: +1.5; UC: +0.0
							Number of nutritionist visits, per year [BL to Mth 12]	**No change**
							Number of specialist doctor visits, per year [BL to Mth 12]	**No change**
Breed and Bereznay (2017) [USA, AMRO] [21]	Uncontrolled trial	Generalized anxiety disorder	Individualized naturopathic care commonly consisting of nutraceuticals, pharmaceuticals, homeopathics, and/or Herbal Medicines At least 2 community health center visits over 26 months, mean number of visits 3.3	Nil	Nil	60	Generalized Anxiety Disorder 7-item scale (GAD-7)	**Reduced anxiety** -5.2 ($p<0.0001$) >50% improvement: 50%
							Patient Health Questionnaire 9-item depression assessment tool	**Reduced depression** -7.8 ($p < 0.0001$) >50% improvement: 58.6%
Carter, et al. (2019) [Australia, WPRO] [22]	Case report	Functional gastrointestinal disorder	Case 1 (3 visits): Botanical supplements: Flordis Iberogast liquid herbal formula containing, *Foeniculum vulgare* seed, *Gentiana lutea* root, chamomile, or dandelion root teas; Nutritional supplements: Bioceuticals MultiGest Enzymes, Metagenics CalmX; Lifestyle advice: mindfulness/meditation practices, mindful eating, exercise, self-massage. Dietary advice: plant based whole foods, fiber, low FODMAP, bone broths. Case 2 (4 visits): Liquid herbal formula containing *Matricaria chamomilla* 1:2, *Cynara scolymus* 1:2, *Taraxacum officinale* radix	Nil	Nil	2	Gastrointestinal Symptom Rating Scale (self-reported) [BL to Visit 2, 3, 4]	**Reduced gastrointestinal symptoms** Case 1: Visit 2, -5 Visit 3, -2 Total, -2 Case 2: Visit 2, -6 Visit 3, -6 Visit 4, -11 Total, -11

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
			1:2, *Althea officinalis* 1:5, *Lavandula angustifolia* 1:2; *Eschscholzia californica* 1:2; *Scutellaria lateriflora* 1:2; Lifestyle advice: sleep hygiene, mindful eating; Dietary advice: apple cider vinegar, protein, legumes, vegetables, fruit, fibrous food. 5 weeks treatment.					
Cooley, et al. (2009) [Canada, AMRO] [23]	Randomized controlled trial	Anxiety	12 weeks: Naturopathic care-lifestyle and diet counseling, exercise, *Withania somnifera*, multivitamin/mineral formula.	Anxiety medication (but not benzodiazepine drug class)	Psychotherapy care: patient directed counseling, cognitive behavioral therapy, educated on healthy diet, reducing caffeine/tobacco stimulants, deep-breathing techniques, exercise advice, matched placebo supplement	75 (36/39)	Beck Anxiety Inventory (BAI)	**Reduced anxiety** NC, -13.31; PC, -7.15 Between group, -6.16 (p=0.0036)
							The Fatigue Questionnaire	**Reduced fatigue** Subjective: NC -20.39; PC -2.38 Between group -18.01 (p<0.0001) Physical: NC -14.29; PC -1.10 Between group -13.19 (p=0.0033) Motivation: NC -18.95; PC +1.37 Between group -20.32 (p<0.0001) Concentration: NC -1.98; PC +0.37 Between group -17.51 (p<0.0001)
							Measure Yourself Medical Outcomes	**Reduced self-identified symptoms** Symptom 1: NC -2.24; PC -0.46 Between group -1.77 (p<0.0001) Symptom 2: NC -1.94; PC -0.86 Between group -1.08 (p=0.0115)
							Weight (kg)	**Reduced weight** -1.47 (p=0.00146)
							Body mass index (kg/m^2)	**Reduced body mass index** -0.56 (p=0.00128)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Fathima-Jebin, et al. (2018) [India, SEARO] [30]	Case report	Ovarian malignancy and non-alcoholic fatty liver disease with ascites	Integrated naturopathy & yoga therapy (INYT) (yoga, acupuncture, massage, hydrotherapy, chromotherapy, mud therapy, reflexology) Diet therapy	Nil	Nil	1	Weight (kg) [BL to Dy 30]	**Reduced weight** - 4
							Body mass index (kg/m^2) [BL to Dy 30]	**Reduced body mass index** -1.5
							Abdominal girth (cm) [BL to Dy 30]	**Reduced abdominal girth** -5
							Blood pressure (BP) (mmHg) [BL to Dy 30]	**Reduced BP** Systolic: -10 Diastolic: -2
							CT imaging of liver density [BL to Dy 30]	**Reduced tumor size** BL: 12.4cm x 12cm x 9.3cm Dy 30: 12.8cm x 9cm x 8.6cm
							CT fluid estimate [BL to Dy 30]	**No change**
							Fasting plasma glucose (mg/DL) [BL to Dy 30]	**Reduced fasting plasma glucose** -7
							Postprandial glucose (mg/dL) [BL to Dy 30]	**Reduced postprandial glucose** -2
							Bilirubin, total (mg/dL) [BL to Dy 30]	**Reduced total bilirubin** -0.03
							Bilirubin, direct (mg/DL) [BL to Dy 30]	**Reduced direct bilirubin** -0.11
							Alkaline phosphatase (ALP) (U/L) [BL to Dy 30]	**Reduced ALP** -11

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Aspartate transaminase (AST) (U/L) [BL to Dy 30]	**Reduced AST** -4.1
							Alanine transaminase (ALT) (U/L) [BL to Dy 30]	**Reduced ALT** -8.3
							Gamma-glutamyl transaminase (GGT) (U/L) [BL to Dy 30]	**Reduced GGT** -6
							Urea (mg/dL) [BL to Dy 30]	**Reduced urea** -31.3
							Creatinine (mg/dL) [BL to Dy 30]	**Reduced creatinine** -0.26
							Uric acid (mg/dL) [BL to Dy 30]	**Reduced uric acid** -4.9
Gowda, et al. (2017) [India, SEARO] [37]	Case report	Metabolic syndrome and hypothyroidism	Over 12 weeks (total: 45 days) Integrated Yoga Naturopathy (IYN): a combination of naturopathic therapies focused on detoxification (therapeutic fasting, calorie restricted diet, hydrotherapy, mud therapy, and manipulative therapies) and yoga therapies (*asanas*, *pranayama*, meditation, relaxation techniques, *kriyas*, educational lectures, and yoga-based counseling sessions).	Hypoglycemic medication (Glimepiride and Metformin BD), Voglibose BD, Levothyroxine OD, Telmisartan OD, Aceclofenac BD	Nil	1	Total cholesterol (mg/dl) [BL to Wk 6]	**Reduced total cholesterol** -47
							High-density lipoprotein (HDL) – cholesterol (mg/dl) [BL to Wk 6]	**Increased HDL cholesterol** +6
							Low-density lipoprotein (LDL) – cholesterol (mg/dl) [BL to Wk 6]	**Reduced LDL cholesterol** -43
							Triglycerides (mg/dl) [BL to Wk 6]	**Reduced triglycerides** -63

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Thyroid stimulating hormone (TSH) (mIU/ml) [BL to Wk 6]	**Reduced TSH** -3.85
							Fasting blood glucose [BL to Wk 6]	**Reduced fasting blood glucose** -35
							Post-prandial blood glucose [BL to Wk 6]	**Reduced post-prandial glucose** -167
							HbA1c (%) [BL to Wk 6]	**Reduced HbA1c** -0.7
							Visual Analog Scale [BL to Wk 6]	**Reduced pain** Knee pain: -5; Neck pain: -4
							Body weight (kg) [BL to Wk 6]	**Reduced body weight** -20.3
							Body mass index (kg/m^2) [BL to Wk 6]	**Reduced body mass index** -7.3
							Blood pressure (BP) (mmHg) [BL to Wk 6]	**Reduced BP** -22/16
							Medication use [BL to Wk 6]	**Reduced medication use** All able to be discontinued: anti-hypertensive (Telmisartan 20 mg), oral hypoglycemics (glimepiride, metformin, and Voglibose 0.03 mg), thyroid (levothyroxine sodium 100 mg), and analgesic (Aceclofenac)
Joseph, et al. (2015) [India, SEARO] [31]	Uncontrolled trial	HIV1 and HIV2	Four study arms based on duration of stay: Group 1: 1-7 days; Group 2 8-15 days; Group 3 16-30 days; Group 4 >30 days) Naturopathy treatment: hydrotherapy, dietary advice,	Antiretroviral medications	Nil	96 (G1: 21/ G2: 28/ G3: 23/ G4: 24)	CD4 count [BL to Discharge]	**Reduced for >30 days treatment** G1: NS G2: NS G3: NS G4: p=0.00038

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
			raw juices, mud therapy, counseling, sun bath. Yoga treatment: loosening exercises, *asanas*, *pranayama*, and deep relaxation techniques.					
Milliman, et al. (2000) [USA, AMRO] [24]	Retrospective cohort study	Hepatitis C	All patients (minimum one month treatment): (a) Silymarin 80% standardized extract (150 mg); (b) d-alpha tocopherol (400IU), vitamin C (500 mg), beta carotene (15 mg), selenium amino acid chelate (50 mcg) (c) N-acetyl-L-cysteine (1000mg); (d) cod liver oil 1-2 tsp daily (e) dietary and lifestyle advice including breakfast muesli. (f) colchicine (1.2 mg); (g) ursodeoxycholic acid (300 mg) Some patients: (h) herbal mixture of *Phyllanthus nigrum or amarus*, *Picrorrhiza kurroa*, *Zingiber officinale*, *Boerhaavia diffusa*, *Andrographis paniculata*, *Cichorium intybus*, *Emblica officinalis*, *Embelia ribes*, *Terminalia chebula*, *Terminalia arjuna*, *Piper longum*, *and Eclipta alba* (i) deglycyrrhizinated licorice 500 mg	All patients: colchicine (1.2 mg daily, five days per week); ursodeoxycholic acid (300 mg bid pc)	Nil	14	Alanine aminotransferase (ALT) (U/L; % reduction)	**Reduced ALT** -35 U/L (p=0.026) Reduction of greater than 25% in 7 of 14 patients
							Self-reported symptoms of advancing liver disease (liver pain, enlarged liver, jaundice, ascites, generalized edema, or liver-related bowel dysfunction)	**No change**
							Self-reported symptoms of wellbeing	**Most patients reported an increased sense of well-being on the treatment program.**
Mooventhan and Shetty (2015) [India, SEARO] [29]	Case report	Metabolic syndrome (40 year old male)	3 weeks: Integrative naturopathic care 60 – 90 min/day of hydrotherapy, mud therapy, massage therapy and diet therapy including fenugreek powder and yoga 120-min/day.	Mixed insulin and candesartan.	Nil	1	Weight (kg) [BL to Wk 3]	**Reduced weight** -9.5
							Body mass index (kg/m^2) [BL to Week 3]	**Reduced body mass index** -3.2

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Waist Circumference (cm) [BL to Wk 3]	**Reduced waist circumference** -9
							Insulin Intake (units) [BL to Wk 3]	**Reduced insulin intake** -40-0-40
							Fasting blood glucose (mg/dL) [BL to Wk 3]	**Reduced fasting blood glucose** -130
							Postprandial blood glucose (mg/dL) [BL to Wk 3]	**Reduced postprandial glucose** -192
							Systolic blood pressure (BP) (mmHg) [BL to Wk 3]	**Reduced systolic BP** -38
							Diastolic blood pressure (mmHg) [BL to Wk 3]	**Reduced diastolic BP** -10
							Serum total triglycerides (mg/dL) [BL to Wk 3]	**Reduced triglycerides** -6
							Serum total cholesterol (mg/dL) [BL to Wk 3]	**Reduced total cholesterol** -41
							High-density lipoprotein (HDL) – cholesterol (mg/dL) [BL to Wk 3]	**Reduced HDL cholesterol** -3
							Low-density lipoprotein (LDL) – cholesterol (mg/dL) [BL to Wk 3]	**Reduced LDL cholesterol** -36

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Very-low-density lipoprotein (VLDL) – cholesterol (mg/dL) [BL to Wk 3]	**Reduced VLDL cholesterol** -2
Nair (2016) [India, SEARO] [32]	Case report	Hypothyroidism hyperprolactinemia, hot flushes (Female, 37 years)	Naturopathy and yoga-based lifestyle modification program including dietary recommendations (50-60% of diet as raw fruit + elimination of leafy greens), therapeutic fasting (2 days/week coconut water only), water-based therapies (immersion, mud and cold baths, water throat and abdominal packs), and 1-hour daily yoga interventions (alternate nostril breathing, fast abdominal breathing, sun salutations), and 21 daily acupuncture sessions.	Thyronorm (levothyroxine sodium) 125 mcg	Nil	1	Weight (kg) [BL to Mth 18]	**Reduced weight** -12
							Thyroid stimulating hormone (U/ml) [BL to Mth 18]	**Reduced TSH** -4.6
							Prolactin (ng/ml) [BL to Mth 18]	**Reduced prolactin** -15.1
							Anti-mullerian hormone (AMH) (ng/ml) [BL to Mth 18]	**Increased AMH** +2.3
							Thyroxine use [BL to Mth 18]	**Reduced thyroxine use** Discontinued (from 125 mcg per day)
Oberg, et al. (2011) [USA, AMRO] [33]	Uncontrolled trial	Type II diabetes mellitus (Adults)	Individual and group nutrition and lifestyle education program including basic nutrition, reading food labels, selecting healthier food, what happens in the body with T2DM, problem-solving dietary habits, organic and wild foods, and understanding and address eating behaviors such as emotional eating. 10 hours intervention over 12 weeks.	None reported	Nil	12	Hemoglobin A1c (%) [BL to Wk 12]	**Reduced HbA1c** -0.4% (p=0.02)
							Serum lipid profile [BL to Wk 12]	NS
							Blood pressure [BL to Wk 12]	NS
							Body Mass Index [BL to Wk 12]	NS
							Summary of Diabetes Self-Care Activities [BL to Wk 12]	**Increased self-care activities** Healthy eating pattern (days in last week): +1.8 (p=0.05) Healthy eating pattern (days per week in last month): +1.2 (p=0.02)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								>5 fruits/vegetables per day (days in last week): +1.3 (p=0.01) Physical activity (days in last week): +3.4 (p=0.02) Blood glucose checking (% of time): +38% (p=0.05) Checked blood sugar as recommended (days in last week): +3.0 (p=0.04)
							Problem Areas in Diabetes [BL to Wk 12]	**Reduced concern about diabetes** Feeling scared about living with diabetes: -1.8 (p=0.006) Feeling overwhelmed by diabetes: -1.9 (p=0.03) Feeling discouraged about diabetes treatment plan: NS Composite score: -18.9% (p=0.05)
							Three-day diary [BL to Week 12]	**Increased healthy eating behaviors** Adherence to healthy eating increased (p=0.05)
							Perceptions about Nutritional Counseling [BL to Wk 12]	**Increased confidence with health eating** Average daily carbohydrate intake: NS Attention to type of dietary fat consumed: From 'Seldom' to 'Often' (p=0.04) Know how to follow dietary guidelines: From 'Definitely no' to 'Yes' (p=0.02) Feel in control of my diabetes: From 'Definitely no' to 'Yes' (p=0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Seven Eating Styles Questionnaire [BL to Wk 12]	**Reduced problem eating behaviors** Emotional eating -0.7 (p=0.02) Food fretting NS Selecting fast food/fresh food -0.8 (p=0.05) Attention to sensory/spiritual dimensions of food -1.2 (p<0.01) Task snacking NS Attention to dining atmosphere -0.6 (p=0.01) Attention to positive social settings NS Integrated eating score -3.7 (p=0.03)
Paul, et al. (2012) [Germany, EURO] [13]	Case reports	1. Chronic pain 2. Active ulcerative colitis 3. Chronic ischemic heart disease patients at an academic teaching hospital integrative clinic	Therapies include stress management training such as meditation, moderate exercise such as yoga, dietary counseling and weekly cooking lessons, naturopathic methods including cataplasms, cupping, phytotherapy, massages, acupressure, and hydrotherapy. 60 hour program over 10 weeks.	Cognitive behavior techniques focusing on self-care strategies	Nil	3	Qualitative interview regarding acceptance of program, lifestyle modifications and symptom severity	Self-reported increased acceptance of health condition, improved coping, and self-efficacy in the management of condition especially in stressful situations
							Satisfaction with therapy at interview	Satisfaction with the therapy was high
Ratnakumari, et al. (2018) [India, SEARO] [34]	Randomized controlled trial	Polycystic ovarian syndrome	12 weeks: (a) Cold abdominal mud pack (b) Cold water enema (c) Cold hip bath; (d) Hot foot immersion bath; (e) Partial massage to abdomen; (f) Partial massage to back; (g) Dietary changes: Fasting using fruit and vegetable juices and fluids;	Nil	Waitlist	50 (25/25)	Ovarian volume [BL to Wk 12]	**Increased ovarian volume (left)** Right: NS; Left Intervention +3.68; Control -0.79 Between group p=0.032
							Ovarian size (cm) [BL to Wk 12]	Right: NS Left: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
			(h) Dietary changes: Raw vegetables, fruits, sprouts, vegetable soup for breakfast, and short vegetarian lunch meal; (i) Dietary changes: Boiled vegetables, steamed food; (j) yogic practice: *Asanas* [supine: *uttanapadasana, pawanmuktasana, naukasana, setu bandhasana;* prone: *bhujangasana, dhanurasana;* sitting: *vakrasana, baddha konasana;* standing: *katichakrasana, ardhakatichakrasana, dwikonasana, padahastasana], Pranayama [bhramari pranayama, surya bhedana pranayama, nadi shodhana pranayama], Kriya [kapalhati], Mudra [yoni mudra],* Relaxation *[savasana]*				Follicles antrum [BL to Wk 12]	**Increased follicle antrum (right)** Right: Intervention +5; Control -4 Between group p<0.001 Left: NS
							Largest follicle size (cm) [BL to Wk 12]	**Reduced follicle length** Right, Length: Intervention -0.1; Control +0.15 Between group p=0.016 Right, Width: NS Left, Length: NS Left, Width: NS
							Total ovarian assessment (instrument not specified) [BL to Wk 12]	**Increased total ovarian quality** Intervention +6.0; Control -3.5 Between group p<0.001
							Body weight (kg) [BL to Wk 12]	**Increased body weight** Intervention +6; Control +0.0 Between group p<0.001
							Body mass index (BMI) (kg/m^2) [BL to Wk 12]	**Increased body mass index** Intervention +2.36; Control 0.0 Between group p<0.001
							Chest circumference (cm) [BL to Wk 12]	**Increased chest circumference** Intervention +4.25; Control +0.75 Between group p<0.001
							Waist circumference (cm) [BL to Wk 12]	**Increased waist circumference** Intervention +5; Control -1.25 Between group p<0.001
							Hip circumference (cm) [BL to Wk 12]	**Increased hip circumference** Intervention +6.75; Control -0.25 Between group p<0.001

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Mid-arm circumference (cm) [BL to Wk 12]	**Increased mid-arm circumference** Intervention +3; Control +0.0 Between group p<0.001
							Waist-hip ratio [BL to Wk 12]	NS
							Cycle length [days] [BL to Wk 12]	Last menstrual period and first cycle NS First and second cycle NS Second and third cycle NS
Ritenbaugh, et al. (2008) [USA, AMRO] [25]	Randomized clinical trial	Temporomandibular disorder (TMD)	Traditional Chinese Medicine (TCM) including acupuncture, herbal therapy, massage, relaxation tapes, 2 visits per week for 6 wks, then 1 per week for 5 – 6 months. OR Naturopathic medicine (NM) including herbal medicine, nutritional supplements, nutritional and lifestyle advice, stress-reduction advice, 9.5 hours over 6 – 8 moths.	Nil	Speciality dental care for TMD treatment including education, bite splints, self-care counselling, and pain management strategies, 2 hr class sessions plus optional referrals for massage, psychological and counseling support.	160 (50/50/ 60)	Worst Facial Pain [BL to Mth 6/8, 9/11]	**Reduced worst facial pain** Mth 6/8: TCM -2.2; NM -2.3; Specialty -1.2 Between group (Specialty vs TCM) p=0.010 Between group (Specialty vs NM) p=0.025 Mth 9/11: TCM -2.5; NM -3.2; Specialty -1.7 Between group (Specialty vs TCM) p=0.037 Between group (Specialty vs NM) p=0.019
							Average Facial Pain [BL to Mth 6/8, 9/11]	**Reduced average facial pain** Mth 6/8: TCM -1.9; NM NS; Specialty -0.9 Between group (Specialty vs TCM) p=0.004 Between group (Specialty vs NM) NS Mth 9/11: TCM -2.3; NM NS; Specialty -1.5 Between group (Specialty vs TCM) p=0.017 Between group (Specialty vs NM) p=NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Impact on Social Life [BL to Mth 6/8, 9/11]	Mth 6/8: TCM, NS; NM -1.2; Specialty -0.5 Between group (Specialty vs TCM) NS Between group (Specialty vs NM) p=0.012 Mth 9/11: NS
Ross, et al (2008) [USA, AMRO] [26]	Retrospective cohort study	Eating disorders	6 months: Naturopathic integrative therapies for insomnia and constipation: insomnia treated with instructions on sleep hygiene and herbal product (containing valerian root extract, *Rhodiola rosea* root extract, *Hops strobiles* extract, *Passiflora incarnata* aerial extract, and German chamomile flower extract) and/or 5-hydroxytryptophan. Constipation treated with plant-based digestive enzymes at mealtimes and a daily probiotic supplement containing *Lactobacillus rhamnosus*	Nil		38	Medications used for sleep [After Dy 3]	NS
							Sleep medications [After Dy 3]	NS
							Constipation medications [After Dy 3]	NS
Ryan, et al. (2019) [USA, AMRO] [14]	Uncontrolled trial	Pre-hypertension or Stage 1 hypertension	1 herbal-mineral caplet per day over a period of 6 months containing *Rosa centifolia*, *Boerhaavia diffusa*, *Dendrogyra cylindrus* (coral powder) (350 mg), magnesium aspartate (200 mg), *Convolvulus pluricaulis* (100mg), *Terminalia arjuna* (100mg), *Tribulus terrestris* (100mg), low-reserpine *Rauwolfia serpentina* (50 mg), and *Rosa vinca* (25 mg).	Anti-hypertensive medication	Nil	30	Serum sodium (nmol.\/L) [BL to Mth 6]	NS
							Serum potassium (nmol/L) [BL to Mth 6]	**Increased serum potassium** Mth 3: +0.12 (p=0.04) Mth 6: +0.18 (p=0.019)
							Serum calcium (mg/dL) [BL to Mth 6]	NS
							Serum magnesium (mg/dL) [BL to Mth 6]	NS
							Aspartate transferase (U/L) [BL to Mth 6]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Alanine transferase (U/L) [BL to Mth 6]	NS
							e-Glomerular filtration rate (mL/min/BSA) [BL to Mth 6]	NS
							b-type natriuretic peptide (pg/mL) [BL to Mth 6]	NS
							Patient Health Questionnaire-9 [BL to Mth 6]	NS
							Blood pressure (BP) (mmHg) [BL to Mth 6]	**Reduced BP** Systolic: not shown (p<0.0001) Diastolic: not shown (p<0.0001)
Seely, et al. (2013) [Canada, AMRO] [27]	Randomized controlled trial	Cardiovascular disease	Individualized naturopathic care (NC) and enhanced usual care including diet and lifestyle counseling, nutritional medicine & supplementation, 7 visits over 1 year.	Anti-hypertensive, lipid lowering, anti-diabetic medications. Natural health product use. Acupuncture, chiropractic, massage, and physiotherapy treatments	Enhanced usual care plus biometric measurement (UC)	246 (124/122)	10-year CVD event risk (Framingham) [BL Wk 25 and 52]	**Reduced CVD risk** NC 7.74%; UC 10.81% Between group -3.07% (p=0.001)
							Prevalent metabolic syndrome [BL to Wk 25 and 52]	**Reduced metabolic syndrome prevalence** NC 31.58%; UC 48.48% Between group -16.9% p=0.002)
							Body weight (kg) [BL Wk 25 and 52]	NS
							Waist (cm) [BL Wk 25 and 52]	NS
							Lipid profile [BL Wk 25 and 52]	NS
							Fasting glucose (mg/dL) [BL Wk 25 and 52]	NS
							Blood pressure (mmHg) [BL Wk 25 and 52]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Shetty and Mooventhan (2015) [India, SEARO] [35]	Case report	Obesity	Initial 15-day admission: yoga sessions (60 mins day), naturopathic treatment (90-120 minutes per day) involving hydrotherapy, diet and fasting, mud therapy and massage therapy. Following 2 years of self-care patient was admitted for 10 days every 2 years (2010, 2012, 2014).	Nil	Nil	1	Body weight (kg) [BL to Dy 15, Yr 2, Yr 6]	**Reduced body weight** Dy 15: -6.1 Yr 2: Weight maintained Yr 6: -22.7 (101 kg to 94.9 kg)
							Body mass index [BL to Dy 15, Yr 2, Yr 6]	**Reduced body mass index** Dy 15: -2.35 Yr 2: Changed from Class-II Obesity to Class-I Obesity Yr 6: Changed to Overweight or Pre-obese (-8.61)
Sinclair (2015) [Australia, WPRO] [15]	Case report	Acute pancreatitis	Dietary changes: avoid coffee, stimulants, purified sugar and fatty meals; increase nutrient- and phytochemical-dense foods; Vegetable soup (butter, onions, garlic, carrot, celery, cauliflower, broccoli, zucchini) cooked for 2-3 hrs in a base of *Curcuma longa* (3 tablespoons, dried), *Zingiber officinale* (1 tablespoon, fresh), *Allium sativum* (3 bulbs, fresh), *Coriandum sativum* (1 bunch, leaf and roots; 2 tablespoons, dried), *Cuminum cyminum* (1 table -spoon, dried) *Illicium verum* (3 x fruit), *Foeniculum vulgare* (1 table spoon, crushed seed), *Ellettaria cardamomum* (5 x pods), *Piper nigrum* (1/2 tea- spoon) Herbal medicines: *Ulmus rubra* (2 tablespoons); *Plantago ovata* (2 tablespoons); *Zingiber officinale* and *Matricaria chamomilla floz* infusion. Exercise: Gentle hike in local nature reserve (6km; 3 hours)	Nil	Nil	1	Pain	**Reduced pain** Resolved within 1 hour
							Nausea	**Reduced nausea** Resolved within 1 hour
							Bowel motions	**Normalized bowel motions** Normalized on day 2 of treatment

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Szczurko, et al. (2007) [Canada, AMRO] [36]	Randomized controlled trial	Chronic low back pain	12-weeks treatment with twice weekly naturopathic care (NM) including dietary counseling, deep breathing relaxation techniques and acupuncture.	NSAIDs	Standardized physiotherapy involving education and instruction on physiotherapy exercises using an approved education booklet.	75 (39/36)	Oswestry Low Back Pain Disability Questionnaire [BL to Wk 12]	**Reduced back pain** NM: -5.0; Education: -0.0 Between group: p<0.0001
							Short Form 36 [BL to Wk 12]	**Increased quality of life** Physical component: NM +9.25; Education +0.78 Between group +8.47 (p<0.0001) Mental component: NM +4.26; Education -2.74 Between group +5.56 (p<0.0045) Physical functioning: NM +7.12; Education +1.56 Between group +5.56 (p<0.0033) Physical role: NM +8.67; Education -2.81 Between group +11.48 (p<0.001) Bodily pain: NM +11.12; Education +0.29 Between group +10.83 (p<0.0001) General health: NM +6.05; Education -1.13 Between group +7.18 (p=0.0002) Vitality: NS Social functioning; NM +8.95; Education -1.62 Between group +10.57 (p<0.0001) Emotional role: NM +4.88; Education -3.17 Between group +8.05 (p=0.0090) Mental health: NM +4.62; Education -2.82 Between group +7.44 (p=0.0003)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Self-reported Pain Scale [BL to Wk 12]	**Reduced pain** NM -1.0; Education -0.0 Between group p<0.0001
							Roland Morris Disability Questionnaire [BL to Wk 12]	**Reduced disability** NM -4.0; Education +2.0 Between group p<0.0001
							Forward Lumbar Flexion Range of Motion (cm) [BL to Wk 12]	**Increased range of motion** NM +4.5; Education -0.5 Between group p<0.0001
							Weight (kg) [BL to Wk 12]	**Reduced weight** NM -1.51; Education -0.05 Between group p<0.0052
							Body Mass Index (kg/m^2) [BL to Wk 12]	**Reduced body mass index** NM -0.58; Education -0.06 Between group p<0.0106
Szczurko, et al. (2009) [Canada, AMRO] [28]	Randomized controlled trial	Rotator cuff tendonitis	12-weeks of 30 minutes of treatment with naturopathic care including dietary counseling, acupuncture, Phlogenzym containing 90mg bromelain, 48mg trypsin and 100mg rutin (2 tablets TID). OR Standardized physical exercises including passive, active assisted and active range of motion exercises and matched placebo.	Nil	Standardized physical exercise	85 (43/42)	Shoulder Pain and Disability Index [BL to Wk 12]	**Reduced shoulder pain and disability** Total: NM -42.34; PE -23.59 Between group -29.66 (p<0.0001) Pain: NM -18.70; PE -5.7 Between group -13.00 (p<0.0001) Disability: NM -21.64; PE -6.00 Between group -15.64 (p=0.0002)
							Pain Visual Analog Scale [BL to Wk 12]	**Reduced pain** NM -2.34; PE -0.67 Between group -1.67 (p<0.0001)
							Short Form 36 [BL to Wk 12]	**Increased quality of life** Physical component: NM +7.75; PE +2.04 Between group +5.71 (p=0.0004) Mental component: NM +5.85; PE +0.13 Between group +5.73

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								(p=0.0107) Physical functioning: NM +14.88; PE +1.36 Between group +13.52 (p=0.0025) Physical role: NM +21.09; PE +3.75 Between group +17.34 (p=0.0015) Bodily pain: NM +24.16; PE +7.64 Between group +16.52 (p=0.0004) General health: NM +10.07; PE -1.54 Between group -11.62 (p=0.0029) Vitality: NM +14.33; PE +4.17 Between group +10.16 (p=0.0047) Social function: NM +14.02; PE +3.65 Between group +10.38 (p=0.0378) Emotional role: NM +13.82; PE -2.27 Between group +16.09 (p=0.002) Mental health: NM +12.44; PE -2.22 Between group +14.66 (p=0.0015)
							Measure Yourself Medical Outcomes Profile [BL to Wk 12]	**Reduced symptoms** MYMOP Symptom 1: NM -2.20; PE -1.29 Between group -0.91 (p=0.0225) MYMOP Symptom 2: NM -3.13; PE -0.66 Between group -1.86 (p=0.0001)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Maximal range of motion (goniometer readings) [BL to Wk 12]	**Increased range of motion** Flexion: NM +37.24; PE -3.69 Between group: +40.94 ($p<0.0001$) Extension: NM +6.1; PE -3.58 Between group: +9.68 ($p<0.0001$) Abduction: NM +47.46; PE +0.89 Between group: +46.57 ($p<0.0001$) Adduction: NS
Taylor, et al. (2018) (Australia, WPRO) [16]	Case report	Interstitial cystitis	Naturopathic care including liquid herbal formula containing *Hypericum perforatum*, *Eleutherococcus senticosus*, *Scutellaria lateriflora*, *Schisandra chinensis*, *Crocus sativus*, (7.5ml BD), herbal tablet containing *Boswellia serrata*, *Curcuma longa*, *Apium graveolens*, *Zingiber officinale*, (2 tablespoons BD); lifestyle counseling including sleep hygiene, stress reduction techniques; dietary advice including increased water consumption and reduction of aggravating foods. Treatment over 2 weeks.	Nil	Nil	1	Client self-reported symptom reduction	**Increased energy and vitality, marked reduction in frequency and urgency of urinary symptoms, improved sleep onset and quality, reduction in edema in feet and ankles.**

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30 Applied Nutrition

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HIGHLIGHTS

- Assessing food choices and dietary patterns – known as applied nutrition – is one of the core therapies used in naturopathic care.
- Poor nutrition has been identified as a modifiable risk factor associated with several non-communicable diseases.
- Naturopaths/NDs provide individualized dietary recommendations and education around food and dietary patterns to patients as part of their patient-centered care.
- Clinical research by the naturopathic community has examined the application of food as medicine, specific dietary interventions, dietary modification based on food intolerance assessments, and dietary education interventions.
- In line with the role of primary care, naturopathic researchers have investigated the effects of applied nutrition interventions on individuals with irritable bowel syndrome, cancer, overweight/obesity, type II diabetes mellitus and prediabetes, metabolic syndrome, generalised anxiety disorder, acne, and asthma as well as in healthy adults.

Applied nutrition involves the modification of dietary patterns and food choices with the goal of optimizing nutritional status in the treatment and/or prevention of disease. For centuries, humans have recognized the connection between food and health [1]. Contemporary research recognizes poor nutrition as a modifiable risk factor in the development and progression of illnesses that contribute heavily to the global burden of disease (e.g., cancer [2], cardiovascular disease [3], diabetes [4] and depression [5]) and establishes nutrition interventions as effective therapeutic options for many of these conditions [6, 7].

Nutritional intervention has historically been one of the key focus areas of naturopathic practice globally, with both applied nutrition and clinical nutrition (the prescribing of specific nutrients – see Chapter 31) being seen as foundational to naturopathic practice, with cross-sectional data suggesting that both are an essential component of the treatment offered to patients seeking naturopathic care globally [8]. Naturopathic applied nutritional interventions include diet therapy (therapeutic diets, fasting and individualized diet modification), therapeutic application of specific foods and behavioural and lifestyle counselling related to eating behaviours [9].

Naturopathic practice incorporates the scientific and empirical knowledge of food and nutrition, it recognizes the value of whole foods beyond their individual constituents, as well as the traditional knowledge of food as a form of medicine – in some cases interfacing with herbal medicines through the use of plant-based foods to improve health – and the importance of considering the constitution and uniqueness of every patient, the thoughts and emotions that they have around food and their environment when applying nutrition therapeutically. Dietary modification is a common component of a multi-faceted comprehensive naturopathic treatment plan and hence is also discussed in *Chapter 29: Complex Naturopathic Interventions.*

Overview of studies

This chapter is dedicated to highlighting the original clinical research (n=25; published in 31 papers) naturopathic clinicians undertook in the field of applied nutrition. This research includes a total of 2,568 participants and was conducted in the United States of America (USA) (n=18), India (n=6), Canada (n=3), New Zealand (n=2), Germany (n=1), and Australia (n=1). The study designs include randomized controlled trials (RCT) (n=14) and subsequent secondary analyses or long-term follow up data related to the RCTs (n=6), uncontrolled trials (n=6), case reports (n=4), and a retrospective cohort study (n=1). Trials were primarily conducted in out-patient community settings and non-medical residential facility.

The study populations treated with applied nutrition include healthy adults (n=4), individuals with irritable bowel syndrome (IBS) (n=3), breast cancer (n=3), overweight/obesity (n=3), type II diabetes mellitus (n=3) or

prediabetes (n=1), prostate cancer (n=2), generalized anxiety disorder (n=2), metabolic syndrome (n=2), acne (n=1), asthma (n=1). Of all the naturopathic clinical studies employing applied nutrition interventions, 88% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 30.1: Clinical research investigating applied nutrition interventions conducted by naturopathic researchers.* This body of naturopathic research on applied nutrition is also supported by 20 observational studies and more than 30 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

Naturopathic applied nutrition interventions have been tested using rigorous study designs. The case reports detailed significant clinical improvement in response to diet modification. Changes in patient-reported diet quality and objective biomarker levels suggest that these interventions can successfully modify participant behaviour, with clinically meaningful improvements in symptom severity. Although studies of specific naturopathic interventions are limited, this data complements and is consistent with observational studies and health services research which show demonstrable sustained improvement in diets for patients receiving naturopathic dietary advice [10, 11].

While the use of clinical nutrition (e.g., dietary supplements) by naturopaths/naturopathic doctors may lead to assumptions that the prescription of products is the main nutritional intervention of the profession, research has shown that applied nutrition via dietary modification is used significantly more by the global naturopathic profession [8]. Where comparative examination with dietitians has occurred, naturopaths/naturopathic doctors are found to follow evidence-based approaches to applied nutrition at least as consistently as dietitians, with the key differences relating to the increased scope of treatment options available to the naturopathic workforce beyond applied nutrition, as well as an emphasis on combining traditional approaches to understanding food and health to complement evidence-based care [12].

Poor dietary habits are one of the major contributors to non-communicable disease and global burden of disease [13]. Naturopathic applied nutrition is frequently used in clinical practice around the globe and evidence suggests that it plays a role in achieving meaningful clinical outcomes. The high level of public trust and preference for naturopathic advice on nutrition by the community [14] suggest that naturopaths/NDs may be able to effectively translate evidence-based dietary guidelines in clinical practice, and integration of the naturopathic workforce in initiatives aimed at improving health through nutrition may be warranted.

Studies investigating specific interventions:

Food as Medicine

Six of the studies involving 277 participants focused on the therapeutic effectiveness of specific foods [15-20]. These studies included interventions to address metabolic syndrome [15], type II diabetes mellitus [18, 19] and obesity [20]. Two of the studies included healthy volunteers with a focus on measuring the impact of chocolate on blood pressure [16]; and the impact of coconut on blood cholesterol readings [17]. Other foods assessed included vegetable and fruit powders [15], lemon and lemon juice [20], bittergourds [19] and bell peppers [18].

A randomized controlled cross-over trial conducted in the USA with 45 overweight adults involved the administration of dark chocolate, cocoa products and placebo [16]. Ingestion of solid dark chocolate and liquid cocoa resulted in an improvement in endothelial function as measured by flow-mediated dilatation. Dark chocolate improved dilatation by 4.3% vs placebo -1.8% ($p<0.001$). Compared to placebo, ingestion of sugar-free and sugared cocoa resulted in improved blood pressure (dark chocolate: systolic -3.2mmHg vs +2.7mmHg, $p<0.001$; diastolic -1.4mmHg vs +2.7mmHg, $p=0.01$).

A pilot randomized controlled trial conducted in India measured the impact of three different bittergourds on patients (n=30) diagnosed with type II diabetes mellitus [19]. Group 1 (n=10) were prescribed 250 ml bittergourd juice (30% concentrate), group 2 (n=10) 250 ml Knol-khol (80% concentrate – also known as kohl rabi) and group 3 (n=10) were prescribed 250 ml ashgourd juice (88% concentrate) [18]. The participants' fasting plasma glucose was measured every 30 minutes from baseline for two hours. A reduction in plasma glucose was found in the Knol-khol group at 30-, 90-, and 120-minutes with effect seen over time ($p=0.029$).

Diet Programs

Eleven studies (published in 13 articles) (n=1,895) focused on specific dietary interventions including low fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAP) diet [21], organic [22], modified Mediterranean [23, 24], vegetarian or vegan [25, 26], fasting [27], low-fat [28, 29], healthy diet patterns [30-32], low glycemic index [33] and individualized naturopathic dietary recommendations [34]. Most often, the programs advised participants to increase intake of vegetables and fruits, foods high in omega-3 fatty acids, fiber and whole grains and to decrease total or saturated fat. The populations included in these studies were individuals with irritable bowel syndrome (n=1) [21], prostate cancer (n=1; 2 published papers) [23, 24], cardiovascular

risk factors (e.g., high cholesterol, hypertension, overweight) (n=1) [25], obesity (n=1) [26], acne vulgaris (n=1) [27], anxiety (n=1) [33], and type II diabetes (n=1) [34]. Studies also sampled breast cancer survivors (n=3) [28, 29, 32], and healthy adult populations (n=3) [22, 30, 31].

A single-blind randomized controlled trial conducted in Germany involving 59 participants with IBS, compared the low FODMAP diet to a yoga intervention [21]. The diet intervention was delivered through a combination of group and individual counselling sessions. Improvements were noted for both the FODMAP (-96.18, p<0.001) and yoga (-66.16, p<0.001) groups across all IBS-SSS domains. Improvements were maintained at the 24-week follow-up. Between group analysis found no significant differences between groups except for a decrease in abdominal distension from baseline to the end of the 12-week intervention (IBS symptom severity score [IBS-SSS]: +14.13, p=0.04) for participants following the low FODMAP diet but not those in the yoga group. This difference was not maintained at Week 24. FODMAP diet participants also reported less food avoidance in Week 12 compared to the yoga group (-17.1; p=0.005). Yoga participants experienced reduced anxiety at Week 12 (Hospital Anxiety and Depression Scale: -1.35, p=0.035) and increased body awareness at Week 24 (Body Awareness Questionnaire: +7.6, p=0.02) compared to the FODMAP group.

In a pilot randomized controlled trial conducted in the USA (n=30) breast cancer survivors were allocated to receive either a 'fatigue reduction diet' or a general health curriculum, delivered individually through a combination of in-person and brief (15-minute) telephone sessions [32]. Using the theoretical framework of social cognitive theory, participants were advised to increase levels of dietary antioxidants through increased intake of fruits, vegetables, wholegrains, and omega-3 fatty acids. Compared with individuals in the control group, those receiving the intervention reported a significant reduction in fatigue (-2.4 vs -0.77; p<0.01) and an improvement in sleep (Pittsburgh Sleep Quality Index +2.5 vs +0.9; p=0.03) at the end of the intervention. Significant improvement in biomarkers, such as blood levels of vitamins and omega-3 fatty acids, among the intervention participants suggested compliance with the intervention.

An uncontrolled study conducted in India involving 47 patients with obesity examined the impact of a low fat, high fiber, vegetarian diet along with daily yoga practice [26]. The study lasted for 6 days and resulted in a reduction of BMI (-0.57kg/m^2; p<0.01), a reduction in waist circumference (-1.69cm; ;p<0.01), reduction in hip circumference (-1.69cm; p<0.01), reduced HDL (-2.88mg/dL; <p<0.01) a reduction in leptin (-23.75ng/mL; p<0.01), an increase in hand grip strength (Right: +2.09, p<0.001; Left: +2.00, p<0.01) and postural stability (20sec: +11.03, p<0.001; 40sec: +24.41, p<0.001; 60sec: +33.91, p<0.001).

Food Intolerance Testing and Support

Five studies [35-39] evaluated the effects of avoiding specific foods that were identified through food sensitivity testing or elimination/challenge procedures. The immunological tests used to determine food sensitivity were leucocyte antigen tests (n=1) [35], immunoglobulin G-reactivity test (n=2) [36, 39], enzyme-linked immunosorbent assay (ELISA) (n=1) [37]. One study used an elimination diet without immunological testing [38].

In a randomized controlled trial (n=58) conducted in the USA the therapeutic effects of applying food sensitivity testing in dietary elimination was assessed in the management of irritable bowel syndrome (IBS) [35]. Individualized diet recommendations were provided based on the results of Leukocyte Activation Test. Participants were randomized to receive instructions to avoid the foods found to be reactive, or a control diet which included recommendations to include foods that were found to be reactive. Participants in the intervention arm reported a significantly greater increase in the IBS Global Improvement Scale at the end of the four-week intervention (-0.86 difference, p=0.04) and a significantly greater reduction in the IBS Symptom Severity Scale (-61.78 difference, p=0.04); improvements were maintained at eight-week follow-up. A decrease in neutrophil elastase was also associated with symptom reduction.

Dietary Education

Two studies (published in six papers) [40-45] assessed the impact of dietary education interventions. These trials included 115 participants and involved the group delivery of community-based educational programs. Topics included in the programs were nutritional guideline education, and exercises to develop skills related to cooking, grocery shopping, and reading food labels.

A randomized controlled trial involving Hispanic breast cancer survivors (n=70) delivered a culturally-based approach to diet change including nutrition education, cooking skills classes, and trips to grocery stores in a group setting [40]. Participants in the intervention group increased total targeted fruit and vegetable servings per day at month 3 compared to participants receiving written nutrition instructions alone (+2 vs +0.2, p=0.004) and the significant improvements were maintained at 6-month follow up (+2.7 vs +0.5, p=0.002). A similar difference was seen in favour of the intervention group for reduction in caloric intake at month 3 (-672.9 vs 92.4, p<0.001) and month 6 (-562.9 vs 61.6, p<0.001). A secondary analysis on serum biomarkers confirmed changes in reported fruit and vegetable consumption [41]. Several publications reported on long-term follow up and subsequent secondary analyses from this trial [41, 43-45].

Table 30.1 Clinical research investigating applied nutrition interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Ali, et al. (2011) [USA, AMRO] [15]	Randomized controlled trial (Crossover)	Metabolic syndrome (adults)	Encapsulated vegetable and fruit powder concentrate blends. Blend 1: vegetable, fruit, and berry; Blend 2: vegetable and fruit 3 capsules twice daily (1 capsule = 750mg) for 8 weeks, with 8-week washout period between crossing over to a new group	Nil	Placebo	64 (22/22/20)	Flow-mediated dilatation of the brachial artery [BL to Wk 8] [BL to Mth 6]	NS
							Plasma glucose (mg/dl) [BL to Wk 8]	NS
							Serum insulin (IU/l) [BL to Wk 8]	NS
							Serum lipids (mg/dl) [BL to Wk 8]	NS
							Body weight (kg) [BL to Wk 8]	NS
Ali, et al. (2017) [USA, AMRO] [35]	Randomized controlled trial	Irritable bowel syndrome	Dietary elimination based on leucocyte antigen test results (LATR); 4 weeks	Nil	Diet including reactive foods and exclusion of non-reactive foods (contrary to LATR)	58 (29/29)	IBS Global Improvement Scale [BL to Wk 4, Wk 8]	**Symptom improvement** Wk 4: -0.86 (p=0.04) Wk 8: -1.22 (p=0.04)
							IBS Symptom Severity Scale [BL to Wk 4, Wk 8]	**Reduced symptom severity** Wk 4: -61.78 (p=0.04) Wk 8: -66.42 (p=0.05)
							IBS Adequate Relief Scale [BL to Wk 4, Wk 8]	NS
							IBS-Quality of Life [BL to Wk 4, Wk 8]	NS
							Neutrophil elastase [BL to Wk 4, Wk 8]	**Reduced neutrophil elastase** Lower in strong responders
Ameya and Nair (2017) [India, SEARO] [27]	Case report	Acne vulgaris	Day 1 to 5: Diet plan including Holy Basil decoction, fresh carrot juice, mosambi (sweet lime) juice, non-spicy vegetable curry and bhakri (sorghum preparation). Day 6 to 16: Alternating daily between therapeutic fasting, and lemon honey juice and tender coconut water. Follow up on Day 14 and 30	Swedish massage, steam bath, warm water enema and hip bath. Yoga 45 minutes per day on non-fasting days	Nil	1	Acne lesions and inflammation [BL to Dy 30, 60]	**Reduced acne lesions** Dy 30: noticeable reduction in lesions, with no noticeable inflammation or swelling Dy 60: No relapse of symptoms reported.

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Aucoin and Bhardwaj (2016) [Canada, AMRO] [33]	Case report	Generalized anxiety disorder	Lower glycemic index diet by increasing protein, fibre, and unprocessed oils	Nil	4 weeks	1	Subjective anxiety symptom severity [BL to Wk 4]	**Reduced anxiety** Wk 4: (8/10 to 4 or 5/10)
							Subjective symptoms [BL to Wk 4]	**Increased energy at Wk 4, reduced frequency and intensity of hypoglycemic symptoms, reduced headaches (once per wk compared to everyday). Cessation of chronic vaginal discharge.**
Aucoin and Bhardwaj (2019) [Canada, AMRO] [38]	Case report	Major depressive disorder and Generalized anxiety disorder	2 years: 3 weeks of elimination diet containing hypoallergenic foods. Following elimination phase, reintroduction of one new food every 3 days, and introduction of nutritional products and exercise	Nutritional products: Omega-3 fish oil (EPA 1.3g, DHA, 200mg, Vitamin E, 6.7mg) daily; intramuscular vitamin B12 injections every 3 weeks; exercise daily	2 years	1	Subjective depression symptoms [BL to Yr 2]	**Reduced depression symptoms** Elimination phase: Fewer days of low mood, less episodes of crying, increase in interest in activities. Reintroduction phase: Dairy – Rapid onset (<24 hr) of low mood symptoms including feelings of sadness and increased crying Follow up phase: Maintenance of dietary change was intermittent, but consumption of dairy and gluten were associated with reduced mood while avoidance was associated with symptom improvement
							Other symptoms (subjective)	**Reduced symptoms** Elimination phase: Increased energy, mental clarity, frequency of bowel movements (once every 2 or 3 days), weight loss (-4.5kg), resolution of acne lesions Reintroduction phase: Dairy and gluten – headaches, gas, bloating,

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								abdominal discomfort Follow up phase: Maintenance of dietary change was intermittent, but consumption of dairy and gluten were associated with constipation and headaches while avoidance was associated with symptom improvement
Bishop, et al. (2015) [New Zealand, WPRO] [23]	Uncontrolled trial	Prostate cancer (males)	30 – 50 g of mixed, unsalted seeds and nuts daily; ⩾15 mL or more of extra virgin olive oil avoiding exposure of the oil to medium and high heat; reduce dairy intake to one portion daily; substitute butter and/or margarine with an olive oil-based spread; limit intake of red meat to less than 400g/wk and substitute with oily fish and white meat; avoid high temperature cooking of protein; avoid processed meats; and eat oily fish ⩾ once weekly. Light to moderate exercise was encouraged.	Exercise	Nil	20	Holman Bloodspot fatty acid profiles (mean %) [BL to 3 Mths]	**Reduced saturated fatty acids** Mean total SFA (-1.0, p=0.002) 18:0 stearic acid (-0.5, p=0.002) n6PUFA: n3PUFA (-0.6, p=0.019) AA: EPA (-1.6, p=0.030) Increased omega-3 fatty acids 22:5 n3 DHA (+0.5, p=0.01) EPA / DHA (+0.6, p=0.042) Modified WBS n3 index (+0.9, p=0.043)
							Alkaline Single-Cell Gel Electrophoresis (Comet) Assay [BL to 3 Mths]	**Reduced DNA damage** DNA damage inverse correlation with dietary adherence (p=0.013) whole blood MUFA (p=0.009) and oleic acid, high red meat (p=0.003) and dairy (p=0.008). Reduced DNA damage with adherence to diet (p=0.013), folate intake (p=0.023), vitamin C (p=0.007), legumes (p=0.004) and green tea (p=0.002). DNA damage positive correlation with intake of dairy products (p=0.043) red meat (p=0.007) and whole blood n6PUFA (p=0.015)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Erdrich, et al. (2015) [New Zealand, WPRO] [24]							Body weight (kg) [BL to 3 Mths]	**Reduced body weight** - 2.3 kg, (p=0.0007)
							BMI [BL to 3 Mths]	**Reduced BMI** -0.85kg/m2, (p<0.001) BMI was inversely correlated to blood n3PUFA (p=0.046). Reduced BMI associated with increased blood PUFA (p=0.031) and LA (p=0.040).
							Changes in the sources of dietary fat [BL to 3 Mths]	**Increased dietary fat** olive oil (+14.2, p=0.0008) nuts (+2.9, p=0.0003) fish (+1.8, p=0.0005) Reduced dairy (-2.9, p=0.0025) and red meat (-2.0, p=0.0005)
							Holman Bloodspot fatty acid profiles (mean %) [BL to 3 Mths]	**Reduced saturated fatty acids** Mean total SFA (-1.0, p=0.002) 18:0 stearic acid (-0.5, p=0.002) n6PUFA: n3PUFA (-0.6, p=0.019) AA: EPA (-1.6, p=0.030) Increased omega-3 fatty acids 22:5 n3 DHA (+0.5, p=0.01) EPA / DHA (+0.6, p=0.042) Modified WBS n3 index (+0.9, p=0.043)
							C reactive protein [BL to 3 Mth, relative to Dietary Adherence Questionnaire]	NS
							Prostate-specific antigen [BL to 3 Mth, relative to Dietary Adherence Questionnaire]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Cohen, et al. (2017) [USA, AMRO] [30]	Uncontrolled trial	Low income, racially and ethnically diverse adults	Double up food bucks (DUFB) for a state-wide health food incentive	Nil	none	177	Use of DUFB and consumption of fruit and vegetables	**Increased fruit and vegetable intake** +0.66 servings ($p<0.001$). Sustained at 3 and 5mths ($p<0.001$). Participants more likely to report use of DUFB ($p<0.001$).
Faridi, et al. (2008) [USA, AMRO] [16]	Randomized controlled trial (crossover)	Healthy adults (overweight)	Phase 1: Solid dark chocolate (74g; equiv. 22g cocoa powder) Phase 2: Sugar-free cocoa (2 cups, equiv. 22g cocoa powder and vanillin, acesulfame-potassium, and aspartame) OR sugared cocoa (2 cups, equiv. 22g cocoa powder and 45.3g sugar)	Nil	Placebo Phase 1: 74g Phase 2: hot liquid	45	Flow-mediated dilation (%) [BL to immediately post-treatment]	**Increased** Chocolate: +4.3; Placebo: -1.8 Between group: $p<0.001$ Sugar-free: +5.7; Sugared: +2.0; Placebo: -1.5 Between group (Sugar-free vs placebo): $p<0.001$ Between group (Sugared vs placebo): $p<0.001$
							Stimulus-adjusted response measure [BL to immediately post-treatment]	**Increased** Chocolate: NS Sugar-free: +0.04; Sugared: +0.02; Placebo: -0.02 Between group (Sugar-free vs placebo): $p<0.001$ Between group (Sugared vs placebo): $p<0.001$
							Systolic blood pressure (mm Hg) [BL to immediately post-treatment]	**Reduced systolic BP** Chocolate: -3.2; Placebo: +2.7 Between group: $p<0.001$ Sugar-free: -2.1; Sugared: +0.9; Placebo: +3.2 Between group (Sugar-free vs placebo): $p<0.001$ Between group (Sugared vs placebo): NS
							Diastolic blood pressure (mm Hg) [BL to immediately post-treatment]	**Reduced diastolic BP** Chocolate: -1.4; Placebo: +2.7 Between group: $p<0.001$ Sugar-free: -1.2; Sugared: +1.7; Placebo: +2.8 Between group (Sugar-free vs placebo) $p<0.001$

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Greenlee, et al. (2007) [USA, AMRO] [31]	Randomized controlled trial	Healthy premenopausal woman	Group 1: Botanical formula 100mg Curcuma longa root extract standardized to 95% curcumin; 100 mg Cynara scolymus leaf 6:1 extract; 100 mg Rosmarinarus officinalis leaf 5:1 extract; 100 mg Silybin marinum seed extract standardized to 80% silybin, silichristin, silidianin, and silymarin; 100 mg Taraxacum officinalis root 4:1 extract; and 50 mg Schisandra. chinensis berry 20:1 extract Group 2: Dietary intervention 3 servings (1/2 cup each) per day of cruciferous vegetables, garlic, onions, beets, dark leafy greens; 30 grams of fiber per day; 1 to 2 liters of water per day; 1 cup per week or less of coffee and black tea (green tea was not limited); and 1 serving per week of alcohol and two grocery bags of organically grown vegetables weekly. Eight, 1 hr workshops with a nutritionist	1 month run-in phase followed by 12 weeks intervention (5 menstrual cycles)	placebo	40 (15/10/ 15)	Anthropometric [Early and late follicular phases from Cycle 1 to 5]	**Reduced** anthropometric -0.5 vs placebo +1.6 (p=0.05)
							Estrone (pg/ML) [Early and late follicular phases from Cycle 1 to 5]	NS
							Estrone sulfate (ng/mL) [Early and late follicular phases from Cycle 1 to 5]	NS
							Total estradiol (pg/mL) [Early and late follicular phases from Cycle 1 to 5]	NS
							Free estradiol (pg/mL) [Early and late follicular phases from Cycle 1 to 5]	NS
							SHBG (nmol/L) [Early and late follicular phases from Cycle 1 to 5]	NS
							2-Hydroxyestrone (ng/mg Cr) [Early and late follicular phases from Cycle 1 to 5]	NS
							16α-Hydroxyestrone (ng/ mg Cr) [Early and late follicular phases from Cycle 1 to 5]	NS
							2α-Hydroxyestrone /16α-hydroxyestrone ratio [Early and late follicular phases from Cycle 1 to 5]	NS
							DHEA (ng/mL) [Early and late follicular phases from Cycle 1 to 5]	**Reduced levels** early follicular -0.69 (p=0.016)
							DHEAS (ug/mL) [Early and late follicular phases from Cycle 1 to 5]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Androstenedione (ng/mL) [Early and late follicular phases from Cycle 1 to 5]	NS
							Free testosterone (ng/mL) [Early and late follicular phases from Cycle 1 to 5]	NS
							Free testosterone (pg/mL) [Early and late follicular phases from Cycle 1 to 5]	NS
Greenlee, et al. (2013) [USA, AMRO] [29]	Randomized controlled trial	Breast cancer survivors (stage 0-IIIa minority groups)	Curves program for 6 months, 6 months observation (IA) (30min exercise circuit, a high vegetable/low fat/calorie- restricted diet – 1200kcal/day for 1-2 weeks; 45% protein, 30% carbohydrates, 25% fat)	90 minutes exercise per week encouraged	Wait list control arm (WCA): 6 Mth observation and 6 Mth curves program	42 (22/20)	Weight loss (kg) [BL to Mth 6 and 12]	**Reduced weight** Mth 6: IA, -3.3% ± 3.5; WC, +1.8% ± 2.9 (p=0.04) Mth 12: IA, regained some but not all of weight lost during first 6 months p=0.02
							Retainment	90.5% were retained for the full 12 months
Delgado-Cruzata, et al. (2015) [USA, AMRO] [28]	Secondary analysis of selected cohort (sub-analysis)				Nil	24	Anthropometric measures (mean change, %) [BL to Mth 6 and 12]	**Reduced weight** Mth 6: -1.9 (p=0.01), Mth 12: -2.1 (p=0.01) **Reduced waist circumference** Mth 6: -2.7 (p<0.01), Mth 12: -2.7 (p=0.01) **Reduced body fat** Mth 6: -2.4% (p=0.03), Mth 12: unavailable Hip circumference: NS Waist-to-hip ratio: NS
							Plasma insulin and HOMA-IR [BL to Mth 6 and 12]	**Reduced insulin resistance** Mth 12: Insulin, -10.6% (p<0.01) HOMA-IR, -11.4% (p<0.01)
							Adaption of Kaiser Physical Activity Survey [BL to Mth 6 and 12]	**Increased physical activity** Sports/exercise index Mth 6: +1.1 (p<0.001) Mth 12: +0.7 (p<0.001)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							DNA methylation biomarkers [BL to Mth 6 and 12]	**Increased methylation** Mth 6: +4.2%; Mth 12: +3% (p<0.0001)
							Associations between changes in anthropometric measures, metabolic markers, diet, and physical activity and changes in markers of DNA methylation [BL to Mth 6 and 12]	**Increased diet quality** Weight loss: NS 10% body fat decrease: NS 10% caloric intake: -0.48% (CI:0.10-0.86) Physical activity: NS 10% increase in fruit and vegetable and protein: +0.85% (CI: 0.12-0.70)
Greenlee, et al. (2015) [USA, AMRO] [40]	Randomized controlled trial	Breast cancer survivors (stage 0-III)	Culturally based dietary interventions for Hispanic women *"¡ Cocinar Para Su Salud!"* (nine sessions on nutrition, education, cooking classes and food shopping field trips) 24 hours total over 12 weeks	Nil	Control – written dietary recommendations	70 (34/36)	Daily targeted fruit and vegetable intake (servings) [BL to Mth 3, Mth 6]	**Increased targeted fruit and vegetable intake** Total targeted fruits and vegetables Mth 3: +2.0 vs +0.2 (p=0.004) Mth 6: +2.7 vs +0.5 (p=0.002) Vegetables Mth 3: +1.2 vs -0.2 (p=0.001) Mth 6: +1.8 vs +0.6 (p=0.02) Fruits Mth 3: NS Mth 6: +0.8 vs -0.1 (p=0.04)
							Daily total fruit and vegetable intake (servings) [BL to Mth 3, Mth 6]	**Increased fruit and vegetable intake** Total fruits and vegetables Mth 3: +1.1 vs -0.3 (p=0.05) Mth 6: +2 vs -0.1 (p=0.005) Vegetables Mth 3: +1.0 vs -0.4 (p=0.004) Mth 6: +1.8 vs +0.2 (p=0.005) Fruits NS
							Daily total caloric intake (kcal) [BL to Mth 3, Mth 6]	**Reduced calorie intake** Mth 3: -672.9 vs -92.4 (p<0.001) Mth 6: -562.9 vs -61.6 (p<0.001)
							Calories from total fat (%) [BL to Mth 3, Mth 6]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Greenlee, et al. (2016) [USA, AMRO] [41]	Follow-up						Anthropometric data [BL to 3 Mths and 6 Mths]	**Reduced waist circumference** Waist circumference Mth 3: -1.6 vs +1.7 (p=0.05); Mth 6: NS Weight, BMI, hip circumference and waist hip ratio (NS)
							Daily targeted fruit and vegetable intake daily (servings) [BL to 12 Mths]	**Maintained increased targeted fruit and vegetable intake** Fruit: +2.3 vs.- 0.1 (p<0.01) Vegetables: 1.6 vs 0.1 (p<0.01)
							Daily total fruit and vegetable intake (servings) [BL to 12 Mths]	**Maintained increase total fruit and vegetable intake** Fruit: +2.0 vs.- 0.4 (p<0.01) Vegetables: 1.6 vs -0.2 (p<0.01)
							Fruit intake (subcategories) [BL to Mth 12]	**Reduced fruit juice intake** Fruit juice excluding citrus: -0.1 vs +0.3 (p=0.05) **Increased citrus fruit intake** Citrus fruit: -0.1 vs -0.2 (p=0.01) Fruit, excluding citrus; Avocado and similar; Fried fruits NS
							Vegetable intake (subcategories) [BL to Mth 12]	**Increased dark green vegetables** Dark green +0.5 vs -0.1 (p<0.01) Deep yellow; Tomato; White potatoes; Other starchy vegetables; Legumes and Other vegetables NS
							Daily total caloric intake (kcal) [BL to 12 Mths]	NS
							Calories from total fat (%) [BL to 12 Mths]	NS
							Inflammatory markers [BL to 12 Mths]	NS
							Anthropometric data [BL to 12 Mths]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Feathers, et al. (2015) [USA, AMRO] [43]	Secondary analysis						Association between access to produce and enrolment in program and consumption of produce	Non-significant trend between higher produce access and increased enrolment and produce (fruit/vegetable) consumption
Crookes, et al. (2016) [USA, AMRO] [44]	Secondary analysis						Social and family networks influence on diet	Participants more likely to share food- related activities rather than exercise with close networks. Spouses and children provide greater support for healthy eating than friends. Despite this support, family was a barrier to eating healthy for almost half of participants.
Shi, et al. (2018) [USA, AMRO] [45]	Secondary analysis						Analysis of covariance assessing intervention effects on psychosocial mediators [BL to Mth 6 and 12]	**Increased impact of intervention on mediators of behavioral change** 6 months: Stages of change: +0.9 ($p<0.001$) Self-efficacy: +0.6 ($p=0.009$) Snack preference: +0.2 ($p=0.045$) 12 months: Stages of change: +0.9 ($p<0.001$) Self-efficacy: +0.4 ($p=0.002$) Snack preference: +0.4 ($p=0.002$) Chance locus of control: -2.6 ($p=0.02$) Healthy food beliefs: NS Difficulty finding produce: NS Difficulty eating produce as snacks: NS Family opinions: NS Cancer worry: NS FACT-B: NS HADS: NS **Increased impact of intervention on mediators of produce intake**

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								6 month mediators on 12 month outcome Total effect: 2.2 ($p<0.001$) Direct effect: 2.2 ($p=0.002$) Indirect effect: NS 12 month mediators on 12 month outcome Total effect: 2.1 ($p<0.001$) Direct effect: 1.9 ($p=0.008$) Indirect effect: NS
Kennedy, et al (2014) [Canada, AMRO] [39]	Uncontrolled trial	Irritable bowel syndrome	Elimination/reintroduction diet based on the results of non-IgE mediated food allergy test; 4 weeks elimination, 5 x bi-weekly reviews	Nil	Nil	4	Non-IgE food allergy tests [BL to Wk 4]	NS
							Symptoms [BL to Wk 4]	NS
							IBS Symptom Severity Scale [BL to Wk 4]	NS
McDougall, et al. (2014) [USA, AMRO] [25]	Retrospective cohort	Mixed population (high cholesterol, hypertension, overweight)	10 days: Dietary counselling; low fat (<10% calories), minimally refined plant food diet; ad libitum to satiety; residential program	Nil	Nil	1615	Weight (kg) [BL to Dy 10]	**Reduced body weight** -1.4 ($p<0.001$)
							Total cholesterol (mg/dL) [BL to Dy 10]	**Reduced total cholesterol** -22 ($p<0.001$)
							Systolic and diastolic blood pressure (mm Hg) [BL to Dy 10]	**Reduced blood pressure** Systolic: -8 ($p<0.001$) Diastolic: -4 ($p<0.001$)
							Blood glucose (mg/dL) [BL to Dy 10]	**Reduced blood glucose** - 3 ($p<0.001$)
							Blood urea nitrogen (mg/dL) [BL to Dy 10]	**Reduced urea** -3 ($p<0.001$)
							Creatinine (mg/dL) [BL to Dy 10]	NS
							10-year risk of a cardiovascular event (%) [BL to Dy 10]	**Reduced cardiovascular risk** -1.0 ($p<0.001$)
Nagashree, et al. (2017) [India, SEARO] [17]	Randomized controlled trial	Healthy volunteers	90 days: Standardized diet based on yogic principles of food blended with modern medical nutrition plus fresh coconut (100g)	Nil	Standardised diet plus groundnuts (45g) and groundnut oil (22g)	58 (27/31)	Triglycerides (mg/dL) [BL to Dy 90]	NS
							Low density lipoprotein (LDL) cholesterol (mg/dL) [BL to Dy 90]	**Increased LDL cholesterol** Coconut: +12.06 ($p<0.001$) Groundnut: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							High density lipoprotein (HDL) cholesterol (mg/dL) [BL to Dy 90]	**Increased HDL cholesterol** Coconut: +3.84 (p<0.01) Groundnut: -2.42 (p<0.001)
							Total cholesterol (mg/dL) [BL to Dy 90]	Coconut: NS Groundnut: -10.65 (p<0.01)
							Triglyceride-HDL ratio [BL to Dy 90]	NS
							Apolipoprotein A/ Apolipoprotein B ratio [BL to Dy 90]	NS
							Body weight (kg) [BL to Dy 90]	**Reduced body weight** Coconut: Reduced (p=0.04) Groundnut: NS
Nagasukeerthi, et al. (2017) [India, SEARO] [18]	Randomized controlled trial	Type II diabetes mellitus	Bell pepper *(Capsicum annuum var. grossum)* juice	Integrated approach of yoga therapy (IAYT)	Integrated approach of yoga therapy only	50 (25/25)	Fasting blood glucose [BL to Day 4]	NS
							Postprandial blood glucose (mg/dL) [BL to Day 4]	**Reduced postprandial glucose** IAYT+Juice: -68.3 (NS) IAYT only: -42.7 (NS) Between group: p<0.001
							Weight [BL to Day 4]	NS
							BMI [BL to Day 4]	NS
							Systolic blood pressure (mmHg) [BL to Day 4]	**Reduced systolic blood pressure** IAYT+Juice: -14.5 (p<0.05) IAYT only: -6.8 (p<0.05) Between group: p=0.002
							Diastolic blood pressure (mmHg) [BL to Day 4]	NS
							Pulse rate [BL to Day 4]	NS
							Mean arterial pressure [BL to Day 4]	NS
							Pulse pressure (mmHg) [BL to Day 4]	**Reduced pulse pressure** IAYT+Juice: -9.7 (p<0.05) IAYT only: +0.48 (NS) Between group: p=0.003

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Rate pressure product [BL to Day 4]	**Reduced rate pressure product** IAYT+Juice: -19.7 ($p<0.05$) IAYT only: -8.7 ($p<0.05$) Between group: $p=0.001$
							Double product [BL to Day 4]	**Reduced double product** IAYT+Juice: -12.6 ($p<0.05$) IAYT only: -7.9 ($p<0.05$) Between group: $p=0.03$
Neuendorf, et al. (2019) [USA, AMRO] [36]	Randomized controlled trial	Overweight/ obese (adults)	Elimination of foods in response to IgG test result	Nil	Waitlist	30 (20/10)	Serum IgG titres [BL to Mth 3]	NS
Oates, et al. (2014) [Australia, WPRO] [22]	Randomized controlled trial (crossover)	Healthy adults	7 days: Diet containing at least 80% organic foods	Nil	Washout crossover	13	Urinary total dialkylphosphate metabolites [Day 8]	**Reduced levels** Organic: 0.032; Conventional: 0.294 Between group: -0.262 ($p=0.013$)
							Urinary dimethylphosphate metabolites [Day 8]	**Reduced levels** Organic: 0.011; Conventional: 0.252 Between group: -0.241 ($p=0.005$)
							Urinary diethylphosphate metabolites [Day 8]	NS
Oberg, et al. (2011) [USA, AMRO] [34]	Uncontrolled trial (pilot)	Type II diabetes mellitus (adults)	Nutrition program delivered as a combination of one-on-one naturopathic physician-delivered dietary counselling and bi-weekly educational sessions for the entire cohort conducted following potluck-style dinners.	Nil	Nil	12	Hemoglobin Alc (%) [BL to Wk 12]	**Reduced HbA1C** -0.4%, $p=0.02$
							Serum lipid profile [BL to Wk 12]	NS
							Blood pressure [BL to Wk 12]	NS
							Body Mass Index [BL to Wk 12]	NS
							Three-day diary [BL to Week 12]	**Increased diet quality** Adherence to healthy eating increased ($p=0.05$)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Summary of Diabetes Self-Care Activities [BL to Wk 12]	**Increased self-care behaviors** Healthy eating pattern (days in last week): +1.8 (p=0.05) Healthy eating pattern (days per week in last month): +1.2 (p=0.02) >5 fruits/vegetables per day (days in last week): +1.3 (p=0.01) Physical activity (days in last week): +3.4 (p=0.02) Blood glucose checking (% of time): +38% (p=0.05) Checked blood sugar as recommended (days in last week): +3.0 (p=0.04)
							Problem Areas in Diabetes [BL to Wk 12]	**Reduced problem areas** Feeling scared about living with diabetes: -1.8 (p=0.006) Feeling overwhelmed by diabetes: -1.9 (p=0.03) Feeling discouraged about diabetes treatment plan: NS Composite score: -18.9% (p=0.05)
							Perceptions about Nutritional counseling [BL to Wk 12]	**Reduced confidence** Average daily carbohydrate intake: NS Attention to type of dietary fat consumed: From 'Seldom' to 'Often' (p=0.04) Know how to follow dietary guidelines: From 'Definitely no' to 'Yes' (p=0.02) Feel in control of my diabetes: From 'Definitely no' to 'Yes' (p=0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							Seven Eating Styles Questionnaire [BL to Wk 12]	**Reduced eating behaviors** Emotional eating: -0.7 (p=0.02) Food fretting: NS Selecting fast food/fresh food: -0.8 (p=0.05) Attention to sensory/spiritual dimensions of food: -1.2 (p<0.01) Task snacking: NS Attention to dining atmosphere: -0.6 (p=0.01) Attention to positive social settings: NS Integrated eating score: -3.7 (p=0.03)
Schumann, et al. (2018) [Germany, EURO] [21]	Randomized controlled trial	Irritable bowel syndrome	Low FODMAP diet (4 sessions of nutritional counselling including an educational group lecture, 2 individual counselling and 1 group counselling sessions; low-FODMAP recipes, lists of foods to avoid) for 12 weeks followed by reintroduction challenge of each food group	Nil	Yoga (75 minutes, 2x/week)	59 (29/30)	IBS Symptom Severity Scale – Total [BL to Wk 12, 24]	**Decreased abdominal distension from low FODMAP diet** *Wk 12* – Total Score: FODMAP, -96.18 (p<0.001); Yoga: -66.16 (p<0.001); Between group: NS Abdominal distension: FODMAP: -29.96, p<0.001; Yoga, NS; Between group: -14.13 (p<0.04) Duration of pain: NS Severity of pain: NS Bowel satisfaction: NS Interference with life: NS *Wk 24* – NS
							IBS Quality of Life – Dysphoria [BL to Wk 12, 24]	**Decreased food avoidance in low FODMAP diet group** *Wk 12* – Food avoidance: FODMAP, NS; Yoga, NS; Between group, -17.1 (p=0.005) Dysphoria: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								Interference with activity: NS Body image: NS Health worries: NS Social reaction: NS Sexual: NS Relationships: NS Overall: NS *Wk 24* – NS
							Perceived Stress Questionnaire [BL to Wk 12]	NS
							Cohen Perceived Stress Scale [BL to Wk 12]	NS
							Hospital Anxiety and Depression Scale [BL to Wk 12]	**Reduced anxiety in yoga group** Anxiety: Wk 12, -1.35 (p=0.03) Wk 24, NS Depression: Wk 12, NS Wk 24, NS
							Short Form-36 [BL to Wk 12]	NS
							Body Responsiveness Scale [BL to Wk 12]	NS
							Body awareness questionnaire [BL to Wk 12]	**Increased body awareness in yoga group** Wk 12: NS Wk 24: +7.6 (p=0.02)
Selvakumar, et al. (2017) [India, SEARO] [19]	Randomized controlled trial (pilot)	Type II diabetes mellitus (Adults)	Group 1: 250 ml bittergourd juice (30% concentrate) Group 2: 250 ml Knol-khol (80% concentrate) Group 3: 250 ml ashgourd juice (88% concentrate)	Nil	Nil	30 (Bittergourd: n=10, Ashgourd: n=10, Knol-khol: n=10)	Fasting plasma glucose [BL to 30 min, 60 min, 90 min and 120 min]	**Reduced plasma glucose** Bittergourd: NS Knol-khol: Reduced at 30, 90 and 120 min time points with effect seen over time (p=0.029, F=4.739). Ashgourd: NS
Sowmya (2018) [India, SEARO] [20]	Randomized controlled trial	Obesity	Group 1: Lemon juice with lemon seeds Group 2: Lemon juice only	Nil	7 days	30 (15/15)	C-Reactive Protein (mg/dL) [BL to Dy 7]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Body mass index (kg/m^2) [BL to Dy 7]	**Reduced BMI** Lemon seeds: -2.0 Lemon juice only: -1.4 Between group: p=0.0001
							Weight (kg) [BL to Dy 7]	**Reduced body weight** Lemon seeds: -4.9 Lemon juice only: -3.3 Between group: p=0.0001
							Waist circumference (cm) [BL to Dy 7]	**Reduced waist circumference** Lemon seeds: -11.3 Lemon juice only: -3.4 Between group: p=0.004
							Hip circumference (cm) [BL to Dy 7]	**Reduced hip circumference** Lemon seeds: -3.53 Lemon juice only: -2.9 Between group: p=0.004
							Waist-hip ratio [BL to Dy 7]	NS
Telles, et al. (2009) [India, SEARO] [26]	Uncontrolled trial	Obesity	Low fat, high fiber, vegetarian diet	Yoga practice (5 hours daily)	Nil	47	Body mass index (kg/m^2) [BL to Dy 6]	**Reduced BMI** -0.57 ($p<0.01$)
							Waist circumference (cm) [BL to Dy 6]	**Reduced waist circumference** -1.72 ($p<0.01$)
							Hip circumference (cm) [BL to Dy 6]	**Reduced hip circumference** -1.69 ($p<0.01$)
							High density lipoprotein (HDL) cholesterol (mg/dl) [BL to Dy 6]	**Reduced HDL cholesterol** -2.88 ($p<0.01$)
							Fasting serum leptin (ng/ml) [BL to Dy 6]	**Reduced leptin levels** -23.75 ($p<0.01$)
							Total cholesterol (mg/dl) [BL to Dy 6]	NS
							Low-density lipoprotein (LDL) cholesterol (mg/dl) [BL to Dy 6]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Serum triglycerides (mg/dl) [BL to Dy 6]	NS
							Hand grip strength (kg) [BL to Dy 6]	**Increased hand grip strength** Right: +2.09 ($p<0.001$) Left: +2.00 ($p<0.01$)
							Postural stability (sec) [BL to Dy 6]	**Increased postural stability** At 20 sec: +11.03 ($p<0.001$) At 40 sec: +24.41 ($p<0.001$) At 60 sec: +33.91 ($p<0.001$)
Tippens, et al. (2019) [USA, AMRO] [42]	Uncontrolled trial	Prediabetes (adults)	Naturopathic whole food nutrition education (12 weekly workshops)	Nil	Nil	45	High sensitivity c-reactive protein (mg/L) [BL to Wk 12, Mth 6, Mth 12]	**Reduced levels** Wk 12: -0.7 ($p<0.05$) Mth 6: -0.2 ($p<0.05$) Mth 12: -0.6 ($p<0.05$)
							Hemoglobin Alc (%) [BL to Wk 12, Mth 6, Mth 12]	**Reduced HbA1C** Wk 12: -0.0 (NS) Mth 6: -0.4 ($p<0.001$) Mth 12: -0.3 ($p<0.001$)
							Total cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced total cholesterol** Wk 12: -7.6 (NS) Mth 6: -26.2 ($p<0.001$) Mth 12: -30.3 ($p<0.001$)
							High-density lipoprotein (HDL) – cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced HDL cholesterol** Wk 12: -1.0 (NS) Mth 6: -11.4 ($p<0.001$) Mth 12: +6.2 ($p<0.01$)
							Low-density lipoprotein (LDL) – cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced LDL cholesterol** Wk 12: -5.4 (NS) Mth 6: -6.0 (NS) Mth 12: -27.3 ($p<0.001$)
							Very-low-density lipoprotein (VLDL) – cholesterol (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced VLDL cholesterol** Wk 12: +0.1 (NS) Mth 6: -8.8 ($p<0.001$) Mth 12: -8.5 ($p<0.01$)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Triglycerides (mg/dL) [BL to Wk 12, Mth 6, Mth 12]	**Reduced triglycerides** Wk 12: +2.0 (NS); Mth 6: -38.7 (p<0.001) Mth 12: -37.6 (p<0.01)
							Fasting plasma insulin (uIU/mL) [BL to Wk 12, Mth 6, Mth 12]	**Increased insulin levels** Wk 12: +0.8 (NS) Mth 6: -3.9 (p<0.001) Mth 12: +4.9 (p<0.001)
							Fasting plasma glucose (mg/dl) [BL to Wk 12, Mth 6, Mth 12]	**Reduced fasting glucose levels** Wk 12: -6 (p<0.01) Mth 6: -11.5 (p<0.001) Mth 12: -13.9 (p<0.001)
							Healthy dietary behavior (food frequency questionnaire) [BL to Wk 12, Mth 6, Mth 12]	**Increased healthy diet** Processed and refined grains: reduced (p<0.001) More healthy oils: increased (p<0.05) Less healthy oils: reduced (p=0.02) Vegetables: NS Fruits: NS Grains: Wk 12, -0.7 (p<0.01); Mth 6, -0.8 (p<0.01); Mth 12, -0.4 (NS) Meat: Wk 12, -0.2 (NS); Mth 6, -0.5 (p<0.01); Mth 12, -0.1 (NS) Dairy: Wk 12, -0.4 (p<0.05); Mth 6, -0.5 (p<0.01); Mth 12, -0.3 (p<0.01) Fat: Wk 12, -0.3 (p<0.01); Mth 6, -0.4 (p<0.01); Mth 12, -0.4 (p<0.01)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Virdee, et al. (2015) [USA, AMRO] [37]	Case report	Asthma	90 day elimination diet informed by individualized results of enzyme-linked immunosorbent assay (ELISA) for IgG antibody assessment. Trial period of complete avoidance of potential allergens while monitoring for symptom changes	Nil	Nil	2	Medication use [BL to Dy 21, 49 and 91]	**Reduced medication use** Patient A Fluticasone-salmeterol: twice daily vs none Albuterol: twice daily vs occasional use in cold weather Patient B: Montelukast sodium: At bedtime vs none Fluticasone-salmeterol: Twice a day (Wk 19) vs occasionally Albuterol: Every night vs at least every night Cetirizine hydrochloride: daily vs none
							Asthma attack frequency	**Reduced asthma frequency** Patient B: 2-3 attacks per week vs one in first 21 days of treatment and then none at Day 91
							Pulse Oxygen	**Reduced levels** Patient B: 86-95% vs 96%
							Physical exam	**Reduced wheezing** Patient B: audible wheezing vs clear lungs from 21 days
							Subjective asthma symptom severity	**Reduced** Patient A: 9/10 vs 0/10
Zick, et al. (2017) [USA, AMRO] [32]	Randomized controlled trial	Breast cancer survivors (stage 0 to III)	3 months: 'Fatigue reduction diet' (FRD) antioxidant-rich diet; rich in fruit/veg, whole grains, omega-3 fatty acids (with individualized counselling)	Nil	Control (general health curriculum with individualized counselling matched for time)	30 (15/15)	Brief fatigue Inventory (%) [BL to Mth 3]	**Reduced fatigue** -2.4 vs -0.77, ($p<0.01$)
							Pittsburgh Sleep Quality Index [BL to Mth 3]	**Increased sleep** -2.5 vs +0.9, ($p=0.03$)
							Serum fatty acids (%) [BL to Mth 3]	**Improved fatty acid profile** Reduced saturated fatty acid ($p=0.04$); Increased omega-3 ($p<0.01$), 3:6 omega ($p=0.02$)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Serum nutrient concentrations [BL to Mth 3]	**Increased carotenoid levels** Increase in FRD for total carotenoids ($p<0.01$), β-cryptoxanthin ($p=0.02$), lutein ($p=0.05$), zeaxanthin ($p=0.01$), lycopene ($p=0.05$). Control: increase γ-tocopherol ($p=0.03$)

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31 Clinical Nutrition

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HIGHLIGHTS

- Clinical nutrition is the use of nutritional and food-based products for therapeutic purposes including vitamins and minerals, amino acids, fish oils, probiotics, and others.
- Naturopaths/NDs are trained in and incorporate various clinical nutritional products into practice.
- Nutritional products can include single ingredients and/or multiple ingredients combined for a desired therapeutic effect.
- Clinical research by the naturopathic community has examined the use of essential fatty acids, multivitamins and/or mineral formulas, single vitamins, minerals, non-essential nutrients, medicinal food, and nutraceutical interventions.
- In line with the role of primary care, naturopathic researchers have investigated the effects of clinical nutrition on individuals with mental health conditions, complex immune conditions, neurological conditions, cancer, gastrointestinal conditions, and other conditions.

Naturopaths and naturopathic doctors commonly use nutritional interventions to support their patients [1], in part due to the fundamental importance of nutrition to the health and function of the body and in alignment with the naturopathic principle, *Treat the Cause*. Interventions involving nutrition include applied nutrition, which focuses on dietary assessment and recommendations and food as medicine (expanded upon in Chapter 30), and clinical nutrition [1, 2]. Clinical nutrition includes the use of therapeutic products (e.g., tablets, powders and liquids) of vitamins, minerals and food-based extracts with health-promoting, disease-preventing or medicinal properties for targeted clinical outcomes [2].

The naturopathic workforce employs clinical nutrition interventions to address identified nutritional insufficiencies (both confirmed and potential), or to initiate biochemical or physiological changes in response to a patient's specific health conditions or complaints [3]. The nutritional products used in this latter application of clinical nutrition can be referred to as 'nutraceuticals.' In addition to essential vitamins and minerals, nutraceuticals include nutrients that have physiological effects such as amino acids and other amino-based compounds (e.g. n-acetyl cysteine, glutathione, acetyl-l-carnitine, s-adenosyl methionine), food-based constituents (e.g. lycopene, lipoic acid, bromelain, quercetin, indole-3-carbinol), and other compounds that are important to foundational human biochemistry and physiology (e.g. essential fatty acids and fish oils, coenzyme Q10, probiotics, digestive enzymes).

The naturopathic workforce is trained to be discerning when prescribing nutritional supplements to patients. For example, they may prefer a partially metabolised or 'active' form of a vitamin if there are clinical concerns about a patient's ability to absorb or metabolize the more usual form (e.g., prescribing fulminic acid or methyltetrahydrofolate in place of folic acid). Similarly, a naturopath/naturopathic doctor may recommend different forms of a nutraceutical depending on a patient's needs (e.g., choosing zinc picolinate as a supplemental form of zinc instead of the more common zinc gluconate) and preferences (e.g., liquid instead of tablets/capsules; vegetarian instead of gelatine capsules). A naturopath's/naturopathic doctor's decision to employ nutraceutical interventions with any given patient will be determined with consideration of the patient's health status and the Naturopathic Therapeutic Order. Clinical nutrition can be used through a general approach to increasing levels of a wide range of vitamins and minerals (e.g., multivitamins); the application of specialized formulas developed for explicit health purposes and effects; or the use of single nutrients targeting specific patient needs. Naturopaths/naturopathic doctors may recommend or prescribe commercially-produced nutritional products,

or extemporaneously dispense compounded nutritional ingredients formulated by the naturopath/naturopathic doctor specifically for the individual patient [3, 4].

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=58; published in 59 papers) naturopathic researchers undertook to examine the effectiveness of clinical nutrition. This research includes a total of 6,734 participants and was conducted in the United States (USA) (n=31), Canada (n=6), and Australia (n=22). The study designs include randomized controlled trials (RCT) (n=42), non-randomized controlled trials (n=1), uncontrolled trials (n=7) cohort studies (n=4), case reports (n=3), follow-up of a RCT (n=1) and one secondary analysis (n=1). The clinician nutrition interventions studied included single nutrients (n=28) and multi-nutrient combinations (n=25). In some studies (n=9) nutrients were combined with herbal medicines, while in others (n=10) different forms, doses or administration methods of the same nutrient were examined. Most interventions employed oral supplements, but studies also used intranasal (n=3), intravenous (n=2), and intramuscular (n=1) administration.

The populations treated with clinical nutrition included healthy adults (n=13), mental health conditions (n=9), complex immune conditions (n=8), neurological conditions (n=7), cancer (n=6), gastrointestinal conditions (n=4), and other conditions (n=8). Of all the naturopathic clinical studies employing clinical nutrition interventions, 62.5% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 31.1 Clinical research investigating clinical nutrition interventions conducted by naturopathic researchers*. The body of naturopathic research on clinical nutrition is also supported by more than 50 observational studies and greater than 90 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

Naturopathic researchers have undertaken clinical research investigating clinical nutrition for a range of conditions, and for diverse nutritional interventions. Importantly, the clinical research undertaken by naturopathic researchers not only examines the effectiveness of single nutrients for specific populations, but also combinations of vitamins, minerals, non-essential nutrients, and other medicinal foods. Furthermore, the research examining clinical nutrition extends beyond efficacy compared with placebo to consider the clinical effect of different doses and forms of the same nutrient, and the safety of nutritional interventions in healthy populations. A similar topic focus is seen in other peer-reviewed publications authored by naturopaths/naturopathic researchers which consider the biochemistry and pharmacology [5-7], safety [8-11], and therapeutic benefits [7, 12-19] of a range of nutraceuticals for diverse health conditions. This broader research gaze highlights the degree to which naturopathic researchers seek to better understand their treatment options to ensure the safety and the best possible outcome for their patients.

With research suggesting that patients are more likely to disclose and discuss their nutritional product use with a naturopathic practitioner than other providers [20], and suggesting that naturopaths and naturopathic doctors are more knowledgeable about clinically significant interactions than other health professions such as conventional physicians and pharmacists [21], naturopaths/naturopathic doctors may be able to play a significant role in facilitating the safe and effective use of complementary medicine products such as nutritional products. Given the wide use of nutritional products in the community, both through self-prescription and under the guidance of different health professionals, insights from these studies have a wider benefit and significance to public health.

Studies investigating specific interventions:

Essential Fatty Acids

Fifteen studies published across 16 papers included omega-3 essential fatty acid products as at least one component of the clinical intervention [22-37]. The omega-3 fatty acids were most commonly derived from fish oil (n=12) [22, 23, 26, 27, 29, 31-37], although green-lipped mussel (n=3) [24, 25, 28], and algal sources (n=1) [30] were also reported. In ten of the included studies the omega-3 product was used in isolation in at least one arm of the study [23-26, 28-30, 34, 36, 37], while the remaining studies combined omega-3 with at least one other nutrient (e.g. vitamin E [22], lipoic acid [35]) or combined with other nutrients [31-33]. The conditions treated in the studies included multiple sclerosis [33, 34, 36], Alzheimer's disease [30, 35], knee osteoarthritis [24, 25], chronic work stress [23], breast cancer [26], ADHD [28], cardiovascular disease [29], acne vulgaris [31], and major depressive disorder [32]. One study also sampled a healthy adult population [22]. Although most studies used an omega-3 product in isolation, the specific doses, forms and health conditions varied substantially.

A randomized controlled trial conducted in Australia examined the clinical effect of a proprietary omega-3 anti-inflammatory extract of New Zealand green-lipped mussel (PCOS-524©) on symptoms of attention-deficit hyperactivity disorder (ADHD) among children (6 to 14 years old) (n=144). The interventional group was found to have improved mental performance (target memory

p=0.05; non-target memory p=0.02; picture recognition accuracy p=0.02) and significant improvements in six of fifteen symptoms in parent-reported outcome measures of the Computerized Mental Performance Assessment System [28]. An uncontrolled trial conducted in USA used a fish oil concentrate (9600mg containing 2.9g EPA and 1.9g DHA) in adults with relapsing-remitting multiple sclerosis (n=10) reported a 58% reduction in immune cell secretion of MMP-9 after 3 months (p<0.01) [34]. A further uncontrolled trial provided participants (n=26) with one of two different doses of DHA (260mg [n=21] or 520mg [n=5]) in adults with major depression disorder who were non-responsive to medication or psychotherapy [37]. This study reported 54% of participants had a ⩾50% reduction in Hamilton Depression Rating Scale (HAM-D) scores after the 8-week intervention (average reduction -10.33 points, p<0.001), and 45% were classified as 'in remission' (HAM-D⩽7). Also reported was a reduction in symptoms on the Clinical Global Impression Severity Scale (-1.28 points, p<0.05).

An uncontrolled trial conducted in Australia examined 3000mg of green-lipped mussel extract as a source of omega-3 fatty acids for the treatment of knee osteoarthritis [24]. The extract was provided twice daily (3 x 500mg BD) for 8 weeks. By the end of week 8, participants' scores for two separate instruments measuring arthritis symptoms had reduced (Lesquesne Index -4.03, p<0.001; Western Ontario McMaster Universities Arthritis Index -18.83, p<0.001), with one third of participants (7/21) not using rescue analgesic medication over the course of the study. The study also found participants had reduced gastrointestinal symptoms at week 8 (Gastrointestinal Symptom Rating Score -3.96, p=0.005).

Multivitamin and/or Mineral Formulas

Combination multivitamin and mineral formulas were examined in fifteen studies published in 16 papers [31-33, 38-50]. The studies focused either on healthy populations of adults (n=3) [45-47] and children (n=1) [50] or in populations with specific health conditions (n=11) (e.g. acne vulgaris (n=1) [31], chronic fatigue syndrome (n=1) [44], fibromyalgia (n=1) [38], AIDS/HIV (n=1) [39], cancer (n=3) [40, 42, 49], multiple sclerosis (n=1) [33], stress (n=1) [41], kidney disease (n=1) [43], major depressive disorder (n=1) [32]). The formulas used in populations with diagnosed health conditions included between 3 to 18 different micronutrients (median=8) as vitamins [32, 33, 38-44, 49, 50], essential minerals [31-33, 38, 39, 41-44, 50] and non-essential nutrients [31-33, 40, 44, 48].

A randomized controlled trial conducted in Australia sampled a healthy population for a 16-week placebo-controlled design to examine the effects of a multivitamin formula for either men or women on energy and mood in adults (n=116) [47]. The commercially available study product used a mix of essential vitamins, minerals and some herbal medicines in two combinations varied for either male or females. At the end of the intervention period, participants in the multivitamin arm reported a greater increase in energy and alertness (MV: 29.1% vs placebo: 11.9%; p=0.022) and improved mood (MV: 23.6% vs placebo: 8.5%; p=0.027) compared to the placebo group. A randomized controlled trial undertaken in the USA examined the effects of a multivitamin formula on behaviour in healthy children aged between 6 and 12 years (n=468) [50]. The study product contained 50% of the United States recommended daily allowance for vitamins and minerals and was administered over 4 months. At the end of the intervention period, participants in the multivitamin arm had a lower cumulative rate of rule violations per person compared to those receiving the placebo (MV: 1.0 vs placebo: 1.875; p=0.014)

A randomized controlled trial conducted in Australia which involved adults (n=71) who were newly diagnosed with cancer and had been prescribed one of three chemotherapeutic drug classes (taxanes, oxaliplatin, vincristine) employed a multi-nutrient B vitamin formula, compared to placebo [49]. The B complex provided a daily intake of thiamine (100mg), riboflavin (200mg), pantothenic acid (327mg), pyridoxine (60mg), folate (1000mcg), cyanocobalamin (1000mcg), biotin (1000mcg), choline (200mg), and inositol (1000mcg). The study measured several outcomes and although the primary outcome measure (Total Neuropathy Score) was non-significant, participants taking the B vitamin intervention reported improved sensory symptoms of peripheral neuropathy after 2 weeks (p=0.03) and extending to 24 (p=0.005) and 36 weeks (p=0.02) while no difference was reported in the placebo group.

An uncontrolled trial conducted in Australia involved 10 individuals with chronic fatigue syndrome (CFS) who were given a multi-nutrient formula designed to specifically address the pathology and symptomatology of CFS [44]. The formula contained 18 nutrients: ubiquinone (coenzyme Q10) – 200mg, alpha lipoic acid – 150mg, n-acetylcysteine – 2000mg, acetyl-l-carnitine – 1000mg, magnesium – 64mg, calcium ascorbate (vitamin C) – 242mg, cholecalciferol (vitamin D3) – 250IU, alpha-tocopherol (vitamin E) – 60IU, retinyl palmitate (vitamin A) – 3000IU, biotin – 600mcg, thiamine (vitamin B1) – 100mg, riboflavin (vitamin B2) – 100mg, nicotinamide (vitamin B3) – 200mg, calcium pantethonate (vitamin B5) – 100mg, pyridoxine hydrochloride (vitamin B6), folic acid – 800mg, and cyanocobalamin (vitamin B12) – 800mcg. Participants reported significant improvement in scores for the Chalder Fatigue Scales across 16 weeks (-9.4; p<0.001), as well as reduced insomnia (Insomnia Severity Index: -3.65; p=0.017) and improvement in overall symptoms (Clinical Global Impression Scale: -0.92; p=0.014).

Single Vitamins, Minerals and Non-essential Nutrients

Sixteen studies published in 17 papers investigated individual nutrients with direct or indirect antioxidant activity in the human body: glutathione (n=3) [51-53]; niacin (n=2) [54, 55]; folate (n=1) [56]; s-adenosyl methionine (SAMe) (n=1) [57]; chromium (n=2) [58, 59]; zinc (n=2) [60, 61], vitamin D (n=1) [62]; N-acetyl cysteine (n=1) [63]; lipoic acid (n=1) [64]; acetyl-l-carnitine (n=2) [65, 66] and one study investigating a variety of single nutrient antioxidants (vitamin C, vitamin E, selenium, zinc, carotenoids, betacarotene and lycopene) (n=1) [67]. The studies included populations diagnosed with Parkinson's disease (n=3) [52, 53, 68], major depressive disorder (n=1) [57], autism spectrum disorder (n=2) [69, 70], obsessive-compulsive disorder (n=1) [57], multiple sclerosis (n=1) [64], metabolic syndrome (n=1) [58], overweight (n=1) [59], cancer (n=2) [65, 67], dyspepsia (n=1) [55], and respiratory conditions (n=1) [51]. Six studies also involved healthy participants, children (n=1) [61] and adults (n=5) [54, 56, 60, 62, 71].

A randomized controlled trial conducted in the USA compared three different doses of lipoic acid with placebo in individuals with multiple sclerosis (n=37) [64]. Participants in the active arms were administered 600mg of lipoic acid twice per day, 1200mg once per day, or 1200mg twice per day. The researchers examined the impact of the different doses on serum lipoic acid levels as well as markers of disease progression. The study found a statistically significant increase in serum lipoic acid levels with increased dose ($p<0.05$). It also found a dose response relationship between lipoic acid and serum levels of both matrix metalloproteinase-9 (MMP-9): every lug/mL increase in serum lipoic acid correlated with 11.10 units of serum MMP-9 ($p=0.04$). A similar dose response relationship was found between serum lipoic acid and serum intercellular adhesion molecule-1 (ICAM-1) ($p=0.03$).

A randomized controlled trial undertaken in Australia compared 1600mg of SAMe per day with escitalopram (10mg/day) or placebo, for the treatment of adults with major depressive disorder (n=144) [57]. Participants in the SAMe arm had a similar reduction in depression symptoms, measured by the Hamilton Depression Score, as participants in the escitalopram arm (SAMe: -7.31; escitalopram: -6.69) and a significantly greater reduction in scores compared to placebo (-4.00; $p=0.018$). There was also a greater proportion of participants with a >50% reduction in their Hamilton Depression Score – considered a clinically significant reduction – in the SAMe arm compared to placebo (SAMe: 45%; placebo: 26%; $p=0.003$).

Two studies sampled healthy populations to investigated differences in zinc forms and dosages on markers of zinc sufficiency [60, 61]. A randomized controlled trial conducted in USA examined the effect of 50mg of elemental zinc per day as zinc picolinate, zinc citrate, zinc gluconate, or placebo over four weeks [60]. Each participant (n=15) crossed between each study arm throughout the total study period of 16 weeks (four weeks per arm). The researchers measured zinc levels in hair, urine, red blood cells and serum at the end of each four weeks. Significant increases in zinc levels were found in the zinc picolinate arm for hair (+7.8; $p<0.005$), urine (+0.26, $p<0.005$) and red blood cells (+1.82, $p<0.005$) but not serum. No other forms of zinc had an increase in any zinc levels. A randomized controlled trial from Canada involving healthy children (n=39) examined zinc gluconate providing 5mg, 10mg or 15mg of elemental zinc, or placebo, for 4 months [61]. The study found no change in zinc-based enzyme activity or other zinc and copper markers except for increase urine zinc/creatinine ratios at the end of the study period with highest levels for the 10mg group (5mg: +4mg; 10mg: +12mg; 15mg: -2mg; $p=0.02$). Participants in the zinc arms also had a greater gain in body weight gain ($p=0.03$) and weight-for-age ($p=0.02$) compared to placebo.

Medicinal Food and Nutraceutical Interventions

Medicinal food and nutraceutical interventions were investigated in ten studies [42, 72-80]. Four studies examined the effects of probiotics, either in isolation (n=2) [75, 76] or in combination with other treatments (n=2) [73, 77], while other studies investigated glucosamine and chondroitin (n=1) [42], methylsulfonylmethane (n=1) [80], l-theanine (n=1) [78], lactoferrin (n=1) [79] medium chain triglyceride oil (n=1) [72], and a proprietary blend of mixed tocopherals, phytonutrients, and fruit and vegetable powders [74]. The study populations included healthy individuals (n=2) [72, 80] as well as individuals with breast cancer (n=1) [42], gastrointestinal conditions (n=2) [73, 75], chronic fatigue syndrome [76], generalized anxiety disorder (n=1) [78], and frequent cold-related symptoms (n=1) [79].

A randomized controlled trial conducted in Australia compared a placebo with 400mg of bovine lactoferrin and 200mg of immunoglobulin-rich whey protein per day for 90 days [79]. The study measured the effect of the intervention on adults experiencing frequent cold-related symptoms (n=103). Participants in the intervention group had a reduced occurrence of the common cold in the first half (lactoferrin: 0.67 events per person; placebo: 1.40; $p<0.001$) and in the second half (lactoferrin: 0.38; placebo: 1.02; $p<0.001$) of the study. The average total of cold events for the entire study was less than half among the intervention group compared with the placebo group (lactoferrin: 0.93; placebo: 2.26; $p<0.001$). A second randomized controlled trial from Australia examined the

effect of probiotics in the prevention of gastrointestinal infection (n=19) [75]. The study employed a combination of two commercially available products; a combination of probiotic bacteria, and a probiotic yeast *(Sacchromyces boulardii)*. Compared to the placebo group, the study participants in the intervention arm had a reduced incidence of gastrointestinal infection at the completion of the 17-week study. They also had significantly increased levels of salivary alpha-amylase (probiotic: +16.2; placebo: +8.1; p=0.007).

A randomized controlled trial conducted in the USA compared the effects of canola oil or medium chain triglyceride (MCT) oil on plasma triglycerides in healthy men (n=20) 5-hours after ingestion [72]. The study found no difference after one hour, but significantly lower plasma triglycerides in the MCT group at 2 hours (MCT: 72.6; canola: 97.7; p=0.001), 3 hours (MCT: 68.6; canola: 114.5; p<0.001), 4 hours (MCT: 69.5; canola: 117.2; p,0.001), and 5 hours (MCT: 69.6; canola: 112.0; p=0.001).

Table 31.1 Clinical research investigating clinical nutrition interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Adams, et al. (2009) [USA, AMRO] [69] Adams, et al. (2009) [USA, AMRO] [70]	Randomized controlled trial	Autism spectrum disorders	Phase 1 & 2: dimercapto succinic acid (DMSA) 10 mg/kg TID or placebo	Nil	Placebo topical cream	106 Part A: 65 (31/33) Part B 2: 41 (26/15)	Urinary excretion of toxic metals after Phase 1 [BL to Dose 1, Dose 9]	**Increased excretion** Lead: Dose 1 +713% (p<0.001) Dose 9 +638% (p<0.001) Tin: Dose 1 +241% (p<0.001) Dose 9 +314% (p<0.05) Bismuth: Dose 1 NS Dose 9 +128% (p<0.05) Uranium: Dose 1 +0.021 (<0.001) Dose2 +0.016 (p<0.05) Mercury Dose 1 +70% (<0.01) Dose 9 NS Titanium: Dose 1 +67% (p<0.001) Dose 9 +42% (p<0.01) Antimony: Dose 1 +49% (p<0.05) Dose 9 NS Tungsten: Dose 1 +51% (p<0.01) Dose 9 +18% (p<0.05) Nickel: Dose 1 -18% (p<0.05) Dose 9 NS Cadmium: Dose 1 NS Dose 9 NS Arsenic: Dose 1 NS Dose 9 -19% (p<0.05)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Urinary excretion of toxic metals after Phase 2 [BL to Dose 1, Dose 9, Round 2, Round 4, Round 6]	**Increased excretion** Lead: Dose 1 +935% (p<0.001) Dose 9 +1562% (p<0.001) Round 2 +1001% (p<0.001) Round 4 +1063% (p<0.001) Round 6 +1005% (p<0.001) Tin: Dose 1 +118% (p<0.05) Dose 9 NS Round 2, 4 and 6 NS Bismuth: NS Uranium: NS Mercury: Dose 1, +120% (<0.05) Dose 9 NS Round 2 +98% Round 4 and 6 NS Titanium: Dose 1 +54% (p<0.01) Dose 9 +44% (p<0.05) Round 2, 4 and 6 NS Antimony: Dose 1 +49% (p<0.05) Dose 9 NS Round 2, 4 and 6 NS Tungsten: Dose 1 +51% (p<0.01) Dose 1 +18% (p<0.05) Round 2, 4 and 6 NS Nickel: Dose 1 -18% (p<0.05) Dose 9 NS Round 2, 4 and 6 NS Cadmium: Dose 1 NS Dose 9 -32% (p<0.05) Round 2, 4 and 6 NS Arsenic: Dose 1, NS Dose 9 -19% (p<0.05) Round 2 -39% (p<0.001) Round 4 -42% (p<0.001) Round 6 -31% (p<0.1)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Red blood cell (RBC) Glutathione [BL to Dose 1, Dose 9, Round 2, Round 4, Round 6]	**Normalized RBC glutathione**
							Platelet count [BL to Dose 1, Dose 9, Round 2, Round 4, Round 6]	**Normalized platelet counts**
							Pervasive Developmental Disorder Behavior Inventory (Maladaptive behaviors) [BL to Round 6]	**Reduced maladaptive behaviors** Sensory/Perceptual Approach Behaviors: 7 rounds -22% ($p<0.05$); 1 round -31% ($p<0.01$) Ritualisms/Resistance to Change: 7 rounds -28% ($p<0.01$); 1 round -23% ($p<0.01$) Arousal Regulation Problems: 7 rounds -22% ($p<0.01$); 1 round NS Specific fears: 7 rounds -22% ($p<0.01$); 1 round NS Aggressiveness: 7 rounds -27% ($p<0.05$); 1 round -26% ($p<0.05$) Social pragmatic problems: 7 rounds NS; 1 round -29% ($p<0.01$) Semantic/Pragmatic problems: NS Composite: 7 rounds -24% ($p<0.001$); 1 round -24% ($p<0.001$)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Pervasive Developmental Disorder Behavior Inventory (Adaptive behaviors) [BL to Round 6]	**Increased adaptive behaviors** Social approach behaviors: 7 rounds -11% ($p<0.05$); 1 round + 6% Express (Phonological and Semantic Pragmatic): 7 rounds +5%; 1 round +17% ($p<0.05$) Learning, Memory and Receptive Language: 7 rounds +12% ($p<0.05$); 1 round +14% ($p<0.05$) Composite: 7 rounds +12%; 1 round +11%
							Autism Treatment Evaluation Checklist [BL to Round 6]	**Reduced autism symptoms** SPLC: 7 rounds -21% ($p<0.001$); 1 round NS Sociability: 7 rounds -27% ($p<0.001$); 1 round -25% ($p<0.05$) Sensory/Cognitive Awareness: 7 rounds -27% ($p<0.001$); 1 round -26% ($p<0.05$) Health/Physical/ Behavior: 7 rounds -28% ($p<0.01$); 1 round NS Total: 7 rounds -26% ($p<0.001$); 1 round -19% ($p<0.01$)
							Severity of Autism Scale [BL to Round 6]	**Reduced severity** 7 rounds -19% ($p<0.001$); 1 round -18% ($p<0.01$)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							Autism Diagnostic Observation Schedule [BL to Round 6]	Communication: NS Sociability: 7 rounds -10% ($p<0.01$) 1 round NS Communication and sociability: 7 rounds -9% ($p<0.001$) 1 round NS Play: NS SBRI: NS
							Parent Global Impression [BL to Round 6]	NS
Ali et al. (2009) [USA, AMRO] [38]	Randomized controlled trial	Fibromyalgia syndrome	Intravenous micronutrient therapy (Myers' Cocktail): Magnesium chloride hexahydrate, 20% (5mL); Calcium gluconate, 10%) (3mL); Hydroxocobalamin, 1000u/mL (1mL); Pyridoxine hydrochloride, 100mg/mL (1mL); Dexpanthenol, 250mg/mL (1mL); B-complex 100 (1mL) containing thiamine HCl [100mg], riboflavin [2mg], pyridoxine HCl [2mg], panthenol [2mg], niacinamide [100mg + 2% benzyl alcohol], vitamin C [5mL of 500mg/mL], 20mL of sterile water.	Nil	Placebo	35 (17/18)	Tender Point Index [BL to Wk 8]	NS
							Visual Analog Scale [BL to Wk 8]	NS
							Fibromyalgia Impact Questionnaire [BL to Wk 8]	NS
							Beck Depression Inventory [BL to Wk 8]	NS
							Health Status Questionnaire [BL to Wk 8]	NS
Ali et al. (2011) [USA, AMRO] [58]	Randomized controlled trial (crossover)	Metabolic syndrome or impaired fasting glucose or impaired glucose tolerance (adults)	Chromium picolinate 500mcg or chromium picolinate 1000mcg (crossover)	Nil	Placebo	59 (30/29)	Serum fasting insulin (IU/l) [BL to Mth 6]	NS
							Homeostasis model assessment of insulin resistance [BL to Mth 6]	NS
							2-hour plasma glucose (mg/dl) [BL to Mth 6]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Fasting plasma glucose (mg/dl) [BL to Mth 6]	NS
							2-hour insulin during oral glucose tolerance testing (IU/l) [BL to Mth 6]	NS
							Anthropometric measures [BL to Mth 6]	NS
							Blood pressure (mmHg) [BL to Mth 6]	NS
							Endothelial function [BL to Mth 6]	NS
							Hemoglobin A1c (%) [BL to Mth 6]	NS
							Urinary microalbumin (mg/dl) [BL to Mth 6]	NS
							Lipids (mg/dl) [BL to Mth 6]	NS
							Flow-mediated dilatation of the brachial artery [BL to Wk 8] [BL to Mth 6]	NS
							Plasma glucose (mg/dl) [BL to Wk 8]	NS
							Serum insulin (IU/l) [BL to Wk 8]	NS
							Serum lipids (mg/dl) [BL to Wk 8]	NS
							Body weight (kg) [BL to Wk 8]	NS
Allen and Bradley (2011) [USA, AMRO] [71]	Uncontrolled trial	Healthy adults	Glutathione (500mg twice daily)	Nil	Nil	40	Creatinine-standardized	NS
							Urinary F2-isoprostanes (F2-isoP)	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Urinary 8-hydroxy-2′-deoxyguanosine (8-OHdG)	NS
							Erythrocyte GSH concentrations	NS
Balfour, et al. (2014) [Canada, AMRO] [39]	Randomized controlled trial	Human immune-deficiency virus (Anti-retroviral treatment naive)	High-dose micronutrient, mineral and antioxidant preparation (K-PAX Ultra®)	Nil	100% recommended daily allowance (RDA) preparation of multivitamins and minerals.	127 (not reported as only presenting baseline data)	Baseline micronutrient deficiency	**Low baseline micronutrient levels** Carotene: 24% <1 nmol/L Vitamin D: 67% <75 nmol/L, 24% <40 nmol/L, 3.5% <20 nmol/L Serum folate: 20% <15 nmol/L Vitamin B12: 2.4% <133 pmol/L Lower baseline levels of B12 correlated with lower baseline CD4 count (r = 0.21, p= 0.02)
							Treatment adherence	Nineteen (15%) withdrew early from the study treatment. Mean treatment adherence was 88%. Subjective adherence was 81% and significantly correlated with pill count (r = 0.29, p <0.001). Adherence was <80% in 75% of participants.
Barrie, et al. (1987) [USA, AMRO] [60]	Randomized controlled trial (crossover)	Healthy adult students with no signs of zinc deficiency	Crossover four x four-week periods of zinc picolinate, zinc citrate, zinc gluconate (equivalent to 50 mg elemental zinc per day) and placebo	NS	Placebo	15	Hair zinc levels (ppm) [BL to Wk 16]	**Increased levels (with picolinate)** Picolinate: +7.8 (p<0.005) Placebo: NS Citrate: NS Gluconate: NS
							Urinary zinc levels [BL to Wk 16]	**Increased levels (with picolinate)** Picolinate: +0.26 (p<0.005) Placebo: NS Citrate: NS Gluconate: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Erythrocyte zinc levels [BL to Wk 16]	**Increased levels (with picolinate)** Picolinate: +1.82 ($p<0.005$) Placebo: NS Citrate: NS Gluconate: NS
							Serum zinc levels [BL to Wk 16]	Picolinate: NS Placebo: NS Citrate: NS Gluconate: NS
Bayes, et al. (2019) [Australia, WPRO] [56]	Randomized controlled trial	Healthy Individuals	4 weeks: folic acid (500 mcg), folinic acid (500 mcg) or 5-Methyltetrahydrofolate (500 mcg)	NS	Placebo	30 (5/5/5/15)	Serum folate [BL to Wk 4]	**Increased** Folic acid: Wk 2, +10.8; Wk 4, -39.9 Folinic acid: Wk 2, +17.1; Wk 4, +15.3 5-MTHF: Wk 2, +8.0; Wk 4, +9.1 Control: Wk 2, -1.3; Wk 4, -2.7 Between group: p=0.0113
							Serum folate, group comparison [BL to Wk 4]	Folinic acid vs other folate: NS MTHF vs other folate: NS
Bertinato, et al. (2013) [Canada, AMRO] [61]	Randomized controlled trial	Healthy children (males, 6-8 yrs)	4 months: Zinc (Zn) gluconate equivalent to elemental Zn (1) 5mg, (2) 10mg or (3) 15mg per day	Nil	Placebo	39 (5mg; 10, 10mg: 9, 15mg: 8, placebo: 10)	Erythrocyte Superoxide dismutase (SOD1) [BL to Mth 2, Mth 4]	NS
							Erythrocyte copper chaperone for copper-Zn superoxide dismutase (eCCS):-SOD1 ratio [BL, Mth 2, Mth 4]	NS
							Plasma zinc [BL, Mth 2, Mth 4]	NS
							Urine zinc/ creatinine ratio [BL, Mth 2, Mth 4]	**Increased zinc levels** Month 2: NS Month 4: 5mg, +4; 10mg, +12; 15mg, -2 Between group: p=0.02
							Plasma copper [BL, Mth 2, Mth 4]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Plasma ceruloplasmin [BL, Mth 2, Mth 4]	NS
							Anthropometric measurements [BL, Mth 2, Mth 4]	**Increased body weight** Weight gain: Between groups, p=0.003 Weight-for-age: Between groups, p=0.02
Bradbury, et al. 2004) [Australia, WPRO] [22]	Randomized controlled trial	Healthy adults (moderately stressed)	6 weeks: 6000 mg tuna oil, with 60 mg d-alpha-Tocopherol containing DHA 1.512 g and EPA 3.6 g daily.	Nil	Placebo OR No treatment	93 (Omega-3: 16/Placebo: 14/ No treatment: 63)	Perceived Stress Scale [BL to Wk 6]	NS
Bradbury, et al. (2017) [Australia, WPRO] [23]	Randomized controlled trial	Chronic work stress	12 weeks: Fish oil 4000mg as 2.2 g EPA, and 0.44 g DHA per day.	Nil	Placebo	90 (45/45)	Perceived Stress Scale [BL to Wk 12]	NS
							Omega-3 index [BL to Wk 12]	**Improved fatty acid profile** Arachidonic acid (AA): Fish oil -22.6; Placebo -11.5 Between group (-8.7, p=0.002) EPA: Fish oil +7.3; Placebo -0.5 Between group (+9.6 ,p<0.001) DHA: NS AA:EPA (%): Fish oil -13.5; Placebo -0.8 Between group (-13.0, p<0.001) EPA:AA (%): Fish oil +0.28; Placebo +0.2 Between group, (+3.0, p<0.001)
							Plasma interleukin-1β [BL to Wk 12]	NS
							Plasma interleukin-6 [BL to Wk 12]	NS
							Plasma interleukin-10 [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Tumor necrosis factor-α [BL to Wk 12]	NS
							High-sensitivity c-reactive protein [BL to Wk 12]	NS
							Salivary cortisol/ DHEA ratio [BL to Wk 12]	NS
							Depression, Anxiety, Stress Scale [BL to Wk 12]	NS
							Occupational Stress Inventory Strain and Resources subscales [BL to Wk 12]	NS
							COPE Inventory [BL to Wk 12]	NS
							Copenhagen Burnout Inventory [BL to Wk 12]	NS
Braun, et al. (2013) [USA, AMRO] [40]	Cohort study (retrospective investigation)	Prostate cancer (post- treatment of radiation therapy with curative intent)	Individualized naturopathic and nutritional antioxidant supplementation (self-selected for naturopathic care. Most frequent green tea extract 750 BD, melatonin 20mg at bedtime, vitamin C 500-1000mg TD and vitamin E 200-400IU TD)	6-8 weeks of radiation, 24 month continuation	Usual care (self-selected for no naturopathic care)	134 (69/65)	Mean PSA (non-hormonal ablation) [⩾ 24 moths post-radiation]	NS
							Mean PSA (hormonal ablation) [⩾ 24 months post-radiation]	NS
Calabrese, et al. (1999) [USA, AMRO] [72]	Randomized controlled trial	Healthy men	5 hours: Sound Nutrition™ medium chain triglyceride (MCT) oil (71g)	Nil	HAIN™ canola oil (71g)	20 (10/10)	Plasma triglycerides (mg/dL) [BL to 1Hr, 2Hr, 3Hr, 4Hr, 5Hr]	**Reduced triglycerides** 1hr: NS 2hr: Canola 97.7; MCT 72.6 Between group -24.6 (p=0.001) 3hr: Canola 114.5; MCT 68.6 Between group -45.4 (p<0.001)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
								4hr: Canola 117.2; MCT 69.5 Between group -46.6 ($p<0.001$) 5hr: Canola 112.0; MCT 69.6 Between group -42.05 ($p=0.001$)
Camfield, et al. (2013) [Australia, WPRO] [41]	Randomized controlled trial	Stress	Swisse Ultivite Formula 1® (Men's/Women's formula) multivitamin	Nil	Placebo	138 (68/70)	Perceived stress scale [BL to Wk 8, Wk 16]	NS
							Serum B6 [BL to Wk 8, Wk 16]	**Increased vitamin B6 levels** Wk 8: Between group ($p=0.003$) Wk 16: Between group ($p=0.009$)
							Serum B12 [BL to Wk 8, Wk 16]	**Increased vitamin B12 levels** Wk 8: Between group ($p=0.003$) Wk 16: Between group ($p=0.009$)
							Homocysteine [BL to Wk 8, Wk 16]	**Reduced homocysteine levels** Wk 8: Between group ($p=0.003$) Wk 16: Between group ($p=0.009$)
							Red cell folate [BL to Wk 8, Wk 16]	**Increased folate levels** Wk 8: NS Wk 16: Between group ($p=0.019$)
							Waking salivary cortisol [BL to Wk 8, Wk 16]	NS
							Evening salivary cortisol [BL to Wk 8, Wk 16]	NS
							Cortisol awakening response [BL to Wk 8, Wk 16]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Coulson, et al. (2012) [Australia, WPRO] [24]	Uncontrolled trial	Knee osteoarthritis	8 weeks: *Perna canaliculus* (green-lipped mussel) extract 1.5 g twice daily	Nil	Nil	21	Lesquesne Index [BL to Wk 4 and 8]	**Reduced arthritis symptoms** Wk 4: -2.86, (p=0.001) Wk 8: -4.03, (p<0.001)
							Western Ontario McMaster Universities Arthritis Index [BL Wk 4 and 8]	**Reduced arthritis symptoms** Wk 4 -11.63, (p=0.001) Wk 8 -18,833, (p<0.001)
							Gastrointestinal symptom rating score [BL Wk 4 and 8]	**Reduced gastrointestinal symptoms** Wk 4 -4.26 (p=0.004) Wk 8 -3.96 (p=0.005)
							Rescue medication use [BL Wk 4 and 8]	**Reduced rescue medication use** 14/21 used rescued medication
							Adverse symptoms [BL Wk 4 and 8]	**Mild adverse symptoms** Reflux (n=1), abdominal pain, reflux, and diarrhea (n=1), gout (n=2)
							Blood pressure [BL Wk 4 and 8]	NS
Coulson, et al. (2013) [Australia, WPRO] [25]	Randomized controlled trial	Knee osteoarthritis	12 weeks: *Perna canaliculus* (green-lipped mussel) extract 1.5 g twice daily	Nil	Glucosamine sulfate 1.5 g twice daily	38 (21/17)	Total fecal bacteria count, as well as levels of four genera of aerobic and six anaerobic bacteria as well as yeast [BL to Wk 12]	NS
							Lesquesne Index [BL to Wk 12]	NS
							Western Ontario McMaster Universities Arthritis Index [BL to Wk 12]	NS
							Gastrointestinal symptom rating score [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Adverse effects	NS
Greenlee, et al. (2012) [USA, AMRO] [67]	Cohort study (analysis of LACE cohort, PMID: 15986109)	Breast cancer stage I-III minimum 1 year since diagnosis	Antioxidants (AO) supplement (vitamin C, vitamin E, zinc, selenium, carotenoid, beta-carotene, lycopene), multivitamin	*Questionnaire and chart review follow up*	nil	2264 (1829 AO users)	All-cause mortality [compared to non-AO users]	**Reduced risk** Vitamin E (p=0.02) Increased risk Combination carotenoids (p=0.03)
							Deaths from breast cancer [compared to non-AO users]	NS for all **Increased risk** Combination carotenoids (p=0.02)
							Breast cancer recurrence [compared to non-AO users]	**Reduced risk** vitamin C – frequent users (p=0.01); vitamin E (p<0.01)
							AO users only	**Reduced risk** vitamin C – frequent users (p=0.03); vitamin E (p=0.02)
Greenlee, et al. (2013) [USA, AMRO] [42]	Uncontrolled trial	Breast cancer (postmenopausal women with joint pain/ stiffness)	24 weeks: Glucosamine-sulfate (1500mg/day) and chondroitin-sulfate (1200mg/day)	Nil	Nil	53 (39 evaluable at 24 weeks)	Outcome measure in Rheumatology Clinical Trials and Osteoarthritis Research society International (OMERACT-OARSI) [BL to Wk 12, Wk24]	**Improved outcomes** Wk 24: 46% (18/39) of patients met criteria
							WOMAC (0/100 scale) [BL to Wk 12, Wk24]	**Reduced pain** 12wks (-9.6, p=0.03) 24wks (-10.7, p=0.02) 51.4% reported ⩾20% reduction in hip and knee pain at 12wks,maintained at 24wks **Increased function** 12wks (-10.7, p=0.01) 24wks (-13.2, p<0.01).

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Modified score for Assessment and Quantification of Chronic Rheumatoid Affections of the hands and wrists (0/100 scale) [BL to Wk 12, Wk24]	**Reduced pain** 12wks (-14.4, p<0.001); 24wks (-13.8, p<0.001) 36.8% reported ≥20% reduction in pain severity; 43.6% reported ≥20% reduction in worst pain **Reduced stiffness** 12wks (-11.3, p=0.03); 24wks (NS) **Increased function** 12wks (-9.2, p=0.03); 24wks (-8.5, p=0.02)
							Beck Pain Inventory (0/100 scale) [BL to Wk 12, Wk24]	**Reduced pain severity** 12wks (-0.7, p=0.05) **Reduced pain interference** 24wks (-1.0, p<0.001) **Reduced worst pain** 12wks (-0.9, p=0.02); 24wks (-1.2, p=0.02)
Hershman, et al. (2013) [USA, AMRO] [65]	Randomized controlled trial	Breast cancer (stage I-III, prevention of chemotherapy-induced peripheral neuropathy (CIPN))	Acetyl l-carnitine (ALC) (3000mg per day)	24 weeks	Placebo	409 (208/201)	Functional Assessment of Cancer Therapy (FACT) – NTX (Taxane neurotoxicity) [BL to Wk 12 and 24]	**Reduced function (increased CIPN)** Wk 12: NS Wk 24: ALC -5.1, Placebo -3.8 Between group: p=0.01
							FACT – Taxane trial Outcome Index [BL to Wk 12 and 24]	**Reduced functional status** Wk 12: NS Wk 24: ALC -4.8, Placebo: -1.4 Between group: p=0.03
							FACT – Fatigue [BL to Wk 12 and 24]	NS
							Adverse events	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Hershman, et al. (2018) [USA, AMRO] [66]	Follow-up						FACT-NTX [BL to Wk 36, 52, and 104]	**Reduced function (increased CIPN)** Both groups, over time: p<0.001 Between group average: ALC -1.39 (p=0.01) Between group Wk 12: NS Between group Wk 24: ALC -1.68 (p=0.02) Between group Wk 36: ALC -1.37 (p=0.04) Between group Wk 52: ALC -1.83 (p=0.02) Between group Wk 104: NS
							FACIT Functional Assessment of Chronic Illness Therapy [BL to Wk 36, 52, and 104]	NS
							FACT-Taxane Trial Outcome Index [BL to Wk 36, 52, and 104]	NS
							Predictors of persistence CIPN	**Increased risk** Women <60 Wk 52: p=0.02, Wk 104: p=0.04 Weight (% per 5kg) Wk 52: p=0.001, Wk 104: p=0.001
Hershman, et al. (2015) [USA, AMRO] [26]	Randomized controlled trial	Stage I-III breast cancer (postmenopausal, Rx aromatase inhibitors)	Omega-3 fatty acid (3.3 g per day; 560mg eicosapentaenoic acid plus docosahexaenoic acid in a 40:20 ratio)	24 hours	placebo	249 (122/127)	Brief Pain Inventory – Short form [BL to Wks 6, 12 and 24]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Western Ontario and McMaster Universities Osteoarthritis Index [BL to Wks 6, 12 and 24]	NS
							Modified Score for the Assessment and Quantification of Chronic Rheumatoid Affections of the Hands [BL to Wks 6, 12 and 24]	NS
							Functional Assessment of Cancer Therapy – Endocrine [BL to Wks 6, 12 and 24]	NS
							Lipid Profile (mg/dL) (Fasting serum) [BL to Wks 6, 12 and 24]	**Reduced triglycerides** Intervention: -22.1, Placebo: -10.3 Between group: p=0.01 Cholesterol: NS C-reactive protein: NS High density lipoprotein: NS Low density lipoprotein: NS
							Adverse events	NS
Shen, et al. (2018) [USA, AMRO] [27]	Secondary analysis (Participants with (BMI ⩾30) and without (BMI <30) obesity)						Brief Pain Inventory – short form [BL to Wk 6, 12 and 24]	**Reduced worst pain** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.02 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction: NS Reduced average pain BMI ⩾30, treatment compared to placebo

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								Wk 12: NS, Wk 24: p=0.002 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.005 Reduced pain interference BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.009 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.01
							Global Ratings of Change questionnaire [BL to Wk 6, 12 and 24]	**Reduced joint stiffness** BMI ⩾30, treatment compared to placebo Wk 12: p=0.02, Wk 24: NS BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction: NS Joint pain: NS
							Modified Score for the Assessment and Quantification of Chronic Rheumatoid Affections of the Hands [BL to Wk 6, 12 and 24]	**Reduced pain** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.04 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction: NS
							WOMAC [BL to Wk 6, 12 and 24]	**Reduced pain** BMI ⩾30, treatment compared to placebo Wk 12: NS,

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								Wk 24: p=0.01 BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.02
							Lipid Profile (Fasting serum) [BL to Wk 6, 12 and 24]	**Increased high density lipoprotein** BMI ⩾30, treatment compared to placebo Wk 12: NS, Wk 24: NS BMI <30, treatment compared to placebo Wk 12: NS, Wk 24: p=0.002 BMI-treatment group interaction Wk 12: NS, Wk 24: p=0.003 **Reduced triglycerides** BMI ⩾30, treatment compared to placebo Wk 12: p=0.02, Wk 24: NS BMI <30, treatment compared to placebo Wk 12: p=0.02, Wk 24: NS BMI-treatment group interaction Wk 12: p=0.01, Wk 24: NS
Kean, et al. (2017) [Australia, WPRO] [28]	Randomized controlled trial	Attention deficit-hyperactivity disorder (6 to 14 years)	14 weeks: Omega-3 anti-inflammatory extract PCSO-524® (lipid extract of New Zealand green-lipped mussel)	Nil	Placebo	144 (74/70)	Test of Variables of Attention (TOVA) [BL to Wk 14]	NS
							Computerized Mental Performance Assessment System (COMPASS) [BL to Wk 14]	**Increased mental performance** PCSO: Improved target memory (p=0.05) PCSO: Improved non-target memory (p=0.02) PCSO: Improved picture recognition accuracy (p=0.02)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Brunel Mood Scale (BRUMS) for adolescents [BL to Wk 14]	**Increased fatigue** PCSO: increased fatigue (p=0.01) Placebo: reduced feelings of confusion (p=0.01)
							Conners Parent Rating Scales (CPRS) [BL to Wk 14]	**Reduced parent-reported symptoms** Aggression NS Peer relations NS Global ADHD index NS Impaired school life NS Impaired relationships NS Inattention NS Conduct disorder NS Oppositional defiant disorder NS Executive function NS ADHD probability: PCSO -28.3; Placebo -13.1 Between group p=0.04 Impaired home life: PCSO -0.52; Placebo +0.05 Between group p=0.02 Hyperactivity: PCSO -10.2; Placebo -3.3 Between group p=0.04 DSM inattention: PCSO -7.18; Placebo -3.3 Between group p=0.01 DSM hyperactivity: PCSO -13.8; Placebo -4.1 Between group p=0.04 Learning problems: PCSO -5.9; Placebo -2.8 Between group p=0.05
							Conners Parent Rating Scales (CPRS) [BL to Wk 14]	**Reduced maladaptive behaviors** Aggression NS Peer relations NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								Global ADHD index NS Impaired school life NS Impaired relationships NS Inattention NS Conduct disorder NS Oppositional defiant disorder NS Executive function NS ADHD probability: PCSO -28.3; Placebo -13.1 Between group p=0.04 Impaired home life: PCSO -0.52; Placebo +0.05 Between group p=0.02 Hyperactivity: PCSO -10.2; Placebo -3.3 Between group p=0.04 DSM inattention: PCSO -7.18; Placebo -3.3 DMS hyperactivity: PCSO -13.8; Placebo -4.1 Between group p=0.04 Learning problems: PCSO -5.9; Placebo -2.8 Between group p=0.05
Kim, et al. (2006) [USA, AMRO] [73]	Randomized controlled trial	Functional gastrointestinal disease	Probiotics & nutrients Group 1: 50million CFU x6 *spp* AND grass juice, fulvic acid derived minerals Group 2: 50million CFUx12 *spp* AND grass juice, fulvic acid derived minerals Group 3: C. 50million CFU x5 *spp* AND Mixed mushroom/ algae Group 4: 50million CFU x6 *spp* Group 5: Grass juice, fulvic acid derived minerals 12 weeks: 4-week run-in, 8 weeks of 4 cap TD	Grass juice, mixed mushroom/algae	Placebo	72 (12/12/12/ 12/12/12)	Gastrointestinal Quality of Life Index [BL to Wk 12]	NS
							Gastrointestinal Visual Analog Scales (bloating, gas, abdominal discomfort, indigestion, constipation, diarrhea) [BL to Wk 12]	NS
							Urinary lactulose-mannitol challenge test [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Lamson and Brignall (2000) [USA, AMRO] [51]	Case study	Acute respiratory crisis secondary to emphysema and bronchial infection	Glutathione solution 60mg/ml	NS	NS	1	Signs of respiratory distress, lung sounds, use of oxygen, patient reported changes in breathing.	Following three days of treatment the patient no longer required a wheelchair or oxygen tank, had no signs of respiratory distress or adventitious lung sounds and reported his breathing was better than it had been in years
Lamson and Wright (2003) [USA, AMRO] [43]	Case study	Early renal functional impairment	Chinese herbal formula 500mg capsules, Ayurvedic herbal formula (includes Vitamin B6 25mg and magnesium aspartate 100mg), and Nutritional/ Botanical formula (vitamin A 5000IU, vitamin C 100mg, vitamin B6 10mg, potassium 99mg, raw kidney concentrate (bovine) 300mg, *Urtica dioca* 50mg, *Taraxacum officinale* root 50mg, parsley leaf 50mg)	Nil	Nil	1	Blood urea nitrogen (mg/dL) [BL to Yr 4]	**Reduced levels** -9
							Serum Creatinine (mg/dL) [BL to Dy 5]	**Reduced levels** -0.2
							24hrs Creatinine Clearance (mL/min)	**Increased clearance** +53
McEwen, et al. (2013) [Australia, WPRO] [29]	Non-Randomized controlled trial	History of cardiovascular disease (adults)	Omega-3 marine – derived PUFA 640 mg (DHA 520 mg and EPA 120 mg) daily	Nil	Healthy adults	56 (40/16)	Maximum slope – Healthy population [BL to Wk 4]	**Reduced** Adenosine phosphate -5.6 (p=0.014) Adrenaline NS Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 NS
							Maximum amplitude (%) – Healthy population [BL to Wk 4]	**Reduced** Adenosine phosphate -5.6 (p=0.014) Adrenaline -5.4 (p=0.013) Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Lag time (sec) – Healthy population [BL to Wk 4]	**Increased** Adenosine phosphate NS Adrenaline +10 (p=0.002) Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 +5 (p<0.001)
							Maximum slope – CVD population [BL to Wk 4]	**Increased** Adenosine phosphate NS Adrenaline NS Arachidonic acid +8.4 (p=0.009) Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein NS U46619 NS
							Maximum amplitude (%) – CVD population [BL to Wk 4]	**Increased** Adenosine phosphate NS Adrenaline NS Arachidonic acid NS Collagen (1.0 ug/mL), NS Collagen (1.0 ug/mL), NS C-reactive protein +5.9 (p=0.012) U46619 NS
							Lag time (sec) – CVD population [BL to Wk 4]	**Increased** Adenosine phosphate NS Adrenaline +10 (p=0.002) Arachidonic acid NS Collagen (1.0 ug/mL) NS Collagen (1.0 ug/mL) NS C-reactive protein, NS U46619 +13 (p=0.0018)
							Platelet activation [BL to Wk 4]	**Reduced in health population** Healthy: -15%; CVD: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Menon, et al. (2017) [Australia, WPRO] [44]	Uncontrolled trial	Chronic Fatigue Syndrome	16 weeks – Ubiquinone (Co Q10) 200 mg; alpha lipoic acid 150 mg; N-acetylcysteine (NAC) 2000 mg; Acetyl l-carnitine (ALC) 1000 mg; magnesium (as orotate 500 mg) 64 mg; calcium ascorbate dehydrate (equiv. ascorbic acid 200 mg) 242 mg; cholecalciferol (equiv. vitamin D3 250 IU); 12.5 ug; a-tocopherol (equiv. natural vitamin E 50 IU) 60 IU; Retinyl palmitate (equiv. vitamin A 3000 IU) 900 ug REIU; and vitamin B co-factors: biotin (vitamin H) (600 ug), thiamine hydrochloride (100 mg), riboflavin (100 mg), nicotinamide (200 mg), calcium pantothenate (100 mg), pyridoxine hydrocholoride (100 mg), folic acid (800 mg), cyanocobalamin (vitamin B12) (800 mcg)	Nil	Nil	10	Chalder Fatigue Scale [BL to Wk 16]	**Reduced fatigue** -9.4 ($p<0.001$).
							Montgomery – Asberg Depression Rating Scale [BL to Wk 16]	NS
							Insomnia Severity Index [BL to Wk 16]	**Reduced insomnia** -3.65 ($p=0.017$)
							Patient Global Impression Scale [BL to Wk 16]	NS
							Clinical Global Impression Scale [BL to Wk 16]	**Reduced symptoms** Severity: NS; Improvement: -0.92 ($p=0.014$)
							Work and Social Adjustment Scale [BL to Wk 16]	NS
							Short-Form Health Survey [BL to Wk 16]	NS
Mills, et al. (2003) [Canada, AMRO] [54]	Randomized controlled trial	Healthy adults	90 minutes: Immediate-release niacin 500 mg	Nil	Placebo	68 (33/35)	Tolerability (no. %) [BL to 90min]	**Reduced tolerability** Niacin: No effect 0.0; Easy to tolerate 6.1; Mildly unpleasant 42.4; Unpleasant 33.3; Intolerable 18.2 Placebo: No effect 97.1; Easy to tolerate 2.9; Mildly unpleasant 0.0; Unpleasant 0.0; Intolerable 0.0
							Adverse events	**Increased adverse events** Composite of pruritis: Niacin 75%; Placebo 0% Between group $p<0.001$

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
								Composite of tingling: Niacin 30%; Placebo 0.0% Between group p<0.001 Unpleasant warmth or flushing: Niacin 100%; Placebo 3% Between group p<0.001 Nausea: Niacin 30%; Placebo 3% Between group p=0.005 Vomiting: Niacin 12%; Placebo 3% Between group p=0.005 Vertigo: Niacin 12%; Placebo 3% Between group p=0.005 Chills: Niacin 52%; Placebo 0% Between group p<0.001 Heart palpitations: Niacin 15%; Placebo 3% Between group p=0.0228
Mischley, et al. (2015) [USA, AMRO] [68]	Randomized controlled trial	Parkinson's Disease (Hoehn Yahr stage <3)	12 weeks: Intranasal reduced glutathione (GSH) 300mg and 600mg	Stable medication (not defined) Supplements (not defined), diet and exercise (30 days)	Control (saline) and placebo (watchful waiting)	34 (10/10/10/4)	Complete blood count [BL to Wk 12]	NS
							Alanine aminotransferase (ALT) [BL to Wk 12]	NS
							Aspartate aminotransferase (AST) [BL to Wk 12]	NS
							Blood urea nitrogen (BUN) [BL to Wk 12]	NS
							Creatine [BL to Wk 12]	NS
							Urinalysis [BL to Wk 12]	NS
							Monitoring of Side Effects Scale [BL to Wk 12]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							SinuNasal Outcome Test (SNOT-20) [BL to Wk 12]	NS
							Unified Parkinson's Disease Rating Scale (UPDRS) [BL to Wk 12]	Mild clinical improvements in both treatment arms compared to placebo (NS)
Mischley, et al. (2016) [USA, AMRO] [52]	Cohort	Parkinson's disease	45 minutes: Intranasal reduced glutathione (GSH) 200mg	Nil	Nil	15	GSH and GSH/ Cr concentrations (H-MRS) [BL to Min 45]	**Increased levels** GSH/Cr: +269% ; GSH: +240% 7.5 min: +0.03 (0.008-0.06) 19.9 min: +0.04 (0.01-0.08) 32.0 min: +0.04 (0.01-0.08) 44.7 min: +0.05 (0.01-0.11)
Mischley et al. (2017) [USA, AMRO] [53]	Randomized controlled trial	Parkinson's Disease (Hoehn Yahr stage 1-3)	12 weeks: Intranasal reduced glutathione (GSH) 300mg and 600mg	Stable medication (not defined) previous 30 days	Control (saline)	39 (11/14/14)	Unified Parkinson's Disease Rating Scale (UPDRS) [BL to and Wk 4, 8, 12 and 16 (at same appointment time for each participant)]	NS
							GSH and GSH/ Cr concentrations (H-MRS) [BL to and Wk 4, 8, 12 and 16]	NS trend toward increasing brain GSH concentrations in the 600 mg/d cohort
Myers, et al. (2010) [Australia, WPRO] [74]	Uncontrolled trial	Healthy adults	5 weeks: Titrated dosing schedule containing (per capsule) 18 mg vitamin E as mixed tocopherols (as d-alpha, d-beta, d-delta and d-gamma tocopherols); 113 mg of an antioxidant blend (quercetin dihydrate; grape skin extract; green tea extract; *Terminalia ferdinandiana* [Australian bush plum powder], 331 mg of a proprietary blend of plant polysaccharide and fruit and vegetable powders	Nil	Nil	21	Serum oxygen radical absorbance capacity (ORAC) [BL to Wk 5]	**Increased oxygen levels** Non-smoker: +58 Smoker: +92 (p=0.040)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
			(aloe vera inner leaf gel, gum acacia, xanthan gum, gum tragacanth, gum ghatti, broccoli, brussel sprouts, cabbage, carrot, cauliflower, garlic, kale, onion, tomato, turnip, papaya and pineapple (Ambrotose AO®)					
Pipingas, et al. (2013) [Australia, WPRO] [45]	Randomized controlled trial	Healthy adults	16 weeks: Swisse Ultivite F1® (Men's/Women's formula) multivitamin (MV). Includes B vitamins as well as vitamins C, D and E, together with select mineral chelates and small quantities of select botanicals.	Nil	Placebo	138 (68/70)	General health questionnaire [BL to Wk 16]	NS
							Profile of Mood states [BL to Wk 16]	NS
							Chalder Fatigue scale [BL to Wk 16]	NS
							State-Trait Anxiety Inventory [BL to Wk 16]	NS
							Bond-Lader and visual analog scales [BL to Wk 16]	NS
							Pennebaker Inventory of Limbic languidness [BL to Wk 16]	NS
							Multi-tasking framework [BL to Wk 16]	NS
Pipingas, et al. (2014) [Australia, WPRO] [46]							Cognitive tasks: Swinburne University Computerized Cognitive Assessment Battery [BL to Wk 16]	**Improved cognition** Simple reaction: NS Complex reaction: NS Stroop congruent: Multivitamin, -12; Placebo, +15 Between group: p=0.01
							Immediate and delayed recognition memory, contextual	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							recognition memory, working memory, arrow flankers [BL to Wk 16]	
							Serum homocysteine [BL to Wk 16]	**Reduced homocysteine levels** Multivitamin: -16%; Placebo: -14% Between group: p<0.0001
							Serum vitamin B6 (nmol/L) [BL to Wk 16]	**Increased vitamin B6 levels** Multivitamin: +391%; Placebo: +12% Between group: p<0.0001
							Serum vitamin B12 (nmol/L) [BL to Wk 16]	**Increased vitamin B12 levels** Multivitamin: +33%; Placebo: +3% Between group: p<0.0001
							Red blood cell folate [BL to Wk 16]	**Increased folate levels** Multivitamin: +30%; Placebo: +11% Between group: p<0.0001
Prousky and Seely (2011) [Canada, AMRO] [55]	Randomized controlled trial	Non-ulcer dyspepsia	4 weeks: inositol hexaniacinate (IHN) (540mg crystalline niacin and 54mg inositol)	Nil	Placebo	62 (36/26)	Gastrointestinal Symptom Questionnaire [BL to Wk 4]	NS
							Gastro-test® pH [BL to Wk 4]	NS
Pumpa et al. (2019) [Australia, WPRO] [75]	Randomized controlled trial	Prevention of gastrointestinal Infection	27 weeks: Probiotics (Ultrabiotic 60 and SB Floractiv)	Nil	Placebo	19 (11/8)	Incidence of GI infection [BL to Wk 17]	**Reduced incidence**
							Salivary Immunoglobulin A (U/mL) [BL to Wk 17]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							Salivary alpha-amylase (U/mL) [BL to Wk 27]	**Increased levels** Wk 10: NS Wk 17: NS Wk 27: Probiotic +16.2; Placebo +8.1 Between group p=0.007
							Salivary cortisol (ug/dL) [BL to Wk 27]	**Increased** Wk 10: NS Wk 17: Probiotic, +0.02; Placebo -0.01 Between group p=0.02 Wk 27: Probiotics -0.01; Placebo -0.05 Between group p=0.001
Quinn, et al. (2010) [USA, AMRO] [30]	Randomized controlled trial	Alzheimer's disease (mild to moderate)	18 months: Algal-derived DHA 2g daily	Nil	Placebo	402 (238/164)	Alzheimer's Disease Assessment Scale [BL to Mth 18]	NS
							Clinical Dementia Rating [BL to Mth 18]	NS
							Mini-Mental State Examination [BL to Mth 18]	NS
							Alzheimer's Disease Cooperative Study activity of daily living scale [BL to Mth 18]	NS
							Neuropsychiatric inventory [BL to Mth 18]	NS
							Adverse events [BL to Mth 18]	NS
Rao, et al. (2009) [Canada, AMRO] [76]	Randomized controlled trial (pilot)	Chronic Fatigue Syndrome	8 weeks: Probiotics (24 billion CFU of *Lactobacillus casei* strain Shirota per day)	Nil	Placebo	35 (19/16)	Stool, total aerobes [BL to Wk 8]	**Increased aerobes** Placebo: -0.16; Probiotics: +0.43
							Stool, total anaerobes [BL to Wk 8]	**Increased anaerobes** Placebo: +0.03; Probiotics: +0.26

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							Stool, bifidobacteria [BL to Wk 8]	**Increased bifidobacteria** Placebo: -0.36; Probiotics: +0.66
							Stool, lactobacillus [BL to Wk 8]	**Increased lactobacillus** Placebo: +0.15; Probiotics: +1.12
							Beck Depression Inventory [BL to Wk 8]	NS
							Beck Anxiety Inventory [BL to Wk 8]	NS
Ross, et al. (2008) [USA, AMRO] [77]	Retrospective cohort study	Eating disorders	3 days: Various integrative therapies for insomnia and constipation: insomnia was treated with instructions on sleep hygiene as well as an herbal product (containing valerian root extract, *Rhodiola rosea* root extract, Hops strobiles extract, *Passiflora incarnata* aerial parts extract, and German chamomile flower extract) and/or 5-hydroxytryptophan (the metabolic precursor to serotonin) were prescribed. Constipation was treated with plant-based digestive enzymes at mealtimes and a daily probiotic supplement containing *Lactobacillus rhamnosus*	Herbal product (containing valerian root extract, *Rhodiola rosea* root extract, Hops strobiles extract, *Passiflora incarnata* aerial parts extract, and German chamomile flower extract)	Placebo	38	Medications used for sleep [After Dy 3]	NS
							Sleep medications [After Dy 3]	NS
							Constipation medications [After Dy 3]	NS
Rubin, et al. (2008) [Canada, AMRO] [31]	Case studies	Acne vulgaris	2 months: 1000 mg of EPA (from sardines and anchovies), zinc gluconate 15mg, selenium 200 mcg, chromium 200 mcg and epigallocatechin-3-gallate (EGCG) 200 mg (from green tea extract)	Nil	Nil	5	Inflammatory acne lesions [BL to Mth 2]	**Reduced lesions** Lesions (average): -40 Inflammatory papule lesions (average): -15
							Arizona Integrative Outcomes Scale [BL to Mth 2]	**Increased outcomes** +24% average across domains

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Sarris, et al. (2012) [Australia, WPRO] [47]	Randomized controlled trial	Healthy adults	16 weeks: Swisse Men's Ultivite F1®/Swisse Women's Ultivite F1®(SMV)	Nil	Placebo	116 (56/60)	More energetic and/ or alert [BL to Wk 16]	**Increased energy/ alertness** MV: 29.1%; Placebo: 11.9% (p=0.022)
							Better mood and emotional state [BL to Wk 16]	**Improved mood** MV: 23.6%; Placebo: 8.5% (p=0.027)
							Negative experiences [BL to Wk 16]	NS
Sarris, et al. (2014) [Australia, WPRO] [57]	Randomized controlled trial	Major depressive disorder	Week 12: SAMe 1600mg/day Or Escitalopram 10mg/day	Nil	Placebo	102 (32/35/35)	Hamilton depression score [BL to Wk 12]	**Reduced depression** SAMe: -7.31; Escitalopram: -6.69; Placebo: -4.00 Between group (placebo v SAMe): p=0.018
							>50% reduction of Hamilton depression score [BL to Wk 12]	**Increased clinically important reduction in depression** SAMe: 45%; Escitalopram: 31%; Placebo: 26% Between group (placebo v SAMe): p=0.003
Sarris, et al (2015) [Australia, WPRO] [63]	Randomized controlled trial	Obsessive-compulsive disorder (OCD)	N-acetyl cysteine (NAC)	16 weeks: Week 1 1000mg Week 2 2000mg Week 3 3000mg	placebo	35 (20/15)	Yale – Brown Obsessive Compulsive Scale (YBOCS) [BL to Wk 4, 8, 12 and 16]	**Reduced compulsion** NAC [BL to week 12] (p=0.013 (dissipating at week 16)
							Hamilton Anxiety Rating Scale [BL to Wk 4, 8, 12 and 16]	NS
							Montgomery-Asberg Depression Rating Scale [BL to Wk 4, 8, 12 and 16]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							Clinical Global Impression Scales – Severity and Improvement [BL to Wk 4, 8, 12 and 16]	NS
							General health (GHQ-28) [BL to Wk 4, 8, 12 and 16]	NS
Sarris, et al. (2018) [Australia, WPRO] [48]	Randomized controlled trial	Major Depressive Disorder	8 weeks: S-adenosylmethionine (SAMe) (800 mg/day); Folinic acid (500 mcg/day) and co-factor vitamin B12 (200 mcg/day)	Nil	Placebo	107 (55/52)	Montgomery-Asberg Depression Rating Scale [BL to Wk 8]	NS
							Beck Depression Inventory-II [BL to Wk 8]	NS
							Hamilton Anxiety Rating Scale [BL to Wk 8]	NS
							Short Form-12 [BL to Wk 8]	NS
							Leeds Sleep Evaluation Questionnaire [BL to Wk 8]	NS
							Clinical global impression scales severity and improvement [BL to Wk 8]	NS
Sarris, et al. (2019) [Australia, WPRO] [78]	Randomized controlled trial	Generalized Anxiety Disorder	10 weeks: L-theanine 450mg per day then titrated up to 900mg per day if required	Nil	Placebo	46 (22/24)	Hamilton Anxiety Rate Score [BL to Wk 10]	NS
							Insomnia severity index [BL to Wk 10]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Sarris et al. (2019) [Australia, WPRO] [32]	Randomized controlled trial	Major Depressive Disorder	8 weeks: SAMe (800 mg), folinic acid (500mcg), vitamin B12 (200mcg). Capsules: omega-3 fatty acid concentrate (EPA-esters 1000 mg/day, DHA-esters 656 mg), 5-HTP (200 mg), zinc picolinate (30 mg elemental/ day), vitamin B6 (100 mg), vitamin C (60 mg), magnesium (amino acid chelate, elemental 40 mg), vitamin E (40IU).	Nil	Placebo	158 (81/77)	Montgomery-Asberg Depression Rating Scale [BL to Wk 10]	NS
Schloss, et al. (2017) [Australia, WPRO] [49]	Randomized controlled trial	Newly diagnosed cancer (breast, lymphoma or lung, undergoing chemotherapy)	B-group vitamin complex, initiated 1 week pre-chemotherapy, continued for 12 weeks post-chemotherapy	36 weeks (B1 50 mg, B2 20 mg, B3 100 mg, P5 164 mg, B6 30 mg, folate 500 mcg, B12 500 mcg, biotin 500 mcg, choline 100 mg, inositol 500 mcg)	Placebo	71 (38/33)	Total Neuropathy Score [BL to Wk 12, 24 and 36]	NS
							MD Anderson Brief Pain Inventory [BL to Wk 12, 24 and 36]	NS
							European Organization for the Research and Treatment of Cancer – Quality of Life [BL to Wk 12, 24 and 36]	NS
							Patient Neurotoxicity Questionnaires – sensory, motor or other neuropathy [BL to Wk 12, 24 and 36]	**Reduced sensory neuropathy** Intervention: Wk 2: p=0.03 Wk 24: p=0.005 Wk 36: p=0.021 Placebo: NS Motor and other: NS
Schoenthaler, et al. (2000) [USA, AMRO] [50]	Randomized controlled trial	Healthy children (6-12 yrs)	4 Months: Daily vitamin-mineral supplement containing 50% of the U.S. recommended daily allowance	Nil	Placebo	468 (234/234)	Violations per person [BL to Mth 4]	**Reduced violations per person** MV: 1.0; Placebo: 1.875 p=0.014

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Shinto, et al. (2008) [USA, AMRO] [33]	Randomized controlled trial	Multiple sclerosis	6 months: Naturopathic treatments plus usual care – daily supplementation of the following: multivitamin/ mineral without iron, vitamin C, vitamin E, fish oil, and α-lipoic acid (Pure Encapsulations, Sudbury, MA) and intramuscular vitamin B12 once a week (Apothecure, Dallas, TX).	Dietary therapy (4 levels). Level 1: limit *trans* fatty acids, decrease intake of artificial sweeteners, decrease intake of coffee and alcohol, decrease cigarette use, increase intake of water to 6-8 cups per day; Level 2: Level 1 intervention plus reduced intake of red meat to two 4-6 oz servings per week; Level 3: Level 2 plus no refined sugar, no fried foods, no processed/ packaged foods, no coffee or alcohol; Level 4: hypoallergenic diet (Brennamen's food elimination and challenge)	MS-focused educational visits with a nurse plus usual care	45 (15/15/15)	Short Form-36 [BL to Mth 6]	NS
							Modified Fatigue Impact Scale [BL to Mth 6]	NS
							Beck Depression inventory [BL to Mth 6]	NS
							Stroop test [BL to Mth 6]	NS
							Paced Auditory Serial Addition Test-3 [BL to Mth 6]	NS
							Expanded Disability Status Scale [BL to Mth 6]	NS
Shinto, et al. (2009) [USA, AMRO] [34]	Uncontrolled trial	Multiple sclerosis (relapsing-remitting)	6 months (including 3 months wash out): Omega-3 fatty acids in the form of fish oil concentrate (9.6 g/day containing 2.9 g EPA and 1.9g DHA)	Nil	Nil	10	Immune cell secretion of matrix metalloproteinase-9 (MMP-9) [BL to Mth 3]	**Reduced MMP-9 levels** -58% after 3 months ($p<0.01$)
							Red blood cell omega-3 fatty acid [BL to Mth 3]	**Increased omega-3 levels** Increased (x6.3 times) ($p=0.001$)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Shinto, et al. (2014) [USA, AMRO] [35]	Randomized controlled trial	Alzheimer's disease	12 months: omega-3 fish oil concentrate containing a daily dose of 675mg DHA and 975mg EPA OR omega-3 fish oil concentrate plus alpha-lipoic acid (ALA) 600 mg/day	Nil	Placebo	39 (13/13/13)	Peripheral F2-isoprostane levels [BL to Mth 12]	NS
							Mini-Mental State Examination [BL to Mth 12]	**Improved mental state** omega-3: -4.3; omega-3 + ALA: -1.0; Placebo: -4.6 Between group (Placebo vs ALA): p<0.01
							Activities of Daily Living [BL to Mth 12]	NS
							Instrumental Activities of Daily Living [BL to Mth 12]	**Increased activities of daily living** Omega-3: -0.7; Omega-3 + ALA: -0.9; Placebo: -4.2 Between group (Placebo vs ALA): p<0.01 Between group (Placebo vs Omega-3): p<0.01
							Alzheimer's Disease Assessment Scale-cognitive subscale [BL to Mth 12]	NS
Shinto, et al. (2016) [USA, AMRO] [36]	Randomized controlled trial	Multiple sclerosis (with major depressive disorder)	3 months: omega-3 fatty acids in the form of fish oil at a daily dose of 5.81g (1.95 grams of EPA and 1.35 grams of DHA)	Nil	Placebo	39 (21/18)	Montgomery-Asberg Depression Rating scale [BL to Mth 3]	NS
Smith, et al. (2017) [Australia, WPRO] [37]	Uncontrolled trial	Major Depressive Disorder	8 weeks: DHA (260 mg or 520 mg/day)	Nil	Nil	26 (21/5)	Hamilton Depression Rating Scale (HAM-D) [BL to Wk 8]	**Reduced depression** -10.33, (p<0.001)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							⩾50% reduction on HAM-D [BL to Wk 8]	**Increased clinically important reduction in depression** Clinical response to treatment: 54% In remission: 46% (p<0.0001)
							Clinical Global Impression Severity Scale [BL to Wk 8]	**Reduced symptom severity** -1.28 (p<0.05)
							Epsworth sleepiness scale [BL to Wk 8]	NS
Traub, et al. (2014) [USA, AMRO] [62]	Randomized controlled trial	Healthy adults with low serum 25-hydroxycholecalciferol (25(OH)D)	12 weeks: 10,000 IU Vitamin D3 daily 1. Chewable tablet 2. Liquid drop 3. Capsule	Nil	Nil	66 (22/23/21)	Total serum 25(OH) D/mcg [BL to Wk 12]	**Increased vitamin D levels** Tablet: +33.3; Liquid: +34.4; Capsule: +53.6 Between groups: p=0.04
							Difference in proportion of D3 between interventions [BL to Mth 12]	Drops had greater increase than tablets (p<0.05). Tablet not different to capsule
							Patients reaching sufficiency [BL to Mth 12]	Tablet: 100%; Drop: 80%; Capsule: 100% (p=0.03)
							Mean change in serum 1,25 (OH)D [BL to Mth 12]	NS
Vitetta, et al. (2013) [Australia, WPRO] [79]	Randomized controlled trial	Adults experiencing frequent cold-related symptoms	Bovine lactoferrin (Lf) 400mg and whey protein Ig rich fraction (IgF) 200mg daily for 90 days	Nil	Placebo	105 (53/52)	Total cold events [BL to Dy 45, Dy 90]	**Reduced occurrence of common cold** Dy 1-45: Lactoferrin 0.67; Placebo 1.40 Between group p<0.001 Dy 46-90: Lactoferrin 0.38; Placebo 1.02 Between group p<0.001 Dy 1-90: Lactoferrin 0.93; Placebo 2.26 Between group p<0.001

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Total number of cold-associated symptoms [BL to Dy 90]	**Reduced cold-associated symptoms** Lactoferrin, 208; Placebo, 288 Between group p<0.05
							Cold duration [BL to Dy 90]	NS
							Cold severity [BL to Dy 90]	NS
Withee, et al. (2017) [USA, AMRO] [80]	Randomized controlled trial	Healthy adult runners	21 days (+2 days post-race): Methylsulfonylmethane (MSM) as OptiMSM® 3g/day prior to half-marathon	Nil	Placebo	22 (11/11)	VAS for muscle pain [BL to Dy 23]	NS
							VAS for joint pain [BL to Dy 23]	NS
							8-hydroxy-2'-deoxyguanosine [BL to Dy 23]	NS
							Malondialdehyde [BL to Dy 23]	NS
							Serum creatine kinase [BL to Dy 23]	NS
							Lactate dehydrogenase [BL to Dy 23]	NS
Yadav, et al. (2005) [USA, AMRO] [64]	Randomized controlled trial	Multiple Sclerosis	14 days: Lipoic acid (a) 600mg twice per day; (b) 1200mg once per day; (c) 1200mg twice per day	Nil	Placebo	37 (10/9/9/9)	Serum lipoic acid [BL to Dy 14]	**Increased levels** Variable levels across all participants 600mg: 0.2ug/mL 1200mg: 4.8ug/mL 2400mg: not reported Placebo: 0.1 ug/mL Between group p<0.05
							Matrix metalloproteinase-9 (MMP-9) [BL to Dy 14]	**Increased MMP-9** +1ug/mL serum lipoic acid correlated with -11.10 units of serum matrix metalloproteinase-9 (p=0.04)
							Serum intercellular adhesion molecule-1 [BL to Dy 14]	**Increased levels** Dose response with lipoic acid (p=0.03)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Yazaki, et al. (2010) [USA, AMRO] [59]	Randomized controlled trial	Overweight	6 months: 1000 mg of chromium picolinate/day	Nil	Placebo	80 (40/40)	Body mass index [BL to Mth 6]	NS
							Body fat (%) [BL to Mth 6]	NS
							Fasting glucose (mg/dl) [BL to Mth 6]	NS
							Fasting serum insulin (u/ml) [BL to Mth 6]	NS
							Cholesterol (mg/dl) [BL to Mth 6]	NS
							High-sensitivity C-reactive protein (mg/dl) [BL to Mth 6]	NS

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32 Herbal Medicine

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HIGHLIGHTS

- Herbal medicine is one of the most common therapies used globally and is a core aspect of naturopathic care.
- Naturopathic training includes a wide range of herbs and integrates herbs common to each Region.
- Clinical research by the naturopathic community has examined the application of single herbs, complex herbal formulations, essential oils, and topical herbal medicine applications.
- In line with the role of primary care, naturopathic researchers have investigated the effects of herbal medicine on individuals with mental health conditions, women's health conditions, gastrointestinal conditions, cardiovascular conditions, musculoskeletal conditions, skin conditions, cancer, complex immune conditions, and a range of other health conditions.

Herbal medicine (also known as botanical medicine or phytotherapy) involves the use of plants, lichen, fungi, and algae in the prevention and treatment of human disease. The naturopathic profession has always included herbal medicine as a pre-eminent modality, strongly influenced by Sebastian Kneipp who identified phytotherapy as one of the "five pillars" of treatment [1-4]. A 2020 international naturopathic survey confirmed the significant importance of herbal medicine in current naturopathic practice with more than half of naturopathic visits including some form of herbal prescription [5]. Hence, the chapter on complex naturopathic interventions (Chapter 29) also includes research on herbal medicine.

The use of herbal medicine in naturopathic practice ranges from herbs as food, the prescription of single herbs (either in whole form or various extracts or use of unaltered constituents from these sources) and compounded formulations with more than one herbal remedy. Herbs may be prescribed as pre-formulated proprietary products (i.e., commercially produced formulas), or dispensed extemporaneously (i.e., compounded onsite for the specific needs of the individual patient). Herbs can be prescribed internally as part of diet, as teas, tinctures, essential oils, or tablets/capsules, and can also be used topically in creams, oils and in poultices and compresses.

Naturopaths and naturopathic doctors are trained to use a wide range of herbs from mild herbs such as *Allium sativum* (garlic), *Zingiber officinale* (ginger), *Salvia rosmarinus* (rosemary), and *Avena sativa* (oats) to extremely powerful herbs that arguably are the basis of modern pharmacological medicine, such as *Digitalis purpurea* (foxglove) yielding digoxin, *Atropa belladonna* (deadly nightshade) yielding atropine, *Pausinystalia johimbe* (yohimbe) yielding yohimbine, *Rauvolfia serpentina* (Indian snakeroot) yielding reserpine, and *Papaver somniferum* (opium poppy) yielding morphine. The range of herbs employed by naturopaths/naturopathic doctors, and the form and dosage, vary based on access to specific herbal medicines in a region as well as the education and scope of practice in a jurisdiction. The integrated nature of naturopathic care supports the use of indigenous herbs in each WHO Region. Hence, the specific herbs studied and prescribed in North America, for example, would likely vary somewhat from those used by naturopaths and naturopathic doctors in Africa or Europe.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=46, published papers 48) naturopathic clinicians undertook in the field of herbal medicine. This research includes a total of 2,745 participants and was conducted in the United States of America (USA) (n=25), Australia (n=13), Canada (n=6), Germany (n=2), India (n=1) and Puerto Rico (n=1). The study designs include randomized controlled trials (RCT) (n=23), case reports (n=14), uncontrolled trials (n=7), retrospective cohort studies (n=2) and secondary analysis (n=2). The

studied interventions evaluated either single herbal remedies (n=27), complex herbal formulations (n=17), topical uses of herbs (n=4) and essential oils (n=2). The conditions treated with herbal medicine ranged from mental health conditions (anxiety (n=4), depression (n=4), ADHD (n=1)); women's health conditions (menopausal symptoms (n=3), candidiasis (n=1), ovarian cysts (n=1), pregnancy issues (n=1)); gastrointestinal conditions (IBS/IBD (n=4)), cardiovascular conditions (heart failure (n=2), leg ulcers (n=2)), musculoskeletal conditions (osteoarthritis (n=1)); skin conditions (dermatitis (n=1), plantar warts (n=1), psoriasis (n=1), vitiligo (n=1)), cancer (breast cancer (n=2), colorectal cancer (n=2), prostate cancer (n=1), general cancer (n=1)), complex immune conditions (human immunodeficiency virus (HIV) (n=2), hepatitis C (n=1)) and other conditions (kidney disease (n=1), asthma (n=2), insomnia (n=2)). Studies were also conducted to determine the impact on healthy volunteers for tasks such as improved driving (n=2).

The studies on naturopathic herbal interventions were completed in a wide range of settings, including naturopathic medical schools and research institutes, private naturopathic practices, and conventional hospitals, clinics, and research centers. While most studies looked at treatment of established conditions, three were conducted principally to determine the safety of various herbal medicines. Of all the naturopathic clinical studies employing herbal medicine interventions, 71.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 32.1: Clinical research investigating herbal medicine interventions conducted by naturopathic researchers.* This body of naturopathic research on herbal medicine is also supported by more than 30 observational studies and more than 120 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

As indicated by the naturopathic research, a wide range of herbs are used in naturopathic practice in a diverse range of conditions. Naturopathic researchers have investigated whole plants, extracts, and isolated constituents as well as single and combination herbs used internally and topically. The research in herbal medicine indicates that herbal medicine interventions provide significant outcomes in most conditions.

Herbal medicines are one of the most common forms of treatment globally, historically through traditional practices but increasingly via integration into developed health systems, with the World Health Organization *2019 Global Report on Traditional and Complementary Medicine* noting that at least 34 countries include herbal medicines in their essential medicines lists [6]. However, the same report identified regulatory issues in the herbal medicine sector which impacted on the safety, quality, and efficacy of herbal medicines. Naturopaths/naturopathic doctors are one profession which has been identified as having a high level of knowledge about regulatory, clinical and safety issues surrounding herbal medicines [7]. This knowledge is formed from a focused education including pharmacognosy and integrated pharmacology, leading to naturopaths/naturopathic doctors playing leading research and clinical roles in identifying and managing drug-herb interactions in primary health care [8, 9]. As such, naturopaths/naturopathic doctors are particularly well-equipped to assist patients manage their use of herbal medicines in conjunction with other therapies [10]. These qualities, in addition to evidence of beneficial application of herbal medicines by the naturopathic community, suggest a greater role of naturopaths/naturopathic doctors in maximizing the benefits of herbal medicine use and minimizing potential harms is warranted.

Studies investigating specific interventions:

Single Herb Interventions

The 26 studies investigating single herbs included the following 18 herbs: two using standard extracts of *Aesculus hippocastanum* for venous insufficiency [11, 12]; *Allium sativum* in the treatment of candidiasis [13]; *Andrographis paniculata* in the treatment of HIV [14]; one using *Artemisia annua* in prostate cancer patients [15]; one using *Bacopa monnieri*, with adults with anxiety and depression [16]; a study using standardized extracts of *Camellia sinensis* in the treatment of breast cancer [17, 18]; a study on *Crataegus laevigata* for heart failure [19, 20]; *Curcuma longa* was studied in children with Crohn's or ulcerative colitis [21]; *Echinacea purpurea* for upper respiratory tract infections [22], *Ginkgo biloba* in the treatment of vitiligo [23]; there were three studies of *Hypericum perforatum*, one in the treatment of depression [24]; one which included *Piper methysticum* in the treatment of anxiety [25] and one with children and adolescents for the treatment of ADHD [26]. ; the safety of *Larrea tridentata* on liver function was studied [27]; one study on *Matricaria chamomilla* for insomnia [28]; one study of *Panax quinquefolius* for upper tract infections in children [29]; *Piper methysticum* impact on driving ability was measured in healthy adults [30]; *Silybum marianum* in the treatment of hepatitis C [31]; *Trigonella foenum-graecum* in the treatment of menopausal symptoms [32]; *Vitex agnus-castus* fruit extract along with vaginal Progesterone for history of spontaneous abortions [33]; three studies on *Zingiber officinale*, two in the treatment of colorectal cancer [34, 35] and one in the management of chemotherapy induced nausea and vomiting [36].

A randomized double-blind, placebo-controlled trial conducted in Australia (n=60) with adult participants with more than one month of generalized anxiety on the Hamilton Anxiety Scale (HAS) were prescribed placebo or *Piper methysticum*, 5 tablets containing 250 mg/d kavalactones [37]. There was a significant reduction in anxiety based on the HAS -10.3, p<0.001, the Beck anxiety index (BAI) score, -8.1, p<0.001, and the Montgomery Asberg Depression Rating Score, -7.6 p=0.003. The aqueous extract was safe with no serious adverse effects or clinical hepatotoxicity.

A randomized placebo control trial conducted in the USA involving 48 adult participants with anxiety and depression found that *Bacapa monnieri* standardized to 50% bacosides A and B, 300mg once daily resulted in significant improvements both at 6 weeks and 12 [16]. The results at 12 weeks were increased learning based on the Rey Auditory Verbal Learning Test (*B.monnieri*, +1.2; placebo +.01; p=0.03), reduced depression based on the Center for Epidemiological Studies Depression scale (*B.monnieri*, -0.9; placebo, +0.8; p=0.05), reduced anxiety based on the State-Anxiety Inventory (*B.monnieri*, -1.6; placebo, +1.1; p=0.04), reduced stroop task reaction time (*B.monnieri*, -2.9; placebo, -0.4; p=0.003) and reduced heart rate (*B.monnieri*, -1.1; placebo, +5.1; p=0.01).

An uncontrolled trial conducted in Canada with twelve participants (ages 12 – 35 years) with confirmed vitiligo, were given standardized *Ginkgo biloba* extract, 60mg BID for 12 weeks [23]. Eleven completed the trial with 85% or more compliance. The progression of vitiligo stopped in all subjects, the vitiligo lesion area scoring index for affected areas decreased (-0.05, p=0.021), the vitiligo European Task Force scale showed reduced disease activity (-3.9, p<0.001), and there were no significant changes in blood clotting markers. Another uncontrolled trial conducted in Canada (n=11) prescribed *Echinacea purpurea* for ten days in children (2-5 years old [n=7] and 6-12 years old [n=4]) for the treatment of upper respiratory tract infections (URTI) [22]. Improvement was seen on all measures assessed: children experiencing sneezing decreased from 5 to 1, nasal secretions 5 to 2, cough 7 to 2, difficulty breathing 5 to 2 and difficulty swallowing 2 to 0.

Complex Herbal Formulations

Naturopaths/naturopathic doctors often prescribe complex herbal formulations as part of a multi-faceted naturopathic treatment. This section focuses on the 17 studies where complex herbal formulations were the primary focus of the study. The complex herbal formulations included between two and eleven different herbs. The conditions treated with herbal complexes included PCOS [38], two studies on depressive with anxiety [16, 25, 39], dermatitis [40], HIV [41], two studies on asthma [42, 43], facial rash [44], IBS [45], cervical cancer [46], chronic kidney disease [47], plantar warts [48], menopausal symptoms [49, 50], sleep difficulties [51] and quality of life in breast cancer [52].

Four of the complex intervention studies assessed the safety and risk of adverse events using several measurements including laboratory testing of liver enzymes and reporting of symptoms compared to a control group [38, 39, 50, 53]. One additional study described the safety profile and adverse effects associated with some herbal medicines as observed by naturopaths/naturopathic doctors in clinical practice [54].

A randomized controlled trial conducted in Australia with women (n=104) experiencing menopausal symptoms scoring greater than 'mild' on MENQOL examined the effects of a multi-botanical capsule comprising of 100mg *Tinospora cardiofolia* (stem), 100mg *Asparagus racemosus* (root), 100mg *Withania somnifera* (root) and 225mg *Commiphora mukul* (gum exudate) [50]. Throughout the study period of 12 weeks, participants in the intervention group (n=54) ingested one capsule twice daily and the placebo group (n=50) were given an identical capsule containing maltodextrin. A change from baseline at Week 4, 8 and 12 for all symptom domains of the MENQOL questionnaire was used to measure study outcomes. A statistically significant difference in change in symptom scores for each domain was reported between groups, with a greater reduction in symptoms reported for the intervention group compared to placebo (p≤0.002). The study also measured changes from baseline in the 7-day incidence of hot flushes, night sweats and total vasomotor symptoms at Week 4, 8 and 12. The intervention group reported a reduction in hot flushes (-30%), night sweats (-50%), and total vasomotor symptoms (-43%) at Week 4, and these reductions increased in magnitude through to Week 12 (Hot flushes: -64%; night sweats: -71%; total flushes: -67%). The difference in change in 7-day incidence of vasomotor symptoms between the intervention and placebo groups was statistically significant across all time points for all symptom categories (p<0.001). Safety data collected in this study found no difference between groups.

A randomized controlled trial conducted in Australia sampled women (n=122) between 18 and 44 years old with PCOS diagnosis confirmed according to the Rotterdam criteria [38]. The study compared a lifestyle intervention with a combined lifestyle and herbal intervention for three months. The lifestyle intervention consisted of lifestyle counselling, inclusive of dietary and exercise behaviours, delivered through a structured personalized plan and fortnightly follow-up support. The herbal medicine intervention constituted administration of two herbal medicine products: (1) Three tablets administered daily containing combined extracts equivalent to 750mg *Glychyrrhiza glabra* (root), 750mg *Paeonia lactiflora* (root), 750mg *Cinnamomum verum* (stem bark) and 750mg *Hypericum perforatum* (flowering herb); (2) Three tablets per day for ten consecutive days – commencing either

on Day 5 of the menstrual cycle of women with oligomenorrhea or within one week of trial commencement for women with amenorrhea-containing a single herbal extract equivalent to 13 500mg *Tribulus terrestris* (aerial parts) standardized to 100mg furostanol saponins (protodioscin). There were 60 participants in the herbal and lifestyle (HL) intervention arm and 62 participants in the lifestyle only (LO) arm. At the end of the 3-month study period, a significant ($p<0.01$) difference in number of days between menstrual periods (Mean difference: -42.9 days), body weight (-2.95 kg), body mass index (-1.0), waist circumference (-3.41 cm) in favor of the HL group compared to LO was reported. Comparatively greater reductions in luteinizing hormone (-1.82 IU/L), fasting insulin (-0.44 mU/L) and systolic (-3.6 mmHg) and diastolic (-5.13 mmHg) blood pressure, as well as increased estradiol (+68.9 pmol/L) were also reported in the HL group. The quality-of-life scores, as measured by the Polycystic Ovarian Syndrome Questionnaire (PCOSQ), were also lower in the HL group compared with the LO group, indicating an improved quality of life in participants receiving HL ($p<0.01$). Depression, anxiety, and stress levels were also significantly reduced for participants in the HL group compared to those receiving LO ($p<0.01$). Pregnancy rates were higher (RR 3.9) for women in the HL group compared with the control, but no difference in the proportional rates of miscarriage was reported between groups.

An uncontrolled trial (n=31) conducted in Australia compared two herbal formulae in the treatment of irritable bowel syndrome (IBS) [45]. The first formula DA-IBS contained dried bilberries (*Vaccinium myrtillus*) 20g, Slippery elm (*Ulmus fulva*) 9g, Cinnamon (*Cinnamomum zeylanicum*) 3g, and Agrimony (*Agrimonia eupatoria*) 6g. The second formulae C-IBS formula contained Lactulose 6g, Slippery elm (*Ulmus fulva*) 14g, Licorice (*Glycyrrhiza glabra*) 3g, and Oat bran (*Avena sativa*) 4g. Twenty-one of the participants received DA-IBS and 10 received C-IBS at a dosage of twice daily in 250 ml of apple juice for three weeks. At the end of the intervention there was an overall reduction in symptoms compared to baseline DA-IBS -0.4 ($p=0.002$) and C-IBS -0.71 ($p=0.0005$). The reduction in diarrhea was greater in the DA-IBS (-0.19 $p=0.03$), reduction in straining was greater in C-IBS (DA-IBS -0.19, $p=0.004$ vs C-IBS -0.74, $p<0.0001$), both formulae resulted in a reduction in pain (DA-IBS -0.19, $p=0.006$ vs C-IBS -0.20, $p=0.03$) and bloating (DA-IBS -0.32, $p<0.0001$ vs C-IBS -0.19, $p=0.03$) and the reduction in flatulence was greater in the DA-IBS formula -0.25 ($p=0.0001$) versus no significant change on this scale with the C-IBS formula.

Essential Oils

There were two studies that involved essential oils. One focused on peppermint oil in the treatment of IBS and SIBO [55], and the other on caraway oil in the treatment of IBS [56]. A case report conducted in Canada examined peppermint oil in a case involving a patient with small intestine bowel overgrowth symptoms based on the lactulose hydrogen breath test. The results indicated a marked reduction in hydrogen production (-22ppm) after a twenty-day treatment with enteric coated peppermint oil (*Mentha x piperita*). The patient in this study also reported decreased bloating, pain, eructation and improvement in bowel function [55].

Topical Applications

Five studies examined the use of herbal remedies topically and were conducted in Germany [56, 57], the USA [40, 46] and India [58]. The studies investigated caraway (*Carum carvi*) oil in a hot abdominal poultice [56], the use of cabbage leaf wraps for osteoarthritis of the knee [57], a starch-fortified turmeric bath for psoriasis [58], and *Calendula officinalis* applied as part of a multi-faceted naturopathic approach for poison oak dermatitis [40] and as part of an integrative treatment for class IV carcinoma in situ of the cervix [46].

A randomized controlled trial conducted in Germany involved participants (n=48) with IBS who were either treated with poultices of hot caraway (*Carum carvi*) oil, hot olive (*Olea europea*) oil, or non-heated olive oil in a cross-over design [56]. During the three-week trial, the reduction of IBS symptoms based on the IBS Symptom Severity Scale was -35.4 during caraway oil treatment, -20.0 during hot olive oil treatment and -4.3 during unheated olive oil treatment.

A randomized clinical trial conducted in India (n=60) assessed the effectiveness of a starch-fortified turmeric bath along with general naturopathic care on patients with psoriasis over a period of ten days [58]. Based on the Psoriasis Area and Severity Index those receiving the turmeric bath reported a reduction in severity of -13.9 whereas those receiving only standard naturopathic care reported a reduction of -0.15 ($p<0.01$).

Table 32.1 Original research on herbal medicine interventions conducted by naturopathic researchers

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Arentz, et al. (2017) [Australia, WPRO] [38]	Randomized controlled trial	Polycystic ovarian syndrome (Women, 18 – 44 years, BMI >24.5 kg/m^2)	Herbal medicine: Tableted extracts of *Glycyrrhiza glabra* root 2.25 g, *Paeonia lactiflora* root without bark 2.25 g, *Cinnamomum verum* bark 2.25 g, *Hypericum perforatum* flowering tops 2.25 g (throughout the cycle), *Tribulus terrestris* aerial parts (standardized to 110 mg protodioscin/tablet) 40.5 g (follicular phase of menstrual cycle only) once per day.	Lifestyle change: calorie-controlled, low-glycemic, nutrient-dense diet; 150 min exercise per week including 90 min aerobic activity (60 – 90% of maximum heart rate) with optional occasional supervised exercise sessions	Lifestyle change only	122 (60/62)	Time between menstrual periods (days) [BL to Mth 3]	**Reduced time between menstrual periods** Herbal and Lifestyle: 63.7; Lifestyle only: 106.6 Between group: p<0.01
							Women with normal menstrual cycle length defined as 20 – 34 days (%) [BL to Mth 3]	**Increased proportion** Herbal and Lifestyle: 55%; Lifestyle only: 24.2% Between group: p<0.01
							Body weight (kg) [BL to Mth 3]	**Reduced body weight** Herbal and Lifestyle: 90.2; Lifestyle only: 97.2 Between group: p<0.01
							Body mass index (kg/m^2) [BL to Mth 3]	**Reduced BMI** Herbal and Lifestyle: 33; Lifestyle only: 35 Between group: p<0.01
							Waist-to-hip ratio [BL to Mth 3]	NS
							Serum luteinizing hormone (LH) level (IU/L) [BL to Mth 3]	**Reduced LH** Herbal and Lifestyle: 5.84; Lifestyle only: 7.4 Between group: p=0.04
							Serum FSH (IU/L) [BL to Mth 3]	NS
							Serum oestradiol (pmol/L) [BL to Mth 3]	**Increased oestradiol** Herbal and Lifestyle: 217; Lifestyle only: 148.1 Between group: p=0.03
							Serum testosterone, total (nmol/L) [BL to Mth 3]	NS
							Serum sex hormone- binding globulin (nmol/L) [BL to Mth 3]	NS
							Serum fasting glucose (nmol/L) [BL to Mth 3]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Serum insulin (mU/L) [BL to Mth 3]	**Reduced insulin levels** Herbal and Lifestyle: 12.3; Lifestyle only: 20.3 Between group: p=0.02
							Blood pressure (BP), systolic (mmHg) [BL to Mth 3]	**Reduced systolic BP** Herbal and Lifestyle: 114.3; Lifestyle only: 118 Between group: p=0.01
							Blood pressure (BP), diastolic (mmHg) [BL to Mth 3]	**Reduced diastolic BP** Herbal and Lifestyle: 69.3; Lifestyle only: 74.6 Between group: p<0.01
							Impact on health-related quality of life (total PCOS score) [BL to Mth 3]	**Reduced quality of life** Herbal and Lifestyle: 81.5; Lifestyle only: 109.3 Between group: p<0.01
							Depression, Anxiety and Stress Scale [BL to Mth 3]	**Reduced depression** Herbal and Lifestyle: 3.5; Lifestyle only: 7.5 Between group: p<0.01 Reduced anxiety Herbal and Lifestyle: 2.4; Lifestyle only: 6.3 Between group: p<0.01 Reduced stress Herbal and Lifestyle: 4.9; Lifestyle only: 9.6 Between group: p<0.01
Aucoin (2017) [Canada, AMRO] [39]	Case study	Major depressive disorder and social anxiety disorder	Herbal formula (*Hypericum perforatum* 60mg, *Passiflora incarnata* 32mg, *Valeriana officinalis* 28mg)	Breakfast smoothies, increased vegetable intake, 45 min exercise twice weekly. Supplement: fish oil (EPA 750mg: DHA 500mg)	Nil	1	Subjective mood and anxiety symptoms [BL to Wk 4]	**Improved mood at each return visit, increased tolerance to anxiety provoking situations, increased energy, and no headaches**

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
				iron ferrous bisglycinate 36mg, methyl cobalamin 300µg, L-5-methyltetrahydrofolate 400µg, pyridoxal 5'-phosphate 5mg, vitamin C 15mg, 1 capsule daily methyl cobalamin 1mg daily sublingual.				
Aucoin (2018) [Canada, AMRO] [33]	Case study	Recurrent pregnancy loss (Female, 29 years)	*Vitex agnus-castus* fruit extract 166.6 mg, 2 capsules per day (fifth and six pregnancies) Progesterone 200 mg vaginal pessary twice daily (from week 5 to week 10 of fifth pregnancy only)	Nil	First pregnancy on presentation (fourth pregnancy in case received no treatment)	1	Serum β-human chorionic gonadotropic (HcG)(IU/ml)	**Increased HcG** 4th pregnancy: 459 5th pregnancy: 1200 6th pregnancy: Not reported
							Serum progesterone (nmol/ml)	**Increased progesterone** 4th pregnancy: 22.1 5th pregnancy: 85.0 6th pregnancy: Not reported
							Pregnancy outcome	**Live births** 4th pregnancy: spontaneous abortion at 5 weeks, 6 days 5th pregnancy: full-term live birth 6th pregnancy: 38 weeks' pregnancy with normal, live, singleton expected

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Bares, et al. (2008) [USA, AMRO] [31]	Uncontrolled trial	Hepatitis C (chronic)	12 weeks: Standardized silybin and soy phosphatidylcholine complex (IdB 1016) 314mg with 120mg silybin per capsule Dose 1: 314mg tds Dose 2: 628mg tds Dose 3: 942mg tds	Nil	Nil	37	Serum iron (ug/dL) [BL to Wk 12]	NS
							Total Iron binding capacity (ug/dL) [BL to Wk 12]	NS
							Transferrin-iron saturation (%) [BL to Wk 12]	NS
							Serum ferritin, by dose (ug/L) [BL to Wk 12]	**Reduced ferritin levels** All participants: -30 (p=0.0005) Dose 1: -51 (p=0.004) Dose 2: -13 (p=0.03) Dose 3: NS
							Serum ferritin, by stage of fibrosis (ug/L) [BL to Wk 12]	**Reduced ferritin levels (Stage III and IV)** Stage II: NS Stage III: -36 (p=0.005) Stage IV: -16 (p=0.01)
							Liver enzymes [BL to Week 12]	NS
Calabrese, et al. (2000) [USA, AMRO] [14]	Uncontrolled trial	Human immunedeficiency virus (Adults, >18 years)	Andrographolide (from *Andrographis paniculata*) 5 or 10 mg/kg tid (planned 20 mg/kg tid dose not administered due to adverse effects). Isolated herbal constituent	Nil	HIV negative patients	18 (HIV+, 13/HIV-, 5)	Adverse effects including allergy (including anaphylaxis), fatigue, headache, rash, diarrhea, nausea, abnormal taste, and others [BL to Wk 6]	**Adverse effects** HIV+: 12/13 (92%), one experienced anaphylaxis requiring hospitalization HIV-: 4/5 (80%)
							Serum AST [µL] [BL to Wk 6]	NS
							Serum ALT [µL] [BL to Wk 6]	**Increased ALT** HIV+: Wk 3, +22.3 (p<0.005); Wk 6, +20.6 (p<0.005); Wk 9, NS HIV-: NS
							Serum CD4 count [cell/ mm3] [BL to Wk 6]	**Increased CD4 count** HIV+: Wk 3, NS; Wk 6, 501.1 vs 404.8 (p=0.002); Wk 9, NS HIV-: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							HIV-1 RNA [log copies/ ml] [BL to Wk 6]	NS
Calabrese, et al. (2008) [USA, AMRO] [16]	Randomized controlled trial	Anxiety and depression (adults ⩾65 years old, without signs of dementia)	*Bacopa monnieri* aerial parts dry methanol extract tablet, standardized to 50% bacosides A and B, 300 mg once daily	Nil	Placebo	48 (24/24)	Rey Auditory Verbal Learning Test delayed recall (# of words) [BL to Wk 6 and 12]	**Increased learning** Wk 6: Bacopa, +0.2; placebo, -0.2 Wk 12: Bacopa, +1.2; placebo, +.01 Between group: p=0.03
							Rey Auditory Verbal Learning immediate reaction times [BL to Wk 6 and 12]	NS
							Center for Epidemiologic Studies Depression scale [BL to Wk 6 and 12]	**Reduced depression** Wk 6: Bacopa, -0.1; placebo, +1.8 Wk 12: Bacopa, -0.9; placebo, +0.8 Between group: p=0.05
							State-Trait Anxiety Inventory [BL to Wk 6 and 12]	**Reduced anxiety** Wk 6: Bacopa, -2.0; placebo, +2.7 Wk 12: Bacopa, -1.6; placebo, +1.1 Between group: p=0.04
							Stroop task reaction time (seconds) [BL to Wk 6 and 12]	**Reduced** Wk 6: Bacopa, -3.8; placebo, -0.6 Wk 12: Bacopa, -2.9; placebo, -0.4 Between group: p=0.003
							Stroop task errors (seconds) [BL to Wk 6 and 12]	NS
							Divided attention task score [BL to Wk 6 and 12]	NS
							Wechsler Intelligence Scale digit task [BL to Wk 6 and 12]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Profile of Mood States [BL to Wk 6 and 12]	NS
							Heart rate [bpm] [BL to Wk 6 and 12]	**Reduced** Wk 6: Bacopa, -1.4; placebo, +2.8 Wk 12: Bacopa, -1.1; placebo, +5.1 Between group: p=0.01
							Blood pressure [mmHg] [BL to Wk 6 and 12]	NS
Canavan and Yarnell (2005) [USA, AMRO] [40]	Case report	Dermatitis not responsive to topical steroids (51-year-old white healthy female)	(1) Initial treatment: chlorine/water wash (2) Second treatment: *Calendula officinalis* and *Ocimum tenuiflorum* ointment, homeopathic rhus tox 30C (3) Third treatment: topical corticosteroid (specific drug and concentration unknown), homeopathic causticum 30C and arsenicum 30C (4) Fourth treatment: *Impatiens capensis* tincture and *Calendula officinalis* cream topically, homeopathic sulfur 30C (5) Fifth treatment: *Grindelia* spp tincture topically and *Grindelia* spp/*Calendula officinalis* cream	Homeopathic sulfur 30C	Nil	1	Skin area affected by rash, self- and physician-assessed	**Reduced rash** 1: reduction on left arm, no change on right 2: spread from arms to supra-pubic region, lower legs, and forearms 3: stable 4: stable 5: rash area stopped oozing and shrank gradually to total resolution
Crew, et al. (2012) [USA, AMRO] [17]	Randomized controlled trial	Breast cancer stage I-III hormone receptor negative, completed adjuvant treatment (survivors)	Oral Green tea (Poly E) – Sinecatechins, a combination of four catechin flavonoids from *Camellia sinensis*	Nil	Placebo	34 (26/8)	Dose-limiting toxicity	1 at 400mg (grade III rectal bleeding) 3 at 600mg (grade II weight gain, grade III indigestion and insomnia) 1 at 800mg (grade III liver functional abnormality)
							Maximum tolerated dose	600mg twice daily (BID)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Crew, et al. (2015) [USA, AMRO] [18]	Secondary analysis						Hepatocyte Growth factor (HGF) [BL to Mth 2, 4 and 6]	**Reduced HGF** Poly E 2mths: 12.7% compared to placebo, 6.3% (p=0.04) 4 Mths and 6 mths: NS
							VEGF [BL to Mth 2, 4 and 6]	NS
							Lipids [BL to Mth 2, 4 and 6]	NS
							Oxidative damage [BL to Mth 2, 4 and 6]	NS
							Inflammatory biomarkers [BL to Mth 2, 4 and 6]	NS
D'Adamo (1992) [USA, AMRO] [41]	Case series	Human immunodeficiency virus/ Autoimmune deficiency syndrome	*Chelidonium majus* 175 mg, *Sanguinaria canadensis* 5 mg, *Ulmus rubra* 20 mg, 1 – 3 tid; concomitant use of *Glycyrrhiza glabra* solid extract (dose not stated). Capsules of freeze-dried extracts. (RZ_2)	Nil	Nil	13, 8 on anti-retroviral drugs; 5 not	Lymphadenopathy (n=8) [unknown]	8/8 had diminished node size and tenderness, 3/8 had total or near total resolution after 3 weeks of RZ2
							Serum CD8 lymphocyte count (n=11) [unknown]	1/11 mild increase (⩽7%), 5/11 no change, 4/11 mild decrease (⩽7%), 1/11 large decrease (>7%)
							Serum CD4 lymphocyte count (n-11) [unknown]	4/11 mild increase (⩽7%), 4/11 no change, 3/11 mild decrease
							Self-assessed energy level (n=8) [unknown]	6/8 energy increased, 2/8 no improvement
Frances (1998) [USA, AMRO] [42]	Case series	Asthma	Concomitant therapeutics highly variable but included: *Passiflora incarnata* tincture, *Piper methysticum* tincture, *Verbascum thapsus* spp tincture, *Eriodictyon* spp tincture, *Aspidosperma quebracho* tincture, *Oplopanax horridus* tincture, *Eleutherococcus senticosus* tincture, *Glycyrrhiza glabra* glycerite, *Echinacea* spp tablets, *Astragalus propinquus*	B complex, antioxidants, nutrients and homeopathic remedies	Nil	6	Beta-agonist inhaler use [unknown]	Elimination or substantial reduction in use

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
			tincture, *Eupatorium perfoliatum* tincture, *Chelidonium majus* tincture, *Taraxacum officinale* tincture, *Silybum marianum* tincture, *Cynara scolymus* tincture, *Bupleurum falcatum* tincture, *Berberis* spp tincture, *Althaea officinalis* tincture, *Foeniculum vulgare* tincture, *Hypericum perforatum* tincture, *Actaea racemosa* tincture, *Panax ginseng* tincture, *Trifolium pratense* tincture					
Gerontakos and Casteleijn (2018) [Australia WPRO] [44]	Case study	Facial skin condition (unknown aetiology) association to nervous system	Herbal medicine *(Avena sativa, Cynara scolymus, Passiflora incarnata, Asparagus racemosus. Zingiber officinale, Gentian lutea, Ulmus rubra)*	Daily meditation and Australian Bush Flower Essence	6-10 weeks	1	Presentation of skin condition; digestion (presence of constipation and/or bloating); mental well-being (perceived stress levels)	**Reduced skin condition** At 10 weeks there was no return of skin condition. Improved digestive symptoms at 4 weeks. Self-reported association with stress and mental and physical wellbeing.
Greenlee, et al. (2007) [USA, AMRO] [53]	Randomized controlled trial	Healthy menstruating women (21 to 45 years)	12 weeks: Curcumin 95% 100 mg, *Cynara scolymus* leaf extract 100 mg, *Salvia rosmarinus* leaf extract 100 mg, silymarin 80% 100 mg, *Taraxacum officinalis* root extract 100 mg, *Schisandra chinensis* fruit extract 50 mg per capsule, 4 capsules twice daily	Nil	Dietary changes OR placebo	40 (15/10/15)	Adverse effects [BL to Wk 12]	Indigestion: Botanical, 5/15; Dietary, 1/10; Placebo, 0/15 Between group, p=0.014
							Serum estrogen fractions, any phase [% change] [BL to Wk 12]	NS
							Serum sex hormone-binding globulin, any phase [nmol/L] [BL to Wk 12]	NS
							Urine estrogen metabolites, late follicular (% change) [BL to Wk 12]	NS
							Body weight [BL to Wk 12]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Serum dehydroepiandrosterone, early follicular phase [% change] [BL to Wk 12]	**Reduced DHEA** Botanical: -13.22; Diet: -18.03; Placebo: +8.66 Between group (botanical vs diet): NS Between group (botanical vs placebo): p=0.016
							Serum androgens, all others, any phase [% change] [BL to Wk 12]	NS
Hawrelak and Meyers (2010) [Australia, WPRO] [45]	Uncontrolled trial	Irritable bowel syndrome	DA-IBS Formula: Dried bilberries *(Vaccinium myrtillus)* 20g, Slippery elm *(Ulmus fulva)* 9g, Cinnamon *(Cinnamomum zeylanicum)* 3g, Agrimony *(Agrimonia eupatoria)* 6g. C-IBS formula: Lactulose 6g, Slippery elm *(Ulmus fulva)* 14g, Licorice *(Glycyrrhiza glabra)* 3g, Oat bran *(Avena sativa)* 4g.	Twice daily in 250 ml apple juice for 3 weeks	Nil	31 (21/10)	Bowel movements per day [BL to Wk 3]	**Reduced (Diarrhea subtype)** DA-IBS: -0.19 (p=0.03) **Increased (Constipation subtype)** C-IBS: +0.22 (p=0.02)
							Consistency of stool [BL to Wk 3]	**Increased (Constipation subtype)** DA-IBS: NS; C-IBS: +0.67 (p<0.0001)
							Sense of straining [BL to Wk 3]	**Reduced straining** DA-IBS: -0.19 (p=0.004); C-IBS: -0.74 (p<0.0001)
							Sense of urgency [BL to Wk 3]	DA-IBS: NS C-IBS: NS
							Abdominal pain [BL to Wk 3]	**Reduced pain** DA-IBS: -0.19 (p=0.006); C-IBS: -0.20 (p=0.03)
							Bloating severity [BL to Wk 3]	**Reduced bloating** DA-IBS: -0.32 (p<0.0001); C-IBS: -0.19 (p=0.03)
							Flatulence severity [BL to Wk 3]	**Reduced (Diarrhea subtype)** DA-IBS: -0.25 (p=0.0001); C-IBS: NS
							Global symptom severity [BL to Wk 3]	**Reduced overall symptoms** DA-IBS: -0.40 (p=0.002); C-IBS: -0.71 (p=0.0005)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Heron and Yarnell (2001) [USA, AMRO] [27]	Case reports	All adults who took *Larrea tridentata* tincture in a naturopathic practice between Jan 1997 and Oct 1998	*Larrea tridentata* aerial parts tincture in various herbal formulas, 32 – 240 ml over several months	Nil	Nil	12	Signs and symptoms of liver damage (n=12)	Nil
							Serum aminotransferases	NS
							Lactate dehydrogenase	NS
							Total bilirubin	NS
							Alkaline phosphatase	NS
Hudson (1991) [USA, AMRO] [46]	Case reports	Cervical cancer (Class IV)	9 weeks: Escharotic treatment to the cervix: bromelain powder was applied to the cervix for 15 min followed removal with *Calendula officinalis* succus, *Sanguinaria canadensis* tincture 75% and zinc chloride 90 g/60 ml sterile water 25% was applied to cervix for 1 min then removed with *Calendula officinalis* succus, vaginal suppositories containing magnesium, iron, *Hydrastis canadensis*, vitamin A, *Melaleuca alternifolia* volatile oil, *Citrus x aurantium* volatile oil, and *Thuja occidentalis* volatile oil placed for 24 hours, then vinegar vaginal douche. Repeated twice weekly for five weeks. During treatment, oral supplements: vitamin C 6 – 10 g, beta-carotene 120,000 – 180,000 IU, selenium 400 mcg, *Taraxacum officinale* root and *Arctium lappa* root capsules 2 – 6 each daily, vegan diet, constitutional homeopathic remedy. After treatment: vitamin A emulsion on a tampon	During treatment, oral supplements: vitamin C 6 – 10 g, beta-carotene 120,000 – 180,000 IU, selenium 400 mcg; vegan diet, constitutional homeopathic remedy; After treatment: vitamin A emulsion on a tampon (for one week) applied each night, then rotated again for two more weeks.	Nil	7	Pap smear [BL to Wk 10, Mth 3, 6 and 12]	**Reduced pap smear** BL: class IV (7) Wk 10: class I (4), class II (1), class IV (2 – 1 regression of dysplasia on ectocervix to class I) Mth 3: class I continued remission (1-4), regression of endocervix in subject 6 to class II, class II (subject 5), class IV (subject 7 – continue to show regression of dysplasia on ectocervix to complete remission) Mth 6: complete remission (1-4), class II (subject 5) class IV (subject 6 despite cryosurgery) class I complete remission (subject after conization) Mth 12: remission (1-4), partial relapse class II-III (Subject 5). Complete remission (subjects 6-7)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
			(for one week) or *Ulmus rubra* suppositories (for one week) were applied each night, then rotated again for two more weeks.					
Jiang, et al. (2013) [USA, AMRO] [34]	Randomized controlled trial	Colorectal cancer	*Zingiber officinalis (radix)* (250mg capsules total of 2g daily)	Nil	Placebo	50 normal risk (14/16) increased risk (10/10)	Colonic COX-1 protein level [BL to Dy 28]	**Risk reduced in high-risk patients** Ginger, -23.8%; Placebo, 18.9%, (p=0.03) Normal risk CRC (NS)
							15-PGDH protein level [BL to Dy 28]	NS
Lamson and Wright (2003) [USA, AMRO] [47]	Case study	Early renal functional impairment	Capsule one: *Rehmannia glutinosa (rehmannia)* prepared root, *Dioscorea oppositifolia* (Chinese yam) rhizome, *Cornus officinalis* (cornelian cherry) fruit, *Wolfiporia cocos* (hoelen) sclerotium, Alisma plantago-aquatica (water plantain) rhizome, *Cinnamomum cassia* (cassia cinnamon) bark, *Aconitum carmichaeli* (aconite) prepared root. Dose: 1 g TID Capsule two: *Didymocarpus pedicellata* (shilapushpa) leaf, *Bergenia ligulata* (pashanbhed) root, *Rubia cordifolia* (Indian madder) root, *Ocimum tenuifolium* (holy basil) leaf, *Achyranthes aspera* (chaff flower) leaf, *Cyperus rotundus* (Java grass) rhizome, *Crataeva religiosa* (sacred garlic pear) bark, vitamin B6, magnesium aspartate, Arctostaphylos uva ursi (uva ursi) leaf. Dose: 1150 mg tid Capsule three: vitamin	Chinese herbal formula 500mg capsules, Ayurvedic herbal formula (includes vitamin B6 25mg and Magnesium aspartate 100mg) and Nutritional/ Botanical formula (vitamin A 5000IU, vitamin C 100mg, vitamin B6 10mg, Potassium 99mg, Raw kidney concentrate (bovine) 300mg, *Urtica dioca* 50mg, *Taraxacum officinale* root	Nil	1	Blood urea nitrogen (mg/dL) [BL to Yr 4]	**Reduced urea** -9
							Serum Creatinine (mg/dL) [BL to Dy 5]	**Reduced creatinine** -0.2
							24 hrs Creatinine Clearance mL/min	**Increased creatinine clearance** +53

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
			A, vitamin C, vitamin B6, potassium, raw bovine kidney concentrate, *Urtica dioica* (stinging nettle) leaf, *Taraxacum officinale* (dandelion) root, *Petroselinum crispum* (parsley) leaf. Dose: 1300 mg tid	50mg, Parsley leaf 50mg)				
Lauche, et al. (2015) [Germany, EURO] [56]	Randomized controlled trial (crossover)	Irritable bowel syndrome	3 weeks: 2% Caraway oil hot poultice (topical oils) applied to abdomen once daily for 20 – 30 mins	Nil	1. Hot olive oil poultice 2. Cold olive oil poultice	48	IBS Symptom Severity Score [BL to Wk 3]	**Reduced severity** *All types:* Caraway oil -35.4; Olive oil (hot) -20.0; Olive oil (cold) -4.3 Between Group Caraway and Olive Oil (hot) NS Between Group Caraway and Olive Oil (cold) -38.4 (p=0.03) *IBS Mixed type:* Between Group Caraway and Olive Oil (hot) -43.2 (p=0.02) Between Group Caraway and Olive Oil (cold) -55.8 (p=0.009) *IBS-C NS* *IBS-D NS*
							European Quality of Life (5 Domain) [BL to Wk 3]	Index NS Visual analog score NS
							Irritable Bowel Syndrome Quality of Life [BL to Wk 3]	All domains: NS
							Hamilton Anxiety and Depression Scale [BL to Wk 3]	NS
Lauche, et al. (2016) [Germany EURO] [57]	Randomized controlled trial	Osteoarthritis (knee)	Cabbage leaf wraps (CLW) (1-2 leaves applied as a poultice) 4 weeks: 2hrs per day	Nil	Diclofenac gel (TPG) and usual care (UC)	81 (27/27/27)	Pain intensity, Visual Analog Scale [BL to Wk 4, Wk 12]	**Reduced pain** UC Wk 4: Between group -12.2 pts (p=0.033) Wk 12: NS TPG Wk 4: NS Wk 12: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Western Ontario and McMaster Universities Arthritis Index [BL to Wk 4, Wk 12]	**Reduced disability** Pain Wk 4: Cabbage leaf -1.3; Usual care +0.2 Between group (UC) -1.3 (p=0.002) Between group (TPG) NS Wk 12: Cabbage leaf -1.0; Usual care +0.2 Between group (UC) -1.1 (p=0.009) Between group (TPG) NS Stiffness Wk 4: Cabbage leaf -1.0; Usual care +0.3 Between group (UC) -1.1 (p=0.031) Between group (TPG) NS Wk 12: Cabbage leaf -1.0; Usual care +0.4 Between group (UC) -1.1 (p=0.039) Between group (TPG) NS Physical function Wk 4: Cabbage leaf -0.9; Usual care +0.3 Between group (UC) -1.2 (p=0.002) Between group (TPG) NS Wk 12: Cabbage leaf -0.8; Usual care +0.3 Between group (UC) -1.0 (p=0.017) Between group (TPG) NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Short Form 36 [BL to Wk 4, Wk 12]	**Increased Quality of Life** Physical component Wk 4: Cabbage leaf +4.1; Usual care +1.3; Diclofenac -0.9 Between group (UC) NS Between group (TPG) +5.0 (p=0.004) Wk 12: Cabbage leaf +4.5; Usual care +0.1; Diclofenac -2.2 Between group (UC) +4.3 (p=0.007) Between group (TPG) +7.8 (p=0.0001) Physical functioning Wk 4: Cabbage leaf +7.2; Usual care -2.5 Between group (UC) +9.4 (p=0.004) Between group (TPG) NS Wk 12: Cabbage leaf +8.3; Usual care -0.9; Diclofenac -0.9 Between group (UC) +9.0 (p=0.019) Between group (TPG) +12.0 (p=0.026) Physical role functioning Wk 4: NS Wk 12: Cabbage leaf +5.5; Diclofenac -16.4 Between group (UC) NS Between group (TPG) +22.1 (p=0.024) Bodily pain Wk 4: NS Wk 12: Cabbage leaf +9.0; Usual care -1.2; Diclofenac -1.7

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
								Between group (UC) +10.7 (p=0.007) Between group (TPG) +13.7 (p=0.003) General health perception Wk 4: NS Wk 12: Cabbage leaf +3.7; Diclofenac -5.0 Between group (UC) NS Between group (TPG) +8.9 (p=0.024) Mental component: NS Vitality: NS Social role functioning: NS Emotional role functioning: NS Mental health: NS
							Arthritis-Specific Self-Efficacy Short-Form Scale [BL to Wk 4, Wk 12]	NS
							Physical Function (30s Chair Stand Test) [BL to Wk 4]	**Reduced Pain** Number of sit ups: NS Pain: Cabbage leaf -1.2 Usual care -0.4 Between group (UC) -1.4 (p=0.003) Diclofenac -0.1 Between group (TPG) -1.3 (p=0.033)
							Pressure Pain Sensitivity Threshold [BL to Wk 4]	**Increased threshold to pressure pain** Maximum: NS Quadriceps muscle: Cabbage leaf, +16.5; Usual care -64.1; Diclofenac -53.2

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
								Between group (UC) +77.8 (p=0.010) Between group (TPG) +90.2 (p=0.039) Pes anserinus: Cabbage leaf +59.1; Usual care -31.3 Between group (UC) +127.1 (p=0.010) Between group (TPG) NS Lateral joint line: NS
Leach, et al. (2006) [Australia, WPRO] [11]	Randomized controlled trial	Chronic venous ulcers	12 weeks: Horse-chestnut *(Aesculus hippocastanum)* seed extract (HSCE) 375mg HCSE, standardized to 75mg aecin	Standardized wound dressing protocol	Placebo + Standardized wound dressing protocol	54 (27/27)	Healed leg ulcers (%) [BL to Wk 4, 8, 12]	NS
							Change in wound dimension [BL to Wk 4, 8, 12]	NS
							Symptoms of chronic venous insufficiency [BL to Wk 4, 8, 12]	NS
							Changes in wound topography [BL to Wk 4, 8, 12]	**Reduced wound slough** Between groups: p=0.045
							Frequency of dressing changes [BL to Wk 4, 8, 12]	**Reduced frequency of dressing changes** Wk 12: HSCE 1.11 (p=0.009); Placebo 2.48 Between group (p=0.009)
							Recurrent episodes [BL to Wk 4, 8, 12]	NS
Leach (2014) [Australia, WPRO] [12]	Case series (prospective)	Chronic venous ulcers	8 -12 weeks: *Aesculus hippocastanum* seed extract 375 mg (standardized to contain 75 mg aescin), 1 tablet twice daily	Standardized wound dressing protocol	None	2	Factors associated with healing [BL to Wk 4 and 8]	Smaller wound volume, mild-to-moderate chronic venous insufficient, improvement in underlying chronic venous insufficient
							Factors associated with non-healing [BL to Wk 4 and 8]	*Pseudomonas aeruginosa* infection of ulcer, larger wound volume, severe chronic venous insufficient that does not improve

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Logan and Beaulne (2002) [Canada, AMRO] [55]	Case report	Irritable bowel syndrome	20mL; Enteric-coated peppermint oil (Herbal/ aromatherapy), 0.2mL three times daily	Nil	Nil	1	Lactulose Hydrogen Breath Test [BL to Day 20+6]	**Reduced levels** *Hydrogen* – Fasting: -6ppm; 20 min: -19ppm; 60 min: -22ppm *Methane* – Fasting: -0.0ppm; 20 min: -2.0ppm; 60 min: -0.0pm
							Self-reported symptoms [BL to Day 20]	**Decreased bloating, pain, eructation, improved frequency of bowel function**
Nelson, et al. (2017) [USA, AMRO] [48]	Case report	Plantar warts of the left hallux unresponsive to cryotherapy (24-year-old white man)	63 days (+ 30 days follow-up): *Hypericum perforatum* aerial parts 2.5%, *Lavandula officinalis* leaf 10%, *Glycyrrhiza glabra* root 2.5%, *Melissa officinalis* leaf 6%, *Eleutherococcus senticosus* root 4%, and *Sarracenia* spp. aerial parts 25% gel with allantoin applied 1 – 2 times daily after application of a pumice stone to the lesions	Nil	Nil	1	Extent of visible lesion	**Reduced lesions** *Day 5:* 'remarkable' reduction *Day 17:* return of epidermal ridges in the affected toe *Day 27:* no further progress *Day 36:* no further progress *Day 46:* appearance of keratotic debris and superficial epidermal necrosis *Day 56:* same as day 46 *Day 63:* changes from day 46 resolved, wart largely resolved; benign, painless petechial hemorrhages on medial margin *Day 90:* total resolution
Newton, et al. (2006) [USA, AMRO] [49]	Randomized controlled trial	Menopausal hot flushes	(1) *Actaea racemosa* root 160 mg standardized to 2.5% triterpenes daily (capsule) + diet counselling (1 phone call; fruit and vegetable booklet (2) Multibotanical: *Actaea racemosa* root 200mg, *Medicago sativa* aerial parts 400 mg, boron 4 mg, *Vitex agnus-castus* fruit 200 mg, *Angelica sinensis* processed root 400 mg, *Chamaelirium luteum* root 200 mg, *Glycyrrhiza*	Diet counselling	Lactose capsules plus dietary counselling (1 phone call from a clinical dietician and a 34-page booklet reinforcing fruit and vegetable	351 (257/77) 1: n=77 2: n=74 3: n=77 4: n=29	Frequency of vasomotor symptoms [BL to Mth 3, 6, 12]	**Reduced in Group 4** Group 1, 2 and 3: NS Group 4: Mth 3, -4.55 ($p<0.001$) Mth 6, -3.86 ($p<0.001$) Mth 12, -3.76 ($p<0.001$) Overall, -4.06 ($p<0.001$)
							Intensity of vasomotor symptoms [BL to Mth 3, 6, 12]	Group 1, 2, 3 and 4: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
			glabra root 200 mg, *Avena sativa* seed 400 mg, *Punica granatum* fruit 400 mg, *Eleutherococcus senticosus* root extract standardized to 0.8% eleutherosides E and B, 400 mg daily + diet counselling (1 phone call; fruit and vegetable booklet). (3) Multibotanical + soy diet counselling: 5 phone calls from a clinical dietician and a 34-page booklet recommending 2 soy food servings daily (equivalent to 12 – 20 g soy protein) (4) Conjugated equine estrogen 0.625mg; + medroxyproges-terone acetate (2.5mg) for women with a uterus + diet counselling (1 phone call; fruit and vegetable booklet)		intake).		Wiklund Menopause Symptom Scale score [BL to Mth 3, 6, 12]	**Reduced in Group 4** Group 1, 2 and 3: NS Group 4: Mth 3, -2.60 ($p<0.001$) Mth 6, -1.78 ($p<0.001$) Mth 12, -1.77 ($p<0.001$) Overall, -2.05 ($p<0.001$)
Rodriguez Malavé (1991) [Puerto Rico, AMRO] [43]	Case series	Asthma (patients of various ages seen in a single naturopathic clinic)	Bromelain (>20 yr only): 250 mg TID, Ma huang compound (>20 yr only): extracts of *Ephedra sinica* 200 mg (standardized to 12 mg ephedrine), *Zingiber officinale* 65 mg, *Glycyrrhiza glabra* 50 mg (standardized to 5% glycyrrhizic acid), *Althaea officinalis* 50 mg (standardized to mucilage content of 30 – 40%) 50 mg, *Drosera rotundifolia* 40 mg, *Euphorbia hirta* 40 mg, *Polygala senega* 40 mg, *Hydrastis canadensis* 20 mg (standardized to 5% total alkaloids, 1 tablet QID	Bromelain, constitutional homeopathic remedy	Nil	6 (1) 51 yrs, (2) 27 yrs, (3) underage, (4) 21 yrs, (5) 24 yrs, (6) >20 yrs	Number of subjects improved	**Increased** <21 yr: 16/17 (94%) >20 yr: 25/29 (86.2%)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
			Compound herbal cough elixir (<21 yr only): *Glycyrrhiza glabra* root, *Inula helenium* root, *Trifolium pratense* flower, *Prunus serotina* bark, *Marrubium vulgare* aerial parts, *Grindelia robusta* aerial parts, *Lobelia inflata* leaf and seed, *Foeniculum vulgare* fruit, *Lomatium dissectum* root, *Pinus strobus* bark, *Populus* spp. bud, 10 or 30 drops four times daily Constitutional homeopathic remedy: individualized.					
Sarris, et al. (2009) [Australia WPRO] [25]	Randomized controlled trial (crossover)	Adults (age 18-65) with Massive Depressive Disorder and comorbid anxiety (minimum score of 10 on Beck Anxiety Inventory)	*Hypericum perforatum* (St. John's wort (SJW) 1.8g (standardized 990mcg of hypericin, and 1500 mcg of flavone glycoside) and *Piper methysticum* (Kava) 2.66g (standardized to 50 mg of kavalactones) (8 weeks)	Nil	Placebo	28	Beck Depression Inventory (BDI-II) [Wk 2 to Wk 6 and 10]	**Reduced depression** Intention-to-treat Over time: p=0.047 Between group: p=0.023 Completer analyses Over time: p=0.008 Between group: p=0.003
							Beck Anxiety Inventory [Wk 2 to Wk 6 and 10]	NS
							WHO Quality of Life Survey (WHOQOL) [Wk 2 to Wk 6 and 10]	NS
Sarris, et al. (2009) [Australia, WPRO] [37]	Randomized controlled trial	Generalized anxiety (adults (18-65 years with > 1 month of > 10 on Beck Anxiety Inventory)	Tablet from pressed, dried aqueous extract of *Piper methysticum* (Kava) standardized to 50mg kavalactones per tablet		placebo	60	Hamilton Anxiety Scale (HAM-A) [BL to Wk 1 and phase 1 and 2]	**Reduced anxiety** Phase 1: −9.9 vs −0.8, (p<0.0001) Phase 2; −10.3 vs. +3.3, (p<0.0001) Increased pooled effect in kava across phases (p<0.0001)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Beck Anxiety Inventory (BAI) [BL to Wk 1 and post treatment 1 and 2]	**Reduced anxiety** Phase 1: −7.2 vs −1.6, (p=0.001) Phase 2: −8.1 vs. +1.4, (p=0.001) Increased pooled effect in kava (p=0.001)
							Montgomery – Asberg Depression Rating Scale (MADRS) [BL to Wk 1 and post treatment 1 and 2]	**Reduced depression** Phase 1: −5.9 vs −1.1, (p=0.003) Phase 2: −7.6 vs. +3.3, (p=0.003)
Sarris, et al. (2012) [Australia, WPRO] [24]	Randomized controlled trial	Major Depressive Disorder (adults)	26 weeks: St John's wort (SJW) (Hypericum perforatum) versus sertraline and placebo (SJW (LI-160, 900 – 1500 mg, standardized for between 0.12 – 0.28 % hypericin) vs sertraline (50 – 100 mg))	Nil	placebo	124 (35/49/ 40)	Hamilton depression rating scale (HAM-D) [Wk 10 to 26]	NS
							Beck Depression inventory (BD) and improvement (CGI-I) [Wk 10 to 26]	NS
							Global Assessment of Functioning (GAF) [Wk 10 to 26]	NS
							Clinical Global Impressions Scales for Severity (CGI-S) [Wk 10 to 26]	NS
Sarris, et al. (2013) [Australia, WPRO] [30]	Randomized controlled trial	Driving ability	Pressed dried aqueous extract of kava standardized to contain 60mg of kavalactones per tablet (total acute dose of 180mg of kavalactones – 3 tablets) administered 90 min before 15min driving simulation	Nil	Oxazepam (30mg) or placebo	22	Braking reaction time (ms) [post intervention]	**Faster braking reaction time** Kava, 104; Oxazepam, 116; placebo, 101 Between group (p<0.001)
							Deviation of lateral position [post intervention]	NS
							Speed deviation [post intervention]	NS
							Concentration lapse [post intervention]	**Reduced concentration lapse** Kava, 1.55; Oxazepam, 2.73 (p=0.033)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Crashes [post intervention]	NS
							Bon-Lader mood visual analogue scale [post intervention]	Treatment and time interaction (p=0.032) Alertness subscale reduced in oxazepam (p<0.01)
							Safety (Fatigue) [post intervention]	NS
Saunders, et al. (2007) [Canada, AMRO] [22]	Uncontrolled trial	Upper respiratory tract infections (URTI) in children	10 days: *Echinacea purpurea* aerial	One child received vitamin A, C and E and zinc	Nil	11	URTI symptoms [BL to day 13]	**Reduced symptoms** Sneezing 5/11 – 1/11 Nasal secretions 5/11 -2/11 Cough 7/11 – 2/11 Difficulty breathing 5/11 – 2/11 Difficulty swallowing 2/11 – 0/11
							Other symptoms [BL to day 13]	Eye discharge 1/11 – 0/11 Lung rattling 1/11 – 0/11 Abdominal tenderness 1/11 – 1/11 Ear cerumen 2/11 – 0/11 Tonsil enlargement 2/11 – 1/11 Lymph enlargement 9/11 – 7/11
Scholey, et al. (2017) [Australia, WPRO] [51]	Randomized controlled trial	Sleep difficulties	3 weeks: Sour date *(Zizyphus jujube var. spinosa)* ext. equiv. to dry seed 4.5g; Hops *(Humulus lupulus)* ext. equiv. to dry flower 500mg	Lactium™ (hydrolyzed milk protein; alpha casozepine enriched) 75 mg; magnesium oxide (equivalent magnesium) 81.7 mg (52.5 mg); vitamin B6; pyridoxine hydrochloride	2 Weeks (+ 1 week run-in)	170	Pittsburgh Sleep Quality Index (PSQI) [BL to Wk 3]	NS
							Leeds Sleep Evaluation Questionnaire [BL to Wk 3]	NS
							Epworth Sleepiness Scale [BL to Wk 3]	NS
							Insomnia Severity Index [BL to Wk 3]	NS
							Consensus Sleep Diary [BL to Wk 3]	NS

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				(equivalent pyridoxine) 10 mg (8.23 mg)			Burckhardt Quality of Life Scale [BL to Wk 3]	NS
							Chalder Fatigue Scale [BL to Wk 3]	NS
							Bond-Lader Visual Analog Scale [BL to Wk 3]	NS
							State-Trait Anxiety Inventory State subscale [BL to Wk 3]	NS
							Stress and Fatigue Visual Analog Mood Scales [BL to Wk 3]	NS
							Multi-tasking Framework [BL to Wk 3]	NS
Shathirapathiyet al. (2015) [India, SEARO] [58]	Randomized controlled trial	Psoriasis	10 days: Starch-fortified turmeric bath with naturopathy interventions	Massage, yoga, hydrotherapy, diet therapy	Naturopathy interventions only (massage, yoga, hydrotherapy, diet therapy	60 (30/30)	Psoriasis Area and Severity Index [BL to Dy 10]	**Reduced psoriasis severity** Turmeric Bath: -13.9; Naturopathy only: -0.15 Between group: p<0.01
Steels, et al. (2017) [Australia, WPRO] [32]	Randomized controlled trial	Menopausal symptoms	12 weeks: *Trigonella foenum-graecum* L. de-husked seed extract 300 mg extract equivalent to 9.9 g dry herb, standardized to minimum 50% furostanol saponins, 1 capsule twice daily	Nil	Placebo: Maltodextrin in identical capsule	104 (54/50)	Vasomotor symptoms (Menopause-Specific Quality of Life Questionnaire – MENQOL) [BL to Wk4, Wk8, Wk12]	**Reduced vasomotor symptoms** Herbal: Wk 4, -1.3; Wk 8, -1.7; Wk 12, -2.1 Placebo: Wk 4, +0.3; Wk 8, +0.2; Wk 12, +0.2 Between group, p<0.001
							Psychosocial symptoms (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced psychosocial symptoms** Herbal: Wk 4, -0.7; Wk 8, -1.1; Wk 12, -1.0 Placebo: Wk 4, +0.1; Wk 8, -0.1; Wk 12, -0.1 Between group, p<0.001

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Physical symptoms (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced physical symptoms** Herbal: Wk 4, -0.7; Wk 8, -1.0; Wk 12, -1.0 Placebo: Wk 4, -0.2; Wk 8, -0.4; Wk 12, −0.3 Between group, p<0.001
							Sexual symptoms (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced sexual symptoms** Herbal: Wk 4, -0.8; Wk 8, -1.4; Wk 12, -1.4 Placebo: Wk 4, +0.1; Wk 8, -0.3; Wk 12, -0.2 Between group, p<0.001
							Impact on Total Quality of Life (MENQOL) [BL to Wk4, Wk 8, Wk 12]	**Reduced quality of life** Herbal: Wk 4, -3.5; Wk 8, -5.2; Wk 12, -5.4 Placebo: Wk 4, -0.3; Wk 8, -0.6; Wk 12, -0.4 Between group, p<0.001
Steels, et al. (2018) [Australia, WPRO] [50]	Randomized controlled trial	Menopausal hot flushes	*Tinospora cordifolia* stem 100 mg, *Asparagus racemosus* rhizome 100 mg, *Withania somnifera* root 100 mg, *Commiphora mukul* gum exudate 225 mg, 1 capsule twice daily	Nil	Placebo: Maltodextrin in identical capsule	104 (54/50)	Vasomotor symptoms [Menopause-Specific Quality of Life Questionnaire – MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced vasomotor symptoms** Herbal: Wk 4, -1.4; Wk 8, -1.9; Wk 12, -1.6 Placebo: Wk 4, +0.3; Wk 8, +0.2; Wk 12, +0.2 Between group, p<0.001
							Psychosocial symptoms [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced psychosocial symptoms** Herbal: Wk 4, -0.9; Wk 8, -1.1; Wk 12, -0.9 Placebo: Wk 4, +0.3; Wk 8, -0.1; Wk 12, -0.1 Between group, p<0.001
							Physical symptoms [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced physical symptoms** Herbal: Wk 4, -0.8; Wk 8, -1.2; Wk 12, -0.9 Placebo: Wk 4, -0.2; Wk 8, -0.4; Wk 12, -0.3 Between group, p=0.002

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Sexual symptoms [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced sexual symptoms** Herbal: Wk 4, -0.7; Wk 8, -1.0; Wk 12, -1.3 Placebo: Wk 4, +0.1; Wk 8, -0.3; Wk 12, -0.2 Between group, p<0.001
							Impact on Total Quality of Life [MENQOL] [BL to Wk4, Wk 8, Wk 12]	**Reduced quality of life** Herbal: Wk 4, -3.8; Wk 8, -5.2; Wk 12, -4.8 Placebo: Wk 4, +0.3; Wk 8, -0.6; Wk 12, -0.4 Between group, p<0.001
							7-day incidence of daytime hot flushes [BL to Wk4, Wk 8, Wk 12]	**Reduced hot flushes** Herbal: Wk 4, -8 (-30%); Wk 8, -14 (-50%); Wk 12, -18 (-64%) Placebo: Wk 4, -1 (-6%); Wk 8, -0.0 (0%); Wk 12, +4 (+22%) Between group, p<0.001
							7-day incidence of night sweats [BL to Wk4, Wk 8, Wk 12]	**Reduced night sweats** Herbal: Wk 4, -7 (-50%); Wk 8, -7 (-50%); Wk 12, -10 (-71%) Placebo: Wk 4, -4 (-36%); Wk 8, -3 (-27%); Wk 12, -1 (-9%) Between group, p<0.001
							7-day incidence of total flushes [BL to Wk4, Wk 8, Wk 12]	**Reduced total flushes** Herbal: Wk 4, -18 (-43%); Wk 8, -22 (-52%); Wk 12, -28 (-67%) Placebo: Wk 4, -17 (-19%); Wk 8, -17 (-19%); Wk 12, +1 (+3%) Between group, p<0.001

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Safety measurements – Blood pressure, weight (kg), fasting blood glucose, serum cholesterol, red cell count, hamatocrit, mean cell volume, mean cell hemoglobin, total protein, albumin [BL to Wk4, Wk 8, Wk 12]	NS
Suskind, et al. (2013) [USA, AMRO] [21]	Uncontrolled trial	Inflammatory Bowel Disorder (IBD) (Pediatric)	Curcumin 500mg	Standard therapy	Nil	11	Pediatric Ulcerative Colitis Index (<30) [BL to Wk 3]	**Reduced symptoms** -20 pts in 2 patients (=remission)
							Pediatric Crohn's Disease Activity Index (<34) [BL to Wk 3]	**Reduced symptoms** -5 (to 0) in 1 patient
Szczurko, et al. (2011) [Canada, AMRO] [23]	Uncontrolled trial	Vitiligo vulgaris (12 – 35 yo)	12 weeks: *Ginkgo biloba* 60mg (standardized to 15mg gingkoflavonglycosides and 4mg terpene lactones per pill), 1 capsule twice per day	Nil	Nil	12	Vitiligo Area Scoring Index [BL to Wk 12]	**Reduced affected area** Total: -0.05 (p=0.021)
							Vitiligo European Task Force Score [BL to Wk 12]	**Reduced disease activity** Area: NS Staging: NS Disease activity: -3.9 (p<0.001)
Vohra, et al. (2007) [Canada, AMRO] [29]	Randomized controlled trial	Children (3 to 12 years) with spontaneous upper respiratory tract infections	Group 1: *Panax quinquefolius* root extract aqueous solution: 26 mg/kg day 1 (max 1800 mg), 17 mg/kg day 2 (max 1200 mg), 9 mg/kg day 3 (max 600 mg) day 3 (all in three equally divided doses) Group 2: same product as above at half the doses stated Treatment was started within 24 hours of onset of upper respiratory tract infection symptoms in all groups	unspecified	Placebo	45 (15/15/15)	Adverse events	NS
							Canadian Acute Respiratory Infection Flu Scale [days to drop to 25% below onset of infection] (compared to controls)	NS
							Use of antipyretics, antibiotics, or any other treatments for respiratory infections (compared to controls)	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Watson, et al. (2014) [Australia, WPRO] [13]	Randomized controlled trial	Candidiasis	14 days: *Allium sativum* bulb 350 mg with allicin potential 3200 mg, 3 tablets twice daily	Nil	Placebo: tablets containing lactose, povidone, maize starch, talc, magnesium stearate	59 (29/30)	Proportion of 'cases' (women with colony counts of candida >100 CFU/ml in any given day during the last 7 days before menstruation) [BL to Wk4, Wk 8, Wk 12]	NS
							Vaginal quantative counts (daily swabs for 2 weeks prior to menstruation) [BL to Wk4, Wk 8, Wk 12]	NS
							Vaginal itch (moderate to severe, compared to mild) [BL to Wk4, Wk 8, Wk 12]	NS
							Abnormal discharge (yes/no) [BL to Wk4, Wk 8, Wk 12]	NS
							Self-reported change in experience of symptoms of vaginitis (same, better or worse than usual) [BL to Wk4, Wk 8, Wk 12]	NS
Weber, et al. (2008) [USA, AMRO] [26]	Randomized controlled trial	Attention-Deficit Hyperactivity Disorder (Children and young adults 6 to 17yo DSM IV Edition criteria for ADHD	8 weeks: 300mg of *Hypericum perforatum* standardized to 0.3% hypericin TID	Nil	Nil	54 (27/27)	ADHD Rating Scale – IV [BL to Wk 8]	NS
							Clinical Global Impression Improvement Scale [BL to Wk 8]	NS
							Adverse events	NS
Yarnell and Heron (2000) [USA, AMRO] [54]	Retrospective cohort	Any patient prescribed at least 960 ml (32 oz) of the intervention	*Gentiana lutea* root 52.5%, *Taraxacum officinale* leaf 15.5%, *Taraxacum officinale* root 11%, *Achillea millefolium* aerial parts 11%, *Artemisia absinthium* root 11% tincture, 1 tsp TID	Nil	Nil	27 (Complete data: 9 Incomplete data: 18)	Symptoms reported historically to be due to *Artemisia absinthium* toxicity	Nil

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
		herbal formula in a nine-month period					Serum alanine amino transferase levels (ALT) (U/L) (n=9) [BL to Mth 9]	**Variable change** Reduced: 2 of 3 patients with baseline elevated levels Increased: (within normal range) 4 patients
							Serum aspartate amino transferase levels (U/L) [BL to Mth 9]	**Variable change** Reduced: In 1 of 1 patient with baseline elevated level Increased (within normal range): 3 patients
Yarnell (2015) [USA, AMRO] [15]	Case series	Prostate cancer	Artemisinin (from *Artemisia annua*) 300 or 400 mg three times daily for 7 days followed by 7 days without	All patients were additionally treated with extensive personalized lifestyle, diet, herbal, and dietary supplement protocols	Nil	15 (Prior prostatectomy: 5; No prior conventional therapy: 10)	Serum prostate-specific antigen doubling time >1 year [BL to 14 days]	Prior prostatectomy: 2/5 (1 unknown) No prior conventional therapy: 5/10 (4 unknown)
							Phase angle, improvement [BL to 14 days]	Prior prostatectomy: 1/5 (4 unknown) No prior conventional therapy: 2/10 (7 unknown)
							Metastasis (of prostate cancer) or mortality (all-cause) [BL to 14 days]	Prior prostatectomy: 0/5 No prior conventional therapy: 0/10
							Adverse effects [BL to 14 days]	Prior prostatectomy: 0/5 No prior conventional therapy: 0/10
Yu, et al. (2011) [USA, AMRO] [35]	Randomized controlled trial and uncontrolled trial	Healthy adults (Trial 2: with normal risk of colorectal cancer Trial 3: with high risk of colorectal cancer)	*Zingiber officinale (ginger)* dry rhizome extract 250 mg containing 6.6 mg [6]-gingerol, 1.58 mg [8]-gingerol, 3.05 mg [10]-gingerol, and 5.63 mg [6]-shogaol per capsule Trial 1: 2 g single dose Trials 2 and 3: 2 g daily for 28 days	Nil	Trial 1: none Trials 2 and 3: placebo	Trial 1: 9 Trial 2: 30 (14/16) Trial 3: 20 (10/10)	Single-dose pharmacokinetics in serum, area under the curve (mcg h/ml), half-life (in h), maximum serum concentration (mcg/ml)	**Metabolized to** [10]-gingerol and [6]-shogaol [6]-gingerol: nd [8]-gingerol: nd [10]-gingerol: 0.008, 1.79, 0.009 [6]-shogaol: 0.024, 1.32, 0.011
							Multi-dose pharmacokinetics in serum, 24 hours after last dose	**No serum accumulation of constituents** [6]-gingerol: nd; [8]-gingerol: nd; [10]-gingerol: nd; [6]-shogaol: nd

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Multi-dose pharmacokinetics in colon tissue (ng/mL), 24 h after last dose	**Accumulation of** [10]-gingerol glucuronide and [10]-gingerol sulfate in colon tissue [6]-gingerol: nd; [8]-gingerol: nd; [10]-gingerol: nd; [10]-gingerol glucuronide: 1.72; [10]-gingerol sulfate: 2.76; [6]-shogaol: nd
Zick, et al. (2006) [USA, AMRO] [52]	Retrospective cohort study	Breast cancer associated quality of life	*Arctium lappa* root, *Rheum palmatum* root, *Rumex acetosella* aerial parts, *Ulmus rubra inner bark (Essiac formula)* tea, mean 43 ml per day (range 12 – 114 ml) or those herbs plus *Nasturtium officinale* aerial parts, *Laminaria digitata thallus, Cnicus benedictus* aerial parts, *Trifolium pratense* flower in various doses (reported use since diagnosis)	Nil	Non-users within cohort	510 (41/469)	Functional Assessment of Cancer Therapy – Breast [between group assessment]	**Increased impact on Physical wellbeing** +1.7 (p=0.02) Associated with: Younger age (p<0.001) Advanced cancer stage (p<0.05) Fewer social supports (p<0.05) **Increased impact on Relationship with doctor:** +0.2 (p=0.047) Associated with: Fewer social supports (p<0.05)
							Profile of Mood Syndromes (compared to controls)	NS
Zick, et al. (2008) [USA, AMRO] [19]	Randomized controlled trial	Heart Failure	*Crataegus laevigata* (hawthorn) leaf and flower extract WS 1442 (containing 84.3 mg proanthocyanins) (Crataegus Special Extract WS1442 (CSE)) 450mg BID for 6 months	Concomitant medications: angiotensin-converting enzyme inhibitor or angiotensin receptor antagonist, beta blocker, and diuretic	Placebo	120 (60/60)	Progression to Heart failure [BL to Mth 6]	**Increased progression to heart failure** CSE resulted in 3.9 times risk of progression. Association of increased risk with LVEF <35%
							Six-minute walk distance	NS
							Peak exercise oxygen consumption	NS
							Anaerobic threshold	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Zick, et al. (2009) [USA, AMRO] [20]	Secondary analysis						Cardiovascular deaths, cardiac events, hospitalizations due to CHF [BL to Mth 6]	NS
							Quality of life, assessed by multiple measures	NS
							Exercise capacity – 6 min walk test	NS
							Blood pressure and heart rate	NS
							Minnesota Living with Heart Failure Questionnaire	NS
							EuroQoL-5D	NS
							Left ventricular ejection fraction (LVEF) (%)	**Increased LVEF** Hawthorn, +0.4 (p=0.004)
Zick, et al. (2009) [USA, AMRO] [36]	Randomized controlled trial	Chemotherapy induced nausea and vomiting	*Zingiber officinale* (ginger) rhizome ethanol extract (containing 5% total gingerols) lg OR 2g per day, for 3 days	Anti-nausea medications (Apripetant, Dolasetron, Granistron, Ondansetron, Palonosetron)	Placebo	162 (53/52/ 57)	Acute or delayed nausea or vomiting, prevalence [BL to Dy 3]	NS
							Severity of nausea or vomiting [BL to Dy 3]	**Increased severity of nausea and vomiting** High-dose ginger: p=0.03 Concomitant aprepitant and ginger: p=0.01
							Adverse effects [BL to Dy 3]	NS
Zick, et al. (2011) [USA, AMRO] [28]	Randomized controlled trial	Insomnia	*Matricaria chamomilla* (chamomile) flower extract (containing 4.3% apigenin and 2% (−)-α-bisabolol) 270 mg twice daily (between lunch and dinner time and 1 hour before bed) for 28 days	Nil	Placebo	34 (17/17)	Total sleep time, sleep efficiency [BL to Dy 28]	NS
							Sleep latency, wake after sleep onset, number of night awakenings, sleep quality [BL to Dy 28]	NS
							Insomnia Severity Index [BL to Dy 28]	NS
							Pittsburgh Sleep Quality Index [BL to Dy 28]	NS
							Daytime fatigue [BL to Dy 28]	NS

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33 Lifestyle Modification

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HIGHLIGHTS

- A person's lifestyle is an important determinant of their level of health.
- Assessing for various lifestyle factors and lifestyle counselling are considered core elements of naturopathic care.
- The naturopathic workforce is known for increasing health literacy and for teaching patients and their community how to achieve a healthy lifestyle.
- Naturopaths/NDs can play an essential role in addressing non-communicable diseases and other diseases that are strongly influenced by lifestyle factors.
- Clinical research by the naturopathic community has examined the application of lifestyle interventions and lifestyle-based risk factor identification.
- In line with the role of primary care, naturopathic researchers have investigated the effects of lifestyle modification on individuals with depression, metabolic syndrome, obesity, and type II diabetes mellitus.

The appreciation for lifestyle factors as critical elements determining wellbeing stems from the knowledge imparted by notable physicians including Hippocrates, through to Sebastian Kniepp and Henry Lindlar of 19th century Europe [1]. These physicians promoted specific therapies, including walking barefoot in the forest and water therapies (hydrotherapy), as well as general factors including the pursuit of 'cleanliness', eating healing foods, regular movement and relaxation. A student of Kniepp, Benedict Lust, embraced these approaches as he brought naturopathy from Europe to North America [1].

Early naturopaths were among the first health professionals to formally acknowledge lifestyle modification as an important element of treatment, which aligned with their focus on prioritizing drugless approaches to healing [2, 3]. The importance of lifestyle counselling in naturopathic practice continues, and is considered one of the core therapeutic elements in naturopathic practice [4]. There is an increasing awareness of the negative implications of modernity on lifestyle factors. Concerns include alterations to the sleep/wake cycle, increased social competition causing less intimate engagement with the family unit, sedentary lifestyle, poorer diets, social isolation, and substance/alcohol misuse. These factors may have implications on both mental and physical health [5].

The therapeutic application of lifestyle modifications is regarded as 'lifestyle medicine.' This approach consists of the application of environmental, psychological, and behavioural principles to enhance wellbeing. This is increasingly regarded as a potentially preventive approach to illness [6], and is one with long-standing strong alignment with naturopathic practices and theories of diagnosis, treatment and management [7]. In practice, these principles may be applied through exercise prescription and postural awareness; the modification of diet; advocation for minimized exposure to tobacco smoking, alcohol, and other illicit substances; and guidelines for the regulation of the sleep-wake cycle through addressing work-rest balance and recreation [8]. Significant considerations of note also include activity scheduling, which encourages meaningful social engagement [9]. Environmental factors are also significant considerations and may be targeted by advocating for reduced exposure to air, water, and noise pollution, and encouraging time spent in nature.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=3) naturopathic clinicians undertook in the field of lifestyle and exercise. It is important to note that lifestyle interventions are typically included in complex naturopathic interventions which are covered in Chapter 29 and in dietary interventional studies (applied nutrition) which are covered in Chapter 30. The naturopathic research on lifestyle and exercise includes a total

of 85,012 participants and was conducted in Australia (n=1), the United States of America (USA) (n=1) and the United Kingdom (n=1). The study designs include randomized controlled trial (n=1), an uncontrolled trial (n=1) and a cohort study (n=1). The populations treated included depression (n=1), metabolic syndrome and/or obesity along with chronic mental illness (n=1), and type II diabetes mellitus (T2DM) (n=1). Of all the naturopathic clinical studies employing lifestyle interventions, 100% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 33.1 Clinical research investigating lifestyle interventions conducted by naturopathic researchers.*

Implications

The studies indicate that naturopathic interventions focused on modifying lifestyle factors have positive impacts on health. Other cross-sectional data has concurred with these findings and has shown that women who consult a naturopath/naturopathic doctor report relatively more positive lifestyle behaviours than those who do not [10]. These findings indicate that lifestyle factors are potentially able to be modified significantly within a therapeutic setting, though due to the cross-sectional nature of the above analysis, it is possible that patients seeing naturopaths/naturopathic doctors may already be predisposed to a healthier lifestyle. However, observational findings from naturopathic practice have also found that positive lifestyle modifications are generally sustained after naturopathic intervention [7, 11].

More research is required to discern the specific implications of lifestyle modifications on health outcomes. Data discerning the key elements which may modify successful lifestyle change, time restrictions and motivational issues, and financial limitations is also required [12]. This may assist naturopaths/naturopathic doctors with sustaining long-term behavioural change through treatment strategies which take cognisance of the above factors. Accordingly, the treatment approach should be offered in a manner which is achievable for the patient and personalized appropriately [13]. Such an approach is best enacted through supported individualized formats that are adaptable to participant needs, which being the basis of naturopathic practice should be translatable in naturopathic settings. With lifestyle medicine being increasingly identified as a tool to improve health outcomes and reduce health burdens [14], further attention on the role of a profession with extensive experience in the application of translation of lifestyle medicine – such as naturopathy – is warranted.

Studies investigating specific interventions:

Lifestyle interventions

Two studies focused on exercise-based interventions [15, 16]. A randomized controlled trial (n=20) conducted in the USA measured the outcome of medical Qigong on stress and depression in T2DM patients [15]. Participants either engaged in Yi Ren Medical Qigong for 60 minutes per week with 30 minutes of home practice twice per week for 12 weeks or in progressive resistance training for 60 minutes per week with 30 minutes of home practice twice a week for 12 weeks. These two forms of exercise were matched to a usual care group for T2DM. The study indicated a reduction in stress in the Qigong group as measured by the Perceived Stress Scale (Qigong -29.3%, $p<0.05$ vs no change with progressive resistance or usual care) and a reduction in depression as measured by the Beck Depression Inventory in the progressive resistance group (progressive resistance -50% $p<0.03$, no change in Qigong or usual care group).

An uncontrolled trial conducted (n=10) in Australia involved a 12 week lifestyle program for patients with a mental illness and co-morbidities of metabolic syndrome or diabetes [16]. The Australian study involved a naturopath-initiated 'Healthy Body Healthy Mind (HBHM)' program which integrated meditation and mindfulness, comprehensive psychoeducation, and educational and practical exercise and nutrition guidance to improve the mental and physical health of participants with a serious mental health diagnosis [16]. Pilot data reported from this study concerned two points: 1) Qualitative data obtained from the patients and clinicians involved in a 2012 unstructured program exploring its acceptance and utility; and 2) Mental health and biometric data collected from the 10 participants involved in the modified and enhanced 12-week 2016 HBHM program. Results revealed a decrease in body mass index (BMI) of approximately one point ($0.96 kg/m^2$; $p=0.019$), coupled with a significant reduction in abdominal circumference (2.55cm; $p=0.046$). Results also indicated that a significant weight loss of 2kg was achieved at the end of the program ($p=0.023$). However, there were no significant alterations in any biometrics, including blood levels, or mental health parameters.

Lifestyle-based risk factor identification

The cohort study was a cross-sectional and longitudinal analysis (n=84,860) conducted in the United Kingdom. This study assessed the relationships between six key lifestyle factors and mood status in individuals with a history or current diagnosis of major depressive disorder

(MDD), and healthy controls (HC) [17]. The study revealed that tobacco smoking and higher levels of sedentary screen-time were both associated with a higher frequency of depressed mood (both $p<0.0001$; ORs 1.09 to 1.36). The study also indicated that optimal sleep duration, healthy diet, and physical activity were associated with a lower frequency of depressed mood (all $p<0.001$; ORs 0.62 to 0.94). The longitudinal analyses revealed that optimal screen time (MDD: OR=0.71, $p<0.001$; HC: OR=0.80, $p<0.001$) and sleep duration (MDD: OR=1.10, $p<0.001$; HC: OR=1.08, $p<0.001$) were both indicative of lower frequencies of depressed mood in both groups. Analyses also revealed a significant interaction between MDD diagnosis and healthy diet ($p=0.024$). In HCs, a higher-quality diet was revealed to alleviate depressed mood (OR=0.92, $p=0.045$), but was not associated with depressive mood in people with MDD.

Table 33.1 Clinical research investigating lifestyle interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Murphy, et al. (2019) [Australia, WPRO] [16]	Uncontrolled trial (pilot study)	Mental illness and co-morbid metabolic syndrome or obesity (stabilized with psychotropic medication for ⩾4 weeks)	Lifestyle program 'Healthy Body Healthy Mind (HBHM)': exercise (theory and practicals), lifestyle psychoeducation, motivation and goal setting skills, and mindfulness techniques (12 week program of weekly 6 hour sessions)	Diet and nutrition (theory and practical skills)	Nil	10	Weight (kg) [BL to Wk 12]	**Reduced body weight** Wk 12: -2.00 (p=0.023)
							Abdominal circumference (cm)	**Reduced abdominal circumference** Wk 12: -2.55 (p=0.046)
							Body mass index (BMI) (kg/m^2)	**Reduced BMI** Wk 12: -0.96 (p=0.019)
							Waist to hip ratio	NS
							Blood pressure	NS
							Fasting glucose	NS
							High-density lipoprotein cholesterol	NS
							Low-density lipoprotein cholesterol	NS
							Total fasting cholesterol	NS
							Triglycerides	NS
							Depression Anxiety Stress Scales	NS
Putiri, et al (2012) [USA, AMRO] [15]	Randomized controlled trial	Type II diabetes mellitus, psychological factors (adults)	Yi Ren Medical Qigong (60 min per wk, with 30 min home practice twice per wk, for 12 wks)	Nil	Progressive resistance training (60 min per wk, with 30 min home practice twice per wk, for 12 wks), Usual care control	20 (7/5/8)	Perceived stress scale [BL to Wk 12]	**Reduced** Qigong: -29.3%, (p<0.05) Progressive resistance: NS Usual care: NS
							Beck Depression Inventory [BL to Wk 12]	**Reduced** Qigong: NS Progressive resistance: -50% (p<0.03) Usual care: NS
Sarris et al. (2020) [UK, EURO] [17]	Cohort study	Major depressive disorder (MDD)	Lifestyle behaviors (physical activity, dietary patterns, sleep, screen time, alcohol intake)	Nil	Healthy control (no history of depressive disorder)	84,860 (18,793/66,067)	Physical activity: metabolic equivalent of task, minutes per week [association with depressive mood at BL, BL to follow-up] (time to follow-up not reported)	**Reduced depressive mood** MDD group: BL, OR 0.94 (p<0.0001); Follow-up, NS Control group: BL, OR 0.94 (p<0.0001); Follow-up, OR 0.92 (p=0.045)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
							Healthy diet Food Frequency Questionnaire [association with depressive mood at BL, BL to follow-up] (time to follow-up not reported)	**Reduced depressive mood** MDD group: BL, OR 0.91 (p=0.0026); Follow-up, NS Control group: BL, OR 0.88 (p<0.0001); Follow-up, NS
							Sleep (hours per 24 hours) [association with depressive mood at BL, BL to follow-up] (time to follow-up not reported)	**Reduced depressive mood (optimal sleep)** MDD group: BL, OR 0.62 (p<0.0001); Control group, BL: OR 0.65 (p<0.0001) Increased depressive mood (non-optimal sleep) MDD group: Follow-up: OR 0.71 (p<0.0001) Control group: Follow-up: OR 0.80 (p<0.0001)
							Tobacco smoking status (current smoker) [association with depressive mood at BL, BL to follow-up] (time to follow-up not reported)	**Increased depressive mood** MDD group: BL, OR 1.36, (p<0.0001); Follow-up, NS Control group: BL, OR 1.32 (p<0.0001); Follow-up, NS
							Sedentary screen time (hours per week) [association with depressive mood at BL, BL to follow-up] (time to follow-up not reported)	**Increased depressive mood** MDD group: BL: OR 1.13 (p<0.0001); Follow-up: OR 1.10 (p=0.0001) Control group: BL: OR 1.09 (p<0.0001); Follow-up: OR 1.08 (p<0.0001)
							Alcohol frequency (6-point Likert scale) [association with depressive mood at BL, BL to follow-up] (time to follow-up not reported)	**Reduced depressive mood** MDD group: BL: OR 0.91 (p<0.0001); Follow-up: NS Control group: NS

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34 Mind-Body Medicine Counselling

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HIGHLIGHTS

- Mind-body medicine (MBM) recognizes the significant role that the mind can have on health outcomes.
- Research indicates that MBM practices are effective in addressing a wide range of conditions including decreasing pain, improvements in blood pressure and digestive symptoms, in reducing stress, anxiety and depression and others.
- Naturopaths/NDs incorporate various MBM practices into patient care.
- Clinical research by the naturopathic community has examined the application of mindfulness-based stress reduction, meditation and other MBM interventions.
- In line with the role of primary care, naturopathic researchers have investigated the effects of MBM practices on individuals with chronic pain, mental health conditions, complex immune conditions, neurological conditions, cancer, and other conditions.

Mind-body medicine (MBM) comprises a variety of practices designed to enhance the mind's positive impact on the body and vice versa, including behavioural, psychological, social, artistic and spiritual approaches [1, 2]. MBM practices, such as yoga, *tai chi*, or meditation have been part of traditional medicine for several hundreds to thousands of years and continue to be part of many practices within traditional and complementary medicine.

In 1979 mindfulness-based stress reduction (MBSR) was introduced as a form of stress reduction, but MBSR technique has evolved to encompass a number of health related conditions [3]. The naturopathic profession formally documented the importance of the mind-body connection in its earliest writings [4]. Others, such as biofeedback, are newer developments that evolved from technological progress. MBM counselling methods, especially counselling on health-related lifestyle factors, has been a substantial component of naturopathic practice from its inception and continues to be an integral aspect of naturopathic care. In a 2019 international practice survey of naturopaths/naturopathic doctors globally, MBM was incorporated as part of the therapeutic intervention with one fifth of all naturopathic patients [5].

MBM is prescribed and practiced by the naturopathic workforce with patients of all ages presenting with functional disorders (e.g., gastrointestinal, endocrine, neurological or cardiovascular conditions), structural disorders (e.g., musculoskeletal conditions, chronic pain), psychological conditions (anxiety, depression, ADHD), and as part of preventive and palliative care. MBM embraces the naturopathic philosophy of Holism and the principle of *Treat the Whole Person*. The practice of MBM is based on the understanding that the mind influences the physical body and conversely the physical influences the state of the mind. MBM is often included as part of a complex naturopathic intervention (see Chapter 29) and as an integral element of yoga therapy (see Chapter 38). This chapter focuses only on those studies where MBM was used as a standalone naturopathic intervention.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=9) naturopathic clinicians conducted investigating MBM. This research includes a total of 531 participants and was conducted in the USA (n=7) and Australia (n=2). The study designs include randomized controlled trials (n=4), uncontrolled trials (n=3), non-randomized controlled trials (n=1) and case reports (n=1). The mind-body medicine techniques studied include the use of mind-body stress reduction (MBSR) (n=2), meditation (n=2), videoconference delivery of mind-body group therapy (n=1), group counselling (n=1), music therapy (n=1), narrative therapy (n=1) and healing touch (n=1).

The conditions treated with MBM included one study each for chronic pain, mental health concerns, work stress, multiple sclerosis, headache, migraine, autism, breast cancer and hospital patients with various ailments. Of all the naturopathic clinical studies employing MBM counselling interventions, 88.9% reported a positive

outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 34.1: Clinical research investigating mind-body medicine interventions conducted by naturopathic researchers.*

Implications

The studies indicate that, while MBM is a broad category of diverse therapeutic options, it may have clinical benefit in several different conditions. Naturopathic researchers have employed MBM interventions for diverse populations and with a focus on changes to participant health behaviours, symptoms, and perceived wellbeing.

One notable consideration in the application of MBM by naturopaths/naturopathic doctors is that in many instances it has functioned as a very practical approach to counselling, facilitating behavioural change and improved symptom management even after the intervention has ceased. While there has been some criticism of MBM such as mindfulness approaches as being ineffective if not being appropriately patient-centered or too focused on the intervention rather than facilitating change [6], these results suggest that when applied in naturopathic clinical settings and in accordance with naturopathic philosophies and principles there can be improved health outcomes. These results are most likely due to the historical and philosophical role of naturopathic practice in acknowledging the importance of mind-body approaches to health as being a core foundation of optimizing patient health. Further attention on the role of naturopaths/naturopathic doctors in the integration and application of MBM to improve health outcomes is warranted.

Studies investigating specific interventions:

Mindfulness-Based Stress Reduction and Meditation

Three studies (total n=81) assessed mindfulness-based stress reduction (MBSR) in somatic illness [7-9]. The MBSR programs were delivered as structured 8-week programs consisting of weekly 2.5-hour group sessions and an all-day silent retreat. Key components of the MBSR program include sitting meditation; walking meditation; hatha yoga and body scan. Another key component is the incorporation of mindfulness into everyday life. The studies investigating MBSR interventions included populations with chronic pain (n=1) [7], stress, anxiety and depression (n=1) [8], and migraine [9].

An uncontrolled trial (n=18) conducted in the USA assessed the effects of MBSR on chronic pain and functional syndromes in adolescents and found reduced disability and symptom impact, stress and anxiety but no effect on quality of life [7]. The reduction in anxiety was measured based on the Multidimensional Anxiety Scale for Children and indicated child reports: Wk 8, -7.5 (p=0.03); Wk 12, -10.1 (p=0.047) and parent reports: Wk 8, -10.0 (p=0.03); Wk 12, -16.2 (p=0.004). A randomized controlled trial (n=62) investigated the feasibility of MBSR compared to education in multiple sclerosis and found the intervention to be feasible. No effects were found on the secondary outcomes stress, anxiety, depression, fatigue, pain, resilience, and information processing [10].

A randomized controlled trial (n=178) conducted in Australia compared the effects of "mental silence" Sahaja meditation to relaxation and a wait-list control group [8]. The 8-week intervention consisted of twice weekly 90-minute sessions and twice daily 10 to 20-minute home practice and employed a series of silent yoga-based affirmations to reach "thoughtless awareness". The meditation intervention resulted in a greater reduction of stress as measured by the Psychological Strain Questionnaire (meditation: -37.0; relaxation: -22.30; no treatment: -17.5 (p=0.026)) and depression as measured by the Profile of Mood States, Depression-dejection subscale (meditation: -3.0; relaxation: no change; no treatment: no change (p=0.019)), but not anxiety.

A case report conducted in the USA assessed effects of an 8-week self-directed variation of the MBSR program (based on a book and recorded meditations without group sessions and retreat) in a 45-year-old female migraine patient with hypertension, pre-diabetes and a BMI of 30 kg/m2 [9]. At the 11-week follow-up there was a significant decrease in both systolic (-34.7, p<0.0001) and diastolic (-29.3, p<0.0004) blood pressure, migraine frequency and use of associated medication.

Other MBM Interventions

Five studies examined a range of other MBM interventions including music therapy [11], healing touch [12], narrative therapy [13], mind-body group therapy [14] and group counselling [15]. The populations for these studies were individuals with breast cancer risk (n=1) [15], autism (n=1) [13], mental health diagnoses (n=1) [14], and chronic headache (n=1) [12]. One study also included hospital inpatients in a family medicine ward (n=1) [11].

A randomized controlled trial (n=90) conducted in the USA used mixed-methods to assess the effectiveness of music therapy compared to massage and usual care in inpatients with mixed internal medicine diagnoses [11]. In the first phase of the music therapy intervention, a customized music playlist was created and provided for use in the hospital and after discharge. Follow-up visits included music-facilitated relaxation and meditation, songwriting, and singing, amongst other. The study

found no significant effects on patients' hospital experience using quantitative measures, but favourable subjective effects on hospital experience, pain management and therapist connectedness were reported in qualitative interviews.

An uncontrolled trial conducted as a qualitative study (n=13) in the USA assessed the subjective effects of healing touch in chronic headache [12], and found the intervention was associated with subjective symptom improvements as well as general changes in patients' views on their lives and health. The intervention consisted of 3 to 6 weekly sessions, consisting of "Mind Clearance", "Full Body Connection", and further energy work based on the therapists' perceptions of the patient's individual state.

An uncontrolled trial (n=10) conducted in Australia evaluated the effects of narrative therapy for young people with autism, and found no effects on the primary outcome parent-rated strength and difficulties [13]. Positive results were found on the child-reported outcome distress but not on hopelessness or salivary cortisol. Narrative therapy consisted of five 1-hour sessions over 10 weeks and was based on the work of Michael White and David Epston, highlighting the individual construction of meaning. A controlled trial (n=9) conducted in the USA included participants with mixed mental health diagnoses and found that compared to a wait-list control, participants who underwent the mind-body group therapy program reported increased wellbeing in the mental (+2.56, $p=0.004$) and physical (+5.0, $p<0.001$) subscales of the Mental, Physical and Spiritual Wellbeing Scale [14]. The 8-week intervention used videoconference technology and was weekly focusing on one of the "7 Foundations of Health and Happiness" (Rest/Relaxation, Movement, Nutrition, Self, Relationships, Work, Meaning), and a final week on Behaviour Change.

A randomized controlled trial (n=150) conducted in the USA included sexual minority women who received 2 hour group breast cancer counselling sessions for four weeks compared to a wait-list control group [15]. The counselling consisted of a personalized assessment of actual risk for breast cancer at three future time points (5 years, 10 years, and at age 79) along with sessions on breast self-exam techniques, problem-solving exercises to identify and overcome barriers to mammography, stress management and social support. The intervention significantly reduced perceived personal cancer risk ($p<0.001$) and cancer worry ($p<0.001$) and increased cancer screening behaviour ($p<0.05$) and mental health-related quality of life ($p<0.01$).

Table 34.1 Clinical research investigating mind-body medicine interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Ali, et al. (2017) [USA, AMRO] [7]	Uncontrolled trial	Chronic pain and other functional somatic syndromes (adolescents and their parents)	Mindfulness-based stress reduction (8-week program of weekly 1.5-hour group sessions and one 4-hour retreat)	Nil	Nil	18	Functional Disability Inventory (reported by child) [BL to Wk 8, Wk 12]	**Reduced disability** Wk 8: -6.8 (p=0.026) Wk 12: NS
							Fibromyalgia Impact Questionnaire – Revised / Symptom Impact Questionnaire (reported by child) [BL to Wk 8, Wk 12]	**Reduced impact** Wk 8: -11.0 (p=0.03) Wk 12: NS
							Pediatric Quality of Life Inventory (reported by child) [BL to Wk 8, Wk 12]	NS
							Perceived Stress Scale (reported by child) [BL to Wk 8, Wk 12]	**Reduced stress** Wk 8: NS Wk 12: -6.2 (p=0.01)
							Multidimensional Anxiety Scale for Children, Second Edition (reported by child and parent) [BL to Wk 8, Wk 12]	**Reduced anxiety** Child reports: Wk 8, -7.5 (p=0.03); Wk 12, -10.1 (p=0.047) Parent reports: Wk 8, -10.0 (p=0.03); Wk 12, -16.2 (p=0.004)
Bowen, et al. (2006) [USA, AMRO] [15]	Randomized controlled trial	Breast cancer risk	Group psychological counselling (Four weekly 2-hour sessions)	Nil	Waitlist control	150 (81/69)	Breast cancer screening – mammography [BL to Mth 24]	**Increased screening** Mth 24 ⩾40 years old: +12% (p<0.05)
							Breast cancer screening – breast (self-exam) [BL to Mth 6, Mth 24]	**Increased screening** Mth 6: +17% (p<0.01) Mth 24: +13% (p<0.05)
							Perception of lifetime personal breast cancer risk [BL to 6mth, 24mth]	**Reduced perception of risk** Mth 6: -20%; Mth 24: -21% Over time: p<0.001 Between group: p<0.001

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Cancer Worry Scale [BL to 6mth, 24mth]	**Reduced worry** Mth 6: -0.7; Mth 24: -0.7% Over time: p<0.001 Between group: p<0.001
							Short Form-36 Health Survey [BL to 6mth, 24mth]	**Increased quality of life** Mth 6: +4.6; Mth 24: +5.1 Over time: p<0.001 Between group: p<0.01
Cashin, et al. (2013) [Australia, WPRO] [13]	Uncontrolled trial	Autism (adolescents and their parents)	Narrative therapy (five 1-hour sessions over 10 weeks)	Nil	Nil	10	Strengths and Difficulties Questionnaire [BL to Wk 9 (Session 5)] (reported by parent)	**Reduced emotional symptoms** Emotional symptoms scale: -2.0 (p=0.042) Conduct problem: NS Hyperactivity scale: NS Peer problem scale: NS Pro-social scale: NS Total difficulties: NS
							Kessler-10 (Scale of Psychological Distress) [BL to Wk 9 (Session 5)] (reported by child)	**Reduced distress** Wk 9: -7.5 (=-0.017)
							Beck Hopelessness Scale [BL to Wk 9 (Session 5)] (reported by child)	NS
							Salivary cortisol: DHEA ratio [Wk 1 (Session 1) to Wk 9 (Session 5)] (for child)	NS
Heermann, et al. (2017) [USA, AMRO] [14]	Non-Randomized controlled trial	Mental health diagnoses	Videoconference delivery of mind-body group therapy (8 sessions)	Nil	Waitlist control	9 (3/6)	Mental, Physical and Spiritual Wellbeing Scale [BL to Session 8]	**Increased wellbeing** Mental subscale: +2.56 (p=0.004) Physical subscale: +5.0 (p<0.001) Spiritual subscale: NS Between groups: NS
							Arizona Integrative Outcomes Scale [BL to Session 8]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Manocha, at al. (2011) [Australia, WPRO] [8]	Randomized controlled trial	Stress, anxiety and depressed mood (full time workers)	"Mental silence" Sahaja yoga meditation (two 1-hour sessions per week and 10-20 minutes daily practice at home for 8 weeks,)	Nil	Active control: relaxation. No treatment control: waitlist	178 (59/56/63)	Psychological Strain Questionnaire [BL to Wk 8]	**Reduced strain** Meditation: -37.0; Relaxation: -22.30; No treatment: -17.5 (p=0.026)
							State/Trait Anxiety Inventory for Adults [BL to Wk 8]	NS
							Profile of Mood States, Depression-dejection subscale [BL to Wk 8]	**Reduced depression** Meditation: -3.0; Relaxation: no change; No treatment: no change (p=0.019)
Oberg, et al. (2013) [USA, AMRO] [9]	Case report	Migraine	Mindfulness meditation (self-directed 8-week program of 45 min sessions)	Nil	Nil	1	Blood pressure (BP), systolic/diastolic (pre- and post-meditation) [Weekly from Wk 1 to Wk 11]	**Reduced BP** Wk 1 BP: 149.2/97.3 vs. 132/84.6; Wk 11 BP: 114.5/68 vs. 112.7/72.7. Systolic -34.7 and -19.3 (p<0.0001) Diastolic -29.3 and -11.9 (p<0.0004)
							Migraine frequency (subjective) [BL to Wk 11]	**Reduced migraine frequency** Reduction until week 17 of migraine headache and use of associated medication
Roseen, et al. (2017) [USA, AMRO] [11]	Randomized controlled trial	Hospital inpatients (family medicine)	Music therapy (10-40 min daily sessions during hospital stay)	Usual inpatient care	Control: Usual care alone Comparison: Massage therapy	90 (30/30/30)	Hospital Consumer Assessment of Healthcare Providers and Systems survey [within 7 days of discharge]	NS
							Qualitative telephone survey [within 7 days of discharge] (not administered to control group)	**Improved experience of hospital stay and pain management** Subjective reports of interventions improving patient experience

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Senders, et al. (2019) [USA, AMRO] [10]	Randomized controlled trial	Multiple sclerosis	Mindfulness-based stress reduction (8 weekly 2 hr classes and one 6-hour retreat)	Nil	Control: Multiple Sclerosis Education protocol (matched to intervention for time and attention, with no overlap in content)	67 (33/34)	Feasibility	**Confirmed** 85% participated in at least 6/8 classes. Practiced on 55% of assigned home practice days, (median duration of 38 min)
							Perceived Stress Scale [BL to post-intervention, 12 Mth]	NS
							Short Form 36 health survey [BL to post-intervention, 12 Mth]	NS
							Patient-Reported Outcomes Measurement Information System (PROMIS) Anxiety [BL to post-intervention, 12 Mth]	NS
							PROMIS Depression [BL to post-intervention, 12 Mth]	NS
							PROMIS Fatigue [BL to post-intervention, 12 Mth]	NS
							PROMIS Pain [BL to post-intervention, 12 Mth]	NS
							Connor-Davidson Resilience Scale [BL to post-intervention, 12 Mth]	NS
							Paced Auditory Serial Addition Test [BL to post-intervention, 12 Mth]	NS
Sutherland, et al. (2009) [USA, AMRO] [12]	Uncontrolled trial (pilot study)	Chronic headache	Healing Touch (three to six 30-40 min sessions, weekly)	Nil	Nil	13	Qualitative interviews [BL, session 3, session 6, post-treatment Mth 3)	**Reduced symptoms** Subjective symptom reduction (frequency, intensity or duration of headaches) and reports of shifts in self-awareness.

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35 Naturopathic Physical Medicine

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HIGHLIGHTS

- Naturopathic physical medicine emphasizes the importance of addressing various structural aspects – including posture, gait, movement and symptoms related to joint and muscle health – as part of naturopathic care.
- Naturopathic practice includes a diverse range of bodywork therapies ranging from exercise recommendations, muscle release techniques, manipulation, yoga, and others depending on the country and jurisdictional regulations.
- There is therapeutic value to incorporating physical medicine techniques in naturopathic care.
- Clinical research by the naturopathic community has examined the application of massage and other manual therapies to improve a range of health conditions.
- In line with the role of primary care, naturopathic researchers have investigated the effects of naturopathic physical medicine on individuals with neck pain, asthma, traumatic brain injury, and knee osteoarthritis as well as medicals inpatients including those receiving hospice/palliative care and undergoing cardiac surgery.

Naturopathic philosophy views the health of the structure of the body including muscles, joints, posture, gait and movement as a primary component of the triad of health. For this reason, bodywork – also known as naturopathic physical medicine – is considered an essential aspect of naturopathic care. Naturopathic physical medicine has always been one of the core foundations of naturopathic practice and remains one of the major treatment modalities employed by the naturopathic community globally [1].

Naturopathic physical medicine has been described as a modality that "integrates both scientific knowledge in physical medicine and the principles of naturopathic medicine into a distinct approach to physical medicine practice." Addressing or correcting structural integrity is considered an essential stage of the Naturopathic Therapeutic Order [2, 3] as naturopaths/naturopathic doctors recognize that there is a correlation between an individual's alignment and structure, the functioning of internal organs and a person's psychological state. A core naturopathic principle is *tolle totum* (Treat the Whole Person): as such, it is not always just the patient's structural issues that are treated through naturopathic physical medicine, as working on the structure can have far-reaching benefits on all aspects of a patient.

Naturopathic practice includes forms of bodywork ranging from muscle release and massage techniques, naturopathic manipulation, and other bodywork techniques. Naturopaths/naturopathic doctors may also employ yoga and acupuncture in their clinical practice, and while these therapies can also be considered within the broad category of naturopathic physical medicine, the clinical studies produced by naturopathic researchers that examines these therapies are presented separately (see *Chapter 37: Acupuncture* and *Chapter 38: Yoga*). Some naturopaths/naturopathic doctors provide naturopathic physical medicine as part of their practice directly with patients while others work with various bodywork practitioners to provide patients with a holistic and an integrated approach to healthcare.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=9) naturopathic clinicians undertook in the field of naturopathic physical medicine. This research includes a total of 595 participants and was conducted in USA (n=4), Germany (n=3) and Australia (n=2). The study designs include randomized controlled trials (RCT) (n=5) and case reports (n=2) with two additional papers presenting the results of secondary analysis from RCTs (n=2). The aspects of naturopathic physical medicine studied include massage therapy (n=5), craniosacral therapy (n=3) and breathing exercises (n=1).

The conditions treated with naturopathic physical medicine included neck pain (n=2), hospice / palliative care (n=2) and one study for asthma, pre- and post-cardiac

surgery, traumatic brain injury, osteoarthritis of the knee and medical inpatients. Of all the naturopathic clinical studies employing naturopathic physical medicine interventions, 66.7% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 35.1 Clinical research investigating naturopathic physical medicine interventions conducted by naturopathic researchers*. This body of naturopathic research on naturopathic physical medicine is also supported by more than 20 observational studies and seven reviews or meta-analyses conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

The naturopathic studies on naturopathic physical medicine imply that there is therapeutic value in bodywork including massage and craniosacral therapy for a range of conditions. Where comparative studies have not been done, there are indications that naturopathic physical medicine may be as effective as mind-body therapies such as music therapy or guided meditation. The results also suggest that the therapeutic value of a treatment is partially dependent on the patient's desire for the therapy, which may position therapeutically eclectic naturopaths/naturopathic doctors, as they are more likely able to provide alternatives to those patients who prefer bodywork therapies.

The degree to which naturopaths/naturopathic doctors apply bodywork practices themselves, or recommend their patients receive treatment or support from other bodywork practitioners varies regionally based on historical and educational factors. For example, in Australia, massage (including Swedish massage) has been included in naturopathic curricula for over 20 years [4]. In North America, naturopathic manipulation and acupuncture is generally part of the scope of practice [5]. Furthermore, in the UK and Australia there has been a historical connection between osteopathy (a profession that is commonly trained in cranio-sacral therapy and other bodywork techniques) and naturopathy which resulted in an extension of naturopaths/naturopathic doctors training and skills in physical medicine [6, 7]. In India, naturopathy and yoga are combined within the naturopathic program and yoga is an integral part of naturopathic care [8].

The 2015 survey conducted by the WNF also found that the naturopathic workforce frequently work in integrated clinics [9] and, as such, they may be referring patients to other practitioners for bodywork therapies through clinical relationships developed through these settings or through external referral networks [10]. With physical therapies increasingly being promoted as non-pharmacological alternatives for conditions that previously required high-level intervention, and the naturopathic philosophical approach centered on low-level interventions as a priority, naturopaths/naturopathic doctors may have an important role in expanding non-pharmacological physical medicine interventions. Given the historic and contemporary focus on bodywork modalities by the global naturopathic profession, more research in the field of naturopathic physical medicine is warranted.

Studies investigating specific interventions:

Massage

The most common intervention studied was therapeutic massage, with five trials involving post-surgery cardiothoracic patients [11], hospice or palliative care patients [12, 13] or hospital inpatients [14] and osteoarthritis of the knee [15]. A randomized controlled trial (n=152) conducted in Australia compared Swedish massage therapy with rest for post-surgery cardiothoracic patients [11]. The results of the study included significant reduction in pain, anxiety and muscular tension and increase in relaxation and satisfaction based on the visual analog scale for those receiving massage. Another randomized controlled trial (n=90) conducted in the USA involving medical inpatients compared massage therapy (inclusive of Swedish and acupressure techniques), music therapy and usual care [14]. Both those patients receiving massage and music therapy reported an overall improvement in their hospital experience and a reduction in pain.

A randomized controlled trial (n=167) conducted in the USA of hospice or palliative care patients compared therapeutic massage, guided meditation/visualization or friendly visits [12]. Neither massage nor guided meditation, delivered up to twice per week, had specific treatment effects when compared with friendly visits from hospice-trained volunteers. In a follow-up publication, the authors found that there was an increase in quality of life when participants were assigned to their preferred treatment group ($p=0.047$), an increase in benefit from the treatment intervention ($p=0.001$) and an increase in days of participation in the study ($p=0.18$) [13]. Much of the apparent benefit of massage over the other two therapies resulted from prior preference for massage; an insight that suggests matching of available treatments to those actively preferred and requested by patients is critical in gaining benefit from such treatments and should lead to a re-evaluation of the appropriateness of randomized controlled trials for end-of-life research.

Other Manual Therapies

Naturopathic research also included manual therapy (osteopathy) combined with breathing training in asthma patients [16] and craniosacral therapy (CST) for

the management of chronic non-specific neck pain [17] and for symptoms associated with post-operative meningioma and traumatic brain injury [18]. One randomized controlled trial (n=54) conducted in Germany investigated CST [17] for the treatment of chronic non-specific neck pain. The CST intervention for this study involved one 45-minute treatment per week for eight weeks. This was compared with a sham intervention through which the participant received light touch applied to standardized anatomical areas for two minutes each time, once per week. Both groups were also followed up at 20 weeks after baseline measurements. The primary study outcomes identified reductions at Week 8 and Week 20 in pain on movement (Wk 8: -18.6, p=0.001; Wk 20: -11.4, p=0.020), pain intensity (Wk 8: -21.0, p=0.001; Wk 20: -16.8, p=0.003) and neck disability (Wk 8: -8.2, p=0.010; Wk 20: -6.5, p=0.006) in the CST intervention group compared to the sham control. They also reported increased physical quality of life (Wk8: +8.0, p=0.010; Wk 20: +6.5, p=0.006). Subsequent secondary analysis [19] examined the applicability of the sham control and found it to be an appropriate control.

A case study conducted in Germany with a patient suffering with headaches, vertigo and chronic neck pain as a result of a traumatic brain injury included five 1-hour sessions of CST into a complex naturopathic plan that involved auricular acupuncture, hydrotherapy, exercise, nutritional therapy, mindfulness exercises and other treatments [18]. The patient reported a decrease in headache intensity, vertigo symptoms, and cervicobrachial and hand numbness (measured by visual analog scales), subjective and objective improvements in neck mobility, muscle tension, sleep quality and general wellbeing.

Table 35.1 Clinical research investigating naturopathic physical medicine interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Braun, et al. (2012) [Australia, WPRO] [11]	Randomized controlled trial	Post-surgery cardiothoracic patients	Swedish Massage therapy		Active control: rest	146 (75/71)	Anxiety, Visual Analog Scale [pre and post intervention]	**Reduced anxiety** Massage: -1.72; Rest: -0.041 Between group: p<0.001
							Muscular tension, Visual Analog Scale [pre and post intervention]	**Reduced muscular tension** Massage: -1.70; Rest: -0.61 Between group: p=0.002
							Relaxation, Visual Analog [pre and post intervention]	**Increased relaxation** Massage: + 2.11; Rest: 0.74 Between group: p<0.0001
							Satisfaction, Visual Analog Scale [pre and post intervention]	**Increased satisfaction** Massage: +0.31; Rest: -0.28 Between group: p=0.016
							Heart rate (beats/sec) [pre and post intervention]	NS
							Respiratory rate (breaths/min) [pre and post intervention]	NS
							Blood pressure (mmHg) [pre and post intervention]	NS
							Anxiety, Visual Analog Scale [pre and post intervention]	**Reduced anxiety** Massage: -1.72; Rest: -0.041 Between group: p<0.001
Courtney, et al. (2019) [Australia, WPRO] [16]	Case reports	Asthma (dysfunctional breathing)	Combined manual therapy and standardized breathing retraining protocol	Not specified	Nil	6	Simplified manual assessment of respiratory motion (MARM) [pre and post treatment to Wk 4]	**Improved respiratory motion** Reduced in 5/6 patients
							Chest expansion (cm) [pre and post treatment to Wk 4]	**Increased chest expansion** Increased xiphoid expansion 3/6 patients Increased axilla expansion 2/6 patients

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Dysfunctional breathing symptoms questionnaires – Self-Evaluation of Breathing Questionnaire (SEBQ) [pre- and post-treatment to Wk 4]	**Reduced dysfunctional breathing** Reduced post treatment 6/6 patients Reduced wk 4 5/5 patients Further reduced from BL 4/5 patients
							Dysfunctional breathing symptoms questionnaires Nijmegen questionnaire (NQ) [pre- and post-treatment to Wk 4]	**Reduced dysfunctional breathing** Reduced post treatment 6/6 patients Reduced wk 4 5/5 patients Further reduced from BL 4/5 patients
							End Tidal CO2 measures (mmHg) [pre- and post-treatment]	**Reduced end tidal CO2 measures** ETCO2 <35 mmHg (hyperventilation) 4/6 patients ETCO2 >35 mmHg 1/6 patients (3)
							Lung function measures (predicted change %)	**Increased lung function measures** Increased FEV1 1/6 patients (3) (29% – 39%) Increased FVC 1/6 patients (3) Reduced FVC 1/6 patients (5)
							Asthma Related Quality of Life Questionnaire (AQLQ) [pre- and post-treatment to Wk 4]	NS
							Perceived Control of Asthma Questionnaire (PCAQ) [pre- and post-treatment to Wk 4]	**Increased control of asthma** Post-treatment and Wk 4 5/6 patients
							Hospital anxiety and depression scale [pre and post treatment to Wk 4]	**Reduced anxiety and depression** Anxiety Score >7 pre: 4/6 post 3/6 Depression score >7 pre: 3/6 post 3/6

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Downey, et al. (2009) [USA, AMRO] [12]	Randomized controlled trial	Hospice or palliative care patients	Therapeutic massage – light back-and neck massage in a position of the patient's choosing, followed by effleurage and goodbye holding (35+10min)		Guided meditation/visualization or Friendly visits	167 (56/56/55)	Quality of Dying and Death Instrument [BL to Wk 10]	NS
							Expected number of weeks of good-quality life over a 10-week period [BL to Wk 10]	NS
							Memorial Symptom Assessment Scale Pain distress over a 10-week period [BL to Wk 10]	NS
							Study partners' reports of quality of life of 106 deceased patients [BL to Wk 10]	NS
Downey, et al. (2009) [USA, AMRO] [13]	Secondary analysis					108 (37/34/37)	Rating scale by surrogate of patient benefit from study treatment	Patient benefit from study treatment when assigned to preferred treatment group (p=0.001)
							Baseline QoL according to patient's treatment preference assignment	Increased baseline QoL when assigned to preferred treatment (p=0.047)
							Days of participation in the study before withdrawal according to patient's treatment preference assignment	Increase in days of participation in study when assigned to preferred treatment (p=0.18)
Haller, et al. (2015) [Germany, EURO] [18]	Case report	Traumatic Brain Injury (headaches, vertigo, and chronic neck pain)	Five 1-hour craniosacral therapy (CST) sessions	Auricular acupuncture, cupping massage, hydrotherapy (cold affusions), thermotherapy (hot and cold cataplasms), exercise, nutritional therapy, and	Nil	1	VAS for headache intensity [BL to Wk 2]	**Reduced headache intensity** Symptom improvement after treatment
							VAS for vertigo symptoms [BL to Wk 2]	**Reduced vertigo symptoms** Symptom improvement after treatment
							Neck mobility and muscle tension [BL to Wk 2]	**Increased mobility and reduced tension** Subjective improvements after treatment

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
				phytotherapy with *Bryophyllum sp.* and *Avena sativa.* Relaxation, stress reduction, mindfulness, and cognitive re-structuring training			VAS for cervicobrachial and hand numbness [BL to Wk 2]	**Reduced numbness** Symptom improvement after treatment
							Interview for sleep quality [BL to Wk 2]	**Increased sleep quality** Improvement after treatment
							Interview for general well-being [BL to Wk 2]	**Increased general wellbeing** Improvement after treatment
Haller, et al. (2016) [Germany, EURO] [17]	Randomized controlled trial	Neck pain (chronic)	8 weeks: Craniosacral therapy (CST) 45 minutes, once per week	Pain medication, massage and acupuncture	Sham: light touch applied to standardized anatomic areas for 2 minutes each time, once per week	54 (27/27)	Pain on Movement Questionnaire [BL, Wk 8, Wk 20]	**Reduced pain on movement** Wk 8: CST, -28.8; Sham, -11.2 Between group -18.6 (p=0.001) Wk 20: CST, -31.2; Sham, -21.1 Between group -11.4 (p=0.020)
							Pain intensity, Visual Analog score [BL, Wk 8, Wk 20]	**Reduced pain intensity** Wk 8: CST, -32.4; Sham, -16.6 Between group -21.0 (p=0.001) Wk 20: CST, -32.5; Sham, -21.1 Between group -16.8 (p=0.003)
							Pressure pain sensitivity test [BL, Wk 8, Wk 20]	Point of max. pain: NS M. levator scapulae: NS M. trapezius: NS M. semispinalis capitis: NS
							Neck Disability Index [BL, Wk 8, Wk 20]	**Reduced neck disability** Wk 8: CST, -14.8; Sham, -4.5 Between group -8.2 (p=0.010) Wk 12: CST, -13.9; Sham, -5.4 Between group, -6.5 (p=0.006)
							Short Form-12, Physical [BL, Wk 8, Wk 20]	**Increased quality of life** Physical Wk 8: CST, +9.2; Sham, +2.1 Between group +8.0 (p=0.010) Wk 12: CST, +10.5; Sham, +2.0 Between group +6.5 (p=0.006)
							Short Form-12, Mental [BL, Wk 8, Wk 20]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Haller, et al. (2014) [Germany, EURO] [19]	Secondary analysis						Questionnaire for Assessing Subjective Physical Wellbeing [BL, Wk 8, Wk 20]	NS
							Hospital Anxiety and Depression Scale [BL, Wk 8, Wk 20]	**Reduced Anxiety** Wk 8: CST, -1.6; Sham, -0.1 Between group -1.0 (NS) Wk 20: CST, -1.9; Sham, +0.7 Between group -2.1 (p=0.020) Depression: NS
							Perceived Stress Questionnaire [BL, Wk 8, Wk 20]	NS
							Emotional/Rational Disease Acceptance Questionnaire [BL, Wk 8, Wk 20]	NS
							Scale of Body Connection [BL, Wk 8, Wk 20]	NS
							Global Impression of Improvement [BL, Wk 8, Wk 20]	**Increased impression of improvement** Wk 8: CST, 2.2; Sham, 3.3 Between group -1.0 (p<0.001) Wk 20: CST, 2.3; Sham, 3.1 Between group -0.7 (p=0.029)
							Credibility/ Expectancy Questionnaire and Helping Alliance/ Satisfaction Questionnaire	NS
							Helping Alliance Questionnaire	**Sham treatment is an appropriate control**

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Perlman, et al. (2012) [USA, AMRO] [15]	Randomized controlled trial (dose-finding)	Osteoarthritis of the knee	Swedish massage (30-60 min, once or twice per wk, for 8 wks)	Not specified	Group 1: 30 mins once per wk, Group 2: 30 mins twice per wk Group 3: 60 mins once per wk Group 4: 60 mins twice per week Control: Usual care	125 (25/25/25/25/25)	Western Ontario and McMaster Universities Arthritis Index (WOMAC) [BL to Wk 8]	**Reduced symptoms** Pain: Group 1, NS; Group 2, NS; Group 3, -27.2; Group 4, -27.7; Usual care, -5.6 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05 Functionality: Group 1, NS; Group 2, NS; Group 3, -21.2; Group 4, -22.0; Usual care, -6.6 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05 Global: Group 1, NS; Group 2, NS; Group 3, -24.0; Group 4, -24.0; Usual care, -6.3 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05 Stiffness: NS
							Visual Analog Scale [BL to Wk 8]	**Reduced pain** Group 1, NS; Group 2, NS; Group 3, -39.8; Group 4, -31.2; Usual care, -9.8 Between group (1&2 vs UC), NS Between group (3&4 vs UC), p<0.05
							Knee range of motion (flexion) [BL to Wk 8]	NS
							Time to walk 50 feet (15m) [BL to Wk 8]	NS
Roseen, et al. (2017) [USA, AMRO] [14]	Randomized controlled trial	Hospital inpatients (family medicine)	Massage therapy (Swedish and acupressure techniques) 10-40 min therapy session each day.	Usual inpatient care	Control: Usual care alone Comparison: Music therapy	90 (30/30/30)	Hospital Consumer Assessment of Healthcare Providers and Systems survey [within 7 days of discharge]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Qualitative telephone survey [within 7 days of discharge] (not administered to control group)	**Improved hospital stay experience and pain management** Subjective reports of interventions improving patient experience

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36 Hydrotherapy

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HIGHLIGHTS

- Hydrotherapy – the application of water for therapeutic purposes – has been used for thousands of years and has been part of naturopathic care since its inception.
- Hydrotherapy can be used externally (baths, compresses and sprays) and internally (inhalation and colon therapy).
- Hydrotherapy is a low cost, effective and safe therapy that can be easily integrated into practice.
- Clinical research by the naturopathic community has examined the application of hydrotherapy baths, topical compresses, and complex hydrotherapy involving multiple hydrotherapy techniques.
- In line with the role of primary care, naturopathic researchers have investigated the effects of hydrotherapy on individuals with primary dysmenorrhoea, anemia, chronic neck pain, migraine, and hepatic cirrhosis.

Hydrotherapy (formerly 'hydropathy') is the application of water for therapeutic purposes. Hydrotherapy can be used externally, which includes compresses, baths (balneotherapy or thalassotherapy) and sprays; and internally, which includes inhalations and colon hydrotherapy [1]. Hydrotherapy is considered a core aspect of nature cure [2] and it is taught in over 80% of naturopathic educational programs globally. It is also included as part of the treatment modalities offered by naturopaths and naturopathic doctors in most countries [3].

As a healing force in the natural environment, water is used to stimulate both the healing power of nature and the self-healing processes within the body [4]. It is a completely drugless therapy that supports the body's healing processes primarily through the manipulation of blood circulation through thermic and mechanical means. Some therapies also use water as a medium for transfer of minerals, herbal remedies or other therapeutic agents. The treatment effect of hydrotherapy is based on the specific application of either cold or hot water or the alternating of cold and hot water compresses and is designed to generally be sedative in acute disease and stimulative in chronic [5].

Although the healing power of water has been used by humans for tens of thousands of years, modern hydrotherapy originated with Vincent Priessnitz in the mid-1820s who is credited with opening the first hydropathic center. Hydrotherapy was further promoted by Sebastian Kneipp with "Kneippism," and his book *My Water Cure* published in 1886, in which he wrote: "Health depends on a normal and regular circulation of blood which is achieved by hydrotherapy, nutrition and herbalism" [6]. Kneipp, a German hydrotherapist, health promotor, herbalist and nutritionist was a pioneer in the naturopathic movement, and an inspiration and mentor to other important naturopaths such as Benedict Lust, Henry Lindlahr and John Scheel, who further entrenched hydrotherapy as a key component of naturopathic treatment [2]. In the early 1900s, Otis G. Carroll, a naturopathic doctor from the United States of America (USA) developed constitutional hydrotherapy which is the alternating of hot and then cold wet towels on the trunk and back of the body followed by wrapping the person in blankets [2].

Today hydrotherapy forms one of the seven core therapeutic modalities used as part of naturopathic treatment and it is applied in practice to stimulate the *vis medicatrix naturae,* or the natural healing ability of the body [2]. Although readily employed in both inpatient and outpatient settings, it is particularly prevalent in countries where naturopathy/naturopathic medicine has retained a focus on inpatient delivery through naturopathic hospitals such as India.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=17) naturopathic clinicians undertook in the field of hydrotherapy. This research includes a total 483 participants and was conducted in India (n=15), Canada (n=1) and the United States (n=1). The study designs include uncontrolled trials (n=5), randomized controlled trials (n=4), randomized crossover trials (n=3), comparative trials (n=2), case studies (n=2) and

non-randomized controlled study (n=1). The location of the clinical research studies was strongly weighted to India and were conducted primarily in inpatient settings in naturopathic hospitals or residential educational institutions. The studies in North America were conducted in outpatient clinics in the community. The hydrotherapy interventions were diverse, and included external applications of plain water (i.e., not spring or sea water), ice, mud and the use of saunas. Hydrotherapy treatments included constitutional hydrotherapy, cold applications including cold packs, or cold baths; hot applications including hot packs or hot baths; and other hydrotherapy techniques including neutral temperature baths, water spray, ice bag, simultaneous applications of hot and cold water, alternating hot and cold baths, ionic foot baths, saunas, and the application of mud.

The conditions treated with hydrotherapy included the effects of hydrotherapy on the blood pressure and heart function of healthy adults (n=5), and one study each for the conditions of heel pain, chronic neck pain, chronic migraine, primary dysmenorrhea, HIV, diabetes, bronchial asthma, anemia, and hepatic cirrhosis. Of all the naturopathic clinical studies employing hydrotherapy interventions, 84.2% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 36.1: Clinical research investigating hydrotherapy interventions conducted by naturopathic researchers.*

Implications

The practice of hydrotherapy encompasses a broad range of treatment modalities which could potentially be applied in many therapeutic settings for both preventive and curative approaches. The results indicate that hydrotherapy may be effective in low lowering of blood pressure, blood sugar and inflammation. For some chronic conditions, such as rheumatoid arthritis or liver disease, hydrotherapy can form an integral part of an inpatient treatment program of naturopathic therapies. Importantly, although most studies were performed in inpatient hospital settings, many of these applications are readily translatable to low resource settings or self-management due to limited equipment required [7].

Due to multiple physiological actions, hydrotherapy has a wide range of therapeutic applications and may offer a low-cost treatment option which can play a major part in naturopathic practice, both in a clinic setting and for home use. Although most studies have been performed in inpatient settings in India, hydrotherapy remains taught and practiced by naturopaths/naturopathic doctors globally [7-9], highlighting the need for further research in these locations. The results of the research and the lack of repetition of studies for the same condition warrant the need for more research in hydrotherapy, but also point to its potential as a low-cost, effective tool for integrating naturopaths/naturopathic doctors.

Studies investigating specific interventions:

Hydrotherapy Baths

Hydrotherapy baths involve immersing parts of the body in water with a controlled temperature, or alternating temperatures. Water bath exposures included those for the hip [10-12], spine [13, 14], foot [15], pelvis (sitz) [11], foot and arm [16], immersion [11, 12, 17] and a mud bath [18]. The populations involved in the studies had primary dysmenorrhea (n=1) [10], anemia (n=1) [11], chronic neck pain (n=1) [12], migraine (n=1) [16], and hepatic cirrhosis (n=1) [17]. Four studies also sampled health populations (n=4) [13-15, 18].

An uncontrolled clinical trial (n=17) conducted in India with women aged 18 to 35 with primary dysmenorrhea [10] included a hot hip sitz bath for 10 minutes with a simultaneous cold compress on the head after drinking a glass of cold water daily, from day 20 of their menstrual cycle until the start of the menstruation. Pain intensity on Day 1 of menstruation decreased (Mth 1: -2.7 ($p=0.03$); Mth 2: -2.8 ($p=0.04$); Mth 3: -3.2 ($p=0.01$)). Participants also reported decreased use of analgesics and absenteeism decreased significantly (Mth 1: -7 ($p < 0.01$); Mth 2: -8 ($p<0.01$); Mth 3: -8 ($p<0.01$)) [7].

A randomized controlled trial conducted in India with chronic migraine patients (n=40) compared conventional medication as needed (n=20), with conventional medication as needed plus hydrotherapy treatments [16]. The hydrotherapy treatments consisted of applying hot compresses to the arm, a hot foot bath (103°F to 110°F) and an ice massage to the head daily for 20 min for 45 days. There was a significant decrease in headache impact test score (34.25±6.74 in the hydrotherapy group versus 9.45±1.42 for pharmacotherapy only group, $p<0.001$ between groups). A decrease in the frequency (hydrotherapy group: -8.65 and pharmaceutical only group: -3.15, between group: $p<0.001$), and intensity of headaches (hydrotherapy group: -6.85 and pharmaceutical only group: -2.05, between group: $p<0.001$) based on the visual analog scale was found. There was also significant improvement in heart rate variability (HRV) parameters in the hydrotherapy group, including a significant decrease in heart rate ($p=0.017$), as well as an increase in parasympathetic activity as measured by an increase in high frequency power ($p=0.014$) and a significant decrease in sympathovagal balance as measured by a decrease in LF/HF ratio ($p=0.004$) [13].

Topical Compresses

Compresses are an alternative way to apply water to specific parts of the body, typically using cloths soaked in cold or hot water. Eleven studies measured the effect of hydrotherapy compresses using alternating hot and cold compress on legs and heels [19] or neck [12], cold compress on the head [10], cold pack on the abdomen [20], cold chest pack [21], hot chest pack [22] ice bag on head [23] or ice massage [24]; and abdominal mud pack [11, 17] and eyes [11, 25]. The participants in these studies were sampled for primary dysmenorrhea (n=1) [10], anemia (n=1) [11], chronic neck pain (n=1) [12], heel pain (n=1) [19], type 2 diabetes mellitus (n=1) [20], and bronchial asthma (n=1) [21]. Four studies sampled healthy populations (n=4) [22-25].

An uncontrolled trial (n=20) conducted in India studied the impact of a 20-minute cold abdominal pack (CAP) on males taking medication for type II diabetes [20]. The parameters studied included blood pressure, pulse rate, variables calculated from those measurements, HRV and blood glucose. Measurements before and after the intervention of a 20-minute CAP showed a significant reduction in blood glucose (154.35±4.09 mg/dL vs. 149.55±33.25 mg/dL, p=0.011). Improvements in cardiovascular and HRV parameters, including pulse rate, systolic blood pressure, mean arterial pressure, but not in diastolic blood pressure or pulse pressure.

A controlled trial (n=20) conducted as a pilot study in India used alternating hot and cold compresses on individuals with heel pain. Patients were assigned to standard naturopathic physiotherapy care (NPC) with two adjuvant therapy groups: a control group (therapeutic ultrasound, n=10), or alternating compresses (n=10) [19]. In this study, alternating compress was the application of hot and cold-water packs, where the hot moist sponge cloth was applied first for 15 to 20 minutes, followed by a cold moist sponge cloth for 30 seconds to 1 minute. The Foot Function Index (FFI) was used to measure changes. The FFI reduced from 46.97 to 31.98 (p=0.005) among standard protocol patients, and from 49.72 to 21.35 (p=<0.001) among the alternating compress protocol patients. Average pain intensity in the seven days of treatment decreased from 3.53 to 2.53 cm on the visual analogue scale (p=<0.001) among patients receiving NPC, and from 4.09 to 2.61 cm (p=<0.001) amongst those receiving NPC plus alternating compresses. There was no significant difference in pain score reduction between the two groups (p=0.206), but patients with alternating compresses as part of their treatment had significant improvements in foot functionality (p=0.007).

Complex Hydrotherapy

Complex hydrotherapy uses an alternating sequence of different hydrotherapy techniques to effect changes in multiple areas. Two studies [12, 17] used multiple hydrotherapy techniques; and a further clinical trial measured the outcome of constitutional hydrotherapy in HIV positive adults [26].

A case study conducted in India with a 39-year-old male with hepatic cirrhosis received various forms of hydrotherapy over a 4-week period of time that included abdominal mud packs, hot and cold kidney packs, neutral baths and alternating hot and cold baths along with yoga and breathing exercises [17]. At the end of the 4 weeks there was a reduction in weight (17 kg) and body mass (6.25 kg/m^2), a reduction in both systolic and diastolic blood pressure (10 mm Hg and 12 mm Hg), reduction in total bilirubin (0.6 mg/dL), reduction in AST by 16 u/L and ALT by 17 u/L and improvement in kidney function as measured by a reduction in urea by 8 mg/dL.

Table 36.1 Clinical research investigating hydrotherapy interventions conducted by naturopathic researchers

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Arankalle, et al. (2016) [India, SEARO] [19]	Non-randomized controlled trial (pilot study)	Heel pain	Alternating hot and cold compresses (AC)	Naturopathic physical care (NPC)	Control: NPC plus ultrasound 'placbo'	20 (10/10)	Visual analog scale [BL to Dy 6]	**Reduced pain** AC: -1.48 (p<0.001); NPC: -1.0 (p<0.001) Between group: NS
							Foot Functional Index [BL to Dy 6]	**Increased function** AC: -18.47 (p-0.001); NPC: -14.99 (p=0.005) Between group: p=0.007
Bharthis, et al. (2012) [India, SEARO] [10]	Uncontrolled trial (pilot study)	Primary dysmenorrhea	Hot hip bath with cold compress on the head (10 min daily for 3 menstrual cycles)	Nil	Nil	17	Absenteeism due to pain (days) [BL to Mth 5]	**Reduced absenteeism** Mth 1: -7 (p < 0.01); Mth 2: -8 (p<0.01); Mth 3: -8 (p<0.01)
							Pain before onset of menstruation, Visual Analog Scale [BL to Mth 1, Mth 2, Mth 3]	NS
							Pain on first day of menstruation, Visual Analog Scale [BL to Mth 1, Mth 2, Mth 3]	**Reduced pain on first day of menstruation** Mth 1: -2.7 (p=0.03); Mth 2: -2.8 (p=0.04); Mth 3: -3.2 (p=0.01)
							Conventional analgesic medication use [BL to Mth 3]	**Reduced medication use**
Corroon et al. (2018) [USA, AMRO] [26]	Uncontrolled trial (pilot study)	HIV+ adults	Constitutional hydrotherapy (Two treatments per week for 6 weeks + 1 week follow-up)	Nil	Nil	15	Adverse events [BL to Wk 8]	None serious
							Viral load (cp/mL) [BL to Wk 8]	NS
							TNF-alpha (pg/mL) [BL to Wk 8]	NS
							Erythrocyte sedimentation rate (pg/mL) [BL to Wk 8]	NS
							High sensitivity C-reactive protein (mg/L) [BL to Wk 8]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Blood pressure (mmHg) [BL to Wk 8]	NS
							Body mass index (kg/m^2) [BL to Wk 8]	NS
							Mean body fat (%) [BL to Wk 8]	**Reduced body fat** -1.6 ($p < 0.0001$)
							Red blood cell (x106/uL) [BL to Wk 8]	NS
							Hemoglobin (g/dL) [BL to Wk 8]	NS
							Hematocrit (%) [BL to Wk 8]	NS
							CD3 (cells/ul) [BL to Wk 8]	NS
							CD4 (cells/ul) [BL to Wk 8]	NS
							CD8 (cells/ul) [BL to Wk 8]	NS
							Sodium (mmol/L) [BL to Wk 8]	**Reduced sodium levels** -2.08 ($p = 0.005$)
							Potassium (mmol/L) [BL to Wk 8]	NS
							BUN ratio	NS
							Creatinine (mg/dL) [BL to Wk 8]	NS
							Aspartate transferase (IU/L) [BL to Wk 8]	NS
							Alanine transferase (IU/L) [BL to Wk 8]	NS
							Bilirubin (mg/dL) [BL to Wk 8]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Short Form-36 health survey [BL to Wk 8]	**Increased energy** Total: NS Energy/Fatigue: +2.5 (p = 0.03) Physical functioning: NS Pain: NS General health: NS
Das, et al. (2018) [India, SEARO] [20]	Uncontrolled trial	Type II diabetes mellitus (adults, male)	Cold abdominal pack (15 – 16°C) (single application, 20 minutes)	Nil	Nil	20	Random blood glucose (mg/dL) [BL to 20 min]	**Reduced blood glucose** -4.8 (p=0.011)
							Systolic blood pressure (mmHg) [BL to 20 min]	**Reduced systolic blood pressure** -2.35 (p=0.023)
							Diastolic blood pressure (mmHg) [BL to 20 min]	NS
							Pulse rate (beats/minute) [BL to 20 min]	**Reduced pulse rate** -1.6 (p=0.028)
							Pulse pressure (mmHg) [BL to 20 min]	NS
							Mean arterial pressure (mmHg) [BL to 20 min]	**Reduced mean arterial pressure** -1.55 (p=0.010)
							Rate pressure product (units) [BL to 20 min]	**Reduced rate pressure product** -3.77 (p=0.006)
							Double product (units) [BL to 20 min]	**Reduced double product** -2.72 (p=0.003)
Gnanadeep, et al. 2016 [India, SEARO] [18]	Randomized controlled trial	Healthy adults (young males)	Mud bath (single session, 45 min)	Nil	Cold wet wrap (single session, 45 min)	60 (30/30)	Heart rate variability [5 min pre- and post-intervention]	NS
							Pulse rate [5 min pre- and post- intervention]	NS
							Respiratory rate [5 min pre- and post-intervention]	NS
							Blood pressure [5 min pre- and post-intervention]	NS
							Body temperature [5 min pre- and post-intervention]	NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Goley et al. (2018) [India, SEARO] [13]	Randomized comparative trial (pilot study)	Healthy adults	Neutral spinal bath (NSB) or Neutral spinal spray (single session, 15 min)	Nil	Nil	30 (15/15)	Blood pressure (BP), systolic (mmHg) [BL to 5 min post-intervention]	**Reduced systolic BP** NSB group: NS NSS group: -5.2 (p=0.037)
							Blood pressure (BP), diastolic (mmHg) [BL to 5 min post-intervention]	**Reduced diastolic BP** NSB group: -7.47 (p=0.008) NSS group: NS
							Pulse pressure (mmHg) [BL to 5 min post-intervention]	**Reduced pulse pressure** NSB group: NS NSS group: -7.34 (p=0.017) Between group: (p=0.039)
							Mean arterial pressure (mmHg) [BL to 5 min post-intervention]	**Reduced mean arterial pressure** NSB group: -5.6 (p=0.008) NSS group: NS
							Heart rate variability (HRV) (RR intervals) [BL to 5 min post-intervention]	**Increased heart rate variability** NSB group: +44.25 (p=0.002) NSS group: +45.92 (p=0.009)
							Heart rate (beats per min) [BL to 5 min post-intervention]	**Reduced heart rate** NSB group: -4.89 (p=0.002) NSS group: -4.96 (p=0.004)
							Low frequency (LF) band HRV (0.04-0.15Hz) [BL to 5 min post-intervention]	NS
							High frequency (HF) band HRV (0.15-0.4 Hz) [BL to 5 min post-intervention]	NS
							HF/LF ratio [BL to 5 min post-intervention]	**Reduced HF/LF ratio** NSB group: -0.7 (p=0.041) NSS group: NS Between group: (p=0.026)

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Jainraj, et al. (2016) [India, SEARO] [14]	Uncontrolled trial	Healthy adults	Cool spinal bath (single session, 26°C, 15 min)	Nil	Nil	50	Blood pressure (BP), systolic (mmHg) [BL to post-intervention]	**Reduced systolic BP** -7.62 (p=<0.001)
							Blood pressure (BP), diastolic (mmHg) [BL to post-intervention]	**Reduced diastolic BP** -6.39 (p=<0.001)
							Breathing rate [BL to post-intervention]	NS
							Pulse rate (beats/min) [BL to post-intervention]	**Reduced pulse rate** -6.18 (p=<0.001)
							Body temperature (% change) [BL to post-intervention]	**Reduced body temperature** -2% (p=0.001)
Jogdand, et al. (2018) [India, SEARO] [25]	Randomized controlled trial (pilot study)	Healthy adults	Mud pack (over eyes, 30 min, 15 sessions)	Nil	Wet pack (over eyes, 30 min, 15 sessions)	60 (30/30)	Mindfulness Attention Awareness Scale (6 point Likert scale) [BL to post-intervention]	**Increased mindfulness** Mud pack: +15.76 (p<0.001) Wet pack: NS
							Perseverative Thinking Questionnaire of negative thinking (5 point Likert scale) [BL to post-intervention]	**Reduced obsessive negative thinking** Mud pack: -9.04 (p<0.05) Wet pack: -8.32 (p<0.01)
							Positive and Negative Affect Schedule – positive score [BL to post-intervention]	NS
							Positive and Negative Affect Schedule – negative score [BL to post-intervention]	**Reduced negative effect** Mud pack: -4.08 (p<0.05) Wet pack: 3.6 (p<0.05)
Kennedy, et al. (2011) [Canada, AMRO] [15]	Comparative trial (proof-of-principle)	Healthy adults	Ionic footbath (70/30 mix positive/negative polarity, 30 min, 4 sessions)	Nil	Footbath without active participant (2 sessions)	6	Concentration of elements in water (difference between pre- and post-footbath, 28 individual elements, grouped as 'Array components', 'Essential elements' and 'Potentially toxic elements (PTEs)'	**Increased concentration of elements in water** Without feet: Total, +103% (p=0.01) Array, +8,271% (p=0.01); Essential, NS; PTEs, NS With feet: Total, +99% (p<0.0001); Array, +10,830% (p<0.0001);

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							[pre- and post-intervention]	Essential, NS; PTEs, +19% (p=0.042) Between group: Total, NS; Array, p=0.005; Essential, NS; PTEs, NS
Manjunath, et al. (2006) [India, SEARO] [21]	Uncontrolled trial	Bronchial asthma (unmedicated adults)	Cold chest pack (30 min daily for 21 days)	Naturopathic care (hydrotherapy, fasting, diet therapy, magnet and colour therapy, acupuncture, mud packs, massage therapy, yoga therapy)	Nil	15	Peak Expiratory Flow Rate (l/min) [BL to Dy 21]	**Increased peak expiratory flow** Day 21: +65.3 (p<0.002)
							Symptom presence/ absence (score out of 3 for breathlessness, cough with expectoration, and wheezing) [BL to Dy 21]	**Reduced symptoms** Day 21: -2.2 (p<0.05)
Manjuladevi, et al (2017) [India, SEARO] [22]	Randomized crossover trial	Healthy adults (young females)	Hot chest pack (HCP) (40°C, 20 min)	Nil	Supine rest (SR) (20 min)	30	Blood pressure (BP), systolic (mmHg) [BL to post-intervention]	**Reduced systolic BP** HCP: -4.4 (p<0.001); SR: -2.8 (p=0.02) Between group: NS
							Blood pressure (BP), diastolic (mmHg) [BL to post-intervention]	**Reduced diastolic BP** HCP: -3.1 (p=0.009); SR: NS Between group: NS
							Pulse rate (beats per min) [BL to post-intervention]	**Reduced pulse rate** HCP: -2.34 (p=0.032); SR: NS Between group: NS
							Pulse pressure (mmHg) [BL to post-intervention]	NS
							Peak Expiratory Flow Rate (l/min) [BL to post-intervention]	**Increased peak expiratory flow** HCP: +22.34 (p<0.001); SR: NS Between group: NS
							Mean arterial pressure (mmHg) [BL to post-intervention]	**Reduced arterial pressure** HCP: -3.51 (p<0.001); SR: NS Between group: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Rate pressure product (myocardial workload) [BL to post-intervention]	**Reduced rate pressure product** HCP: -6.08 ($p<0.001$); SR: NS Between group: $p=0.043$
							Double product (myocardial oxygen consumption) [BL to post-intervention]	**Reduced double product** HCP: -4.79 ($p<0.001$); SR: NS Between group: $p=0.04$
Mooventhan, et al (2016) [India, SEARO] [23]	Randomized crossover trial	Healthy adults (young males, with average adipose tissue)	Ice bag (1 – 2°C, applied to head and spine while prone, 20 min)	Nil	Tap water bag (24 – 25°C, applied to head and spine while prone, 20 min). Control (lying prone on massage table, 20 min)	28	Blood pressure (BP), systolic (mmHg) [BL to post-intervention]	**Reduced systolic BP** Ice bag: -1.93 ($p<0.05$); Tap water: -2.46 ($p<0.05$); Control: NS
							Blood pressure (BP), diastolic (mmHg) [BL to post-intervention]	**Reduced diastolic BP** Ice bag: -2.75 ($P<0.01$); Tap water: NS; Control: NS
							Pulse rate (beats per min) [BL to post-intervention]	**Reduced pulse rate** Ice bag: -5.0 ($p<0.001$); Tap water: -2.22 ($p<0.05$); Control: NS
							Pulse pressure (mmHg) [BL to post-intervention]	NS
							Mean arterial pressure [BL to post-intervention]	**Reduced mean arterial pressure** Ice bag: -2.48 ($p<0.01$); Tap water: NS; Control: NS
							Rate pressure product (myocardial workload) [BL to post-intervention]	**Reduced rate pressure product** Ice bag: -6.55 ($p<0.001$); Tap water: -4.04 ($p<0.05$); Control: NS
							Double product (myocardial oxygen consumption) [BL to post-intervention]	**Reduced double product** Ice bag: -5.53 ($p<0.001$); Tap water: -2.78 ($p<0.05$); Control: NS

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Mooven-than, et al. (2016) [India SEARO] [24]	Randomized crossover trial	Healthy adults (unmedicated young males)	Ice massage (with bag of ice, 1 – 2°C, applied to head and spine while prone, 20 min)	Nil	Tap water massage (with bag of water, 24 – 25°C, applied to head and spine while prone, 20 min). Control (lying prone on massage table, 20 min)	30	Heart rate variability (HRV) (RR intervals) [BL to post-intervention]	**Increased heart rate variability** Ice massage: +52.99 (p=0.001); Tap water: +34.15 (p=0.004); Control: NS
							Heart rate (beats per min) [BL to post-intervention]	**Reduced heart rate** Ice massage: -4.02 (p=0.001); Tap water: -2.43 (p=0.008); Control: NS
							Heart rate variability – parasympathetic branch (Root mean square of the successive differences) [BL to post-intervention]	**Increased parasympathetic HRV** Ice massage: +13.67 (p=0.013); Tap water: NS; Control: +8.5 (p=0.027)
							Heart rate variability – successive variation (NN50) [BL to post-intervention]	**Increased successive variation HRV** Ice massage: +24.56 (p=0.17); Tap water: NS; Control: NS
							Heart rate variability – proportionate (PNN50) [BL to post-intervention]	**Increased proportionate HRV** Ice massage: +9.58; Tap water: NS; Control: NS
							Low frequency (LF) band HRV (0.05-0.15Hz) [BL to post-intervention]	NS
							High frequency (HF) band HRV (0.15-0.5 Hz) [BL to post-intervention]	NS
							HF/LF ratio [BL to post-intervention]	NS
Nair, et al. (2015) [India, SEARO] [11]	Case report	Anemia (female)	Mud pack (lower abdomen, eyes), sitz bath/hip bath, spinal spray, emersion bath, enemas, abdominal cold water wrap (90 min sessions, daily, for 6 days)	Swedish massage, vibro (talcum) massage, electrotherapy	Nil	1	Hemoglobin (gm/dL) [BL to Dy 6]	**Increased hemoglobin** Dy 6: +1.2
							Resting blood pressure [BL to Dy 6]	No change
							Pulse rate [BL to Dy 6]	No change
							Respiratory rate [BL to Dy 6]	No change

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
Pullan, et al. (2016) [India, SEARO] [12]	Randomized controlled trial	Chronic neck pain	Moist heat; bath (steam baths, neutral bath – immersion, hip, spinal or half); compress/pack/revulsive (alternating hot and cold) compress (neck, kidney) (10 days)	Naturopathy (hydrotherapy, massage, diet, yoga)	Acupuncture (ACU) (with naturopathy)	60 (30/30)	Pain, Visual Analog Scale [BL to Dy 10]	NS
							Neck Disability Index [BL to Dy 10]	NS
							State Trait Anxiety Inventory [BL to Dy 10]	**Reduced anxiety** Between group: p=0.02
							Short Form-36 (SF-36) health survey – Physical functioning [BL to Dy 10]	NS
							SF-36 – limitations, physical health [BL to Dy 10]	NS
							SF-36 – limitations, emotional problems [BL to Dy 10]	**Reduced emotional problems** Between group: p=0.01
							SF-36 – emotional wellbeing [BL to Dy 10]	NS
							SF-36 – social functioning [BL to Dy 10]	NS
							SF-36 – energy/fatigue [BL to Dy 10]	NS
							SF-36 health survey – bodily pain [BL to Dy 10]	NS
							SF-36 – general health [BL to Dy 10]	NS
Revadi, et al. (2018) [India, SEARO] [17]	Case report	Hepatic cirrhosis with portal hypertension and ascites (male, 39 years)	Naturopathic hydrotherapy (abdominal mud packs, hot and cold kidney packs, neutral baths 34 – 35°C, alternate hot and cold baths. Varied daily treatments for 4 weeks)	Yogic meditation and breathing exercises (2 hrs per day during 3rd and 4th weeks), bodywork to legs (15 min daily for 3rd week), vegetarian diet (4 weeks)	Nil	1	Weight (kg) [BL to Wk 4]	**Reduced body weight** Wk 4: -17
							Body Mass Index (kg/m^2) [BL to Wk 4]	Reduced BMI Wk 4: -6.25
							Abdominal girth (inches) [BL to Wk 4]	**Reduced abdominal girth** Wk 4: -12
							Blood pressure (BP), systolic (mmHg) [BL to Wk 4]	**Reduced systolic BP** Wk 4: -10
							Blood pressure (BP), diastolic (mmHg) [BL to Wk 4]	**Reduced diastolic BP** Wk 4: -12

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Breath holding capacity (secs) [BL to Wk 4]	**Increased breath holding capacity** Wk 4: +6
							Hemoglobin (gm %) [BL to Wk 4]	**Increased hemoglobin** Wk 4: +4.2
							Liver function – bilirubin (mg/dL, total, direct and indirect) [BL to Wk 4]	**Reduced bilirubin** Wk 4 total: -0.6 Wk 4 direct: -0.2 Wk 4 indirect: -0.4
							Liver function – aspartate amino transferase enzyme (u/L) [BL to Wk 4]	**Reduced AST** Wk 4: -16
							Liver function – alanine aminotransferase enzyme (u/L) [BL to Wk 4]	**Reduced ALT** Wk 4: -17
							Liver function – serum albumin (g/dL) [BL to Wk 4]	**Increased serum albumin** Wk 4: +1.3
							Renal function – serum creatinine (mg/dL) [BL to Wk 4]	**Reduced creatinine** Wk 4: -0.4
							Renal function – blood urea (mg/dL) [BL to Wk 4]	**Reduced urea** Wk 4: -8
Sujan, et al. (2016) [India SEARO] [16]	Randomized controlled trial	Chronic migraine	Hot arm and foot bath (103°F – 110°F), ice massage to head (20 min, five days per week, for 45 days)	Pharmaceutical medication	Pharmaceutical medication only	40 (20/20)	Headache Impact Test [BL to Dy 45]	**Reduced impact** Hydrotherapy: -34.3; Pharmaceutical: -9.5 Between group: p<0.001
							Pain frequency (daily diary) [BL to Dy 45]	**Reduced pain frequency** Hydrotherapy: -8.65; Pharmaceutical: -3.15 Between group: p<0.001
							Visual Analog Scale (pain intensity) [BL to Dy 45]	**Reduced pain intensity** Hydrotherapy: -6.85; Pharmaceutical: -2.05 Between group: p<0.001

Author (year) [Country, World Region]	Design	Study Population	Intervention(s)	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Heart rates (beats per min) [BL to Dy 45]	**Reduced heart rates** Hydrotherapy: -5.9; Pharmaceutical: +2.4 Between group: p<0.05
							Standard Deviation of NN interval [BL to Dy 45]	NS
							Root mean square of the successive differences [BL to Dy 45]	NS
							Heart rate variability – total frequency (ms^2) [BL to Dy 45]	NS
							Low-frequency (LF) power (ms^2) [BL to Dy 45]	**No change in low frequency power** Hydrotherapy: -0.97; Pharmaceutical: -2.62 Between group: p<0.05
							High-frequency (HF) power (ms^2) [BL to Dy 45]	**Increased high-frequency power** Hydrotherapy: +1.3; Pharmaceutical: -0.8 Between group: p<0.05
							LF/HF ratio [BL to Dy 45]	**Reduced LF/HF ratio** Hydrotherapy: -0.27; Pharmaceutical: -0.09 Between group: p<0.01

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37 Acupuncture

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HIGHLIGHTS

- Acupuncture is practiced in over 180 countries and has been incorporated into diverse disciplines, including naturopathy.
- The practice of acupuncture includes needling, auricular acupuncture, electroacupuncture, cupping, and others.
- Naturopaths/NDs often combine acupuncture with other therapies and practices.
- Clinical research by the naturopathic community has examined the application of combination acupuncture interventions, standalone acupuncture, standalone cupping therapy and other forms of standalone acupuncture-related treatments.
- In line with the role of primary care, naturopathic researchers have investigated the effects of acupuncture and acupuncture-related treatments on individuals with musculoskeletal conditions, cancer, endocrine conditions, complex immune conditions, neurological conditions, women's health conditions, cardiovascular conditions, mental health conditions and other conditions as well as in healthy individuals.

Acupuncture is particularly associated with and prominent in Traditional Chinese Medicine (TCM) [1], yet it also has a long history in other Asian, European and American traditional medical systems [2, 3]. Acupuncture has been practiced for over 3000 years for a wide range of conditions [4], from headaches to musculoskeletal pain to gastrointestinal complaints to anxiety and depression, among others [1]. Acupuncture is practiced in over 180 countries worldwide [5] and practitioners from diverse disciplines, including traditional healers, medical doctors, physiotherapists as well as naturopaths and naturopathic doctors have incorporated acupuncture into their practice. The education and licensure requirements to practice acupuncture differ by profession and jurisdictions [6].

Acupuncture, as a drugless therapy, fits well into the Naturopathic Therapeutic Order as it involves four of the seven stages outlined in the Naturopathic Therapeutic Order: establishing the conditions for health (level 1); stimulation of the healing power of nature (level 2); supporting and balancing physiological and bioenergetic systems (level 3); and addressing pathology using specific natural modalities (level 5) [7]. Acupuncture, along with the study of TCM is included in the curriculum in some naturopathic educational programs and is part of the scope of naturopathic care in some countries such as Canada, the USA, South Africa, India, Germany, Switzerland, and Brazil [6, 8].

Acupuncture is practiced in several different ways including needling, electroacupuncture, auricular acupuncture, acupressure, cupping and moxibustion to name a few. Needle acupuncture includes the insertion of needles along meridian channels on the body based on TCM philosophy. Auricular acupuncture, first described in 1950 in France [9], is another modality within acupuncture whereby points in the ear are needled or where acupuncture 'seeds' or tiny needles (often resembling a small circular bandage) are applied to specific points on the ear. In 1958 electroacupuncture was introduced whereby a small electric current is connected to pairs of needles which have been inserted into the skin [10]. Acupressure uses the same philosophical basis as acupuncture, but instead of needles, pressure, either with a finger or with a device, is applied to acupuncture points. Specific acupressure points are sometimes taught to patients as a way of managing conditions such as headaches. Acupressure also allows practitioners who cannot use needling techniques, due to regulatory restrictions, to still practice a form of acupuncture. Cupping dates back to Egyptian, Chinese and Middle Eastern cultures and involves the application of suction using various devices on a specific area of skin using cups of various sizes for a short period of time [11]. Cupping traditionally uses continuous suction, but modern devices also allow for pulsating suction or the sliding of cups along the skin. Other techniques that fall under TCM and are included

in this chapter include moxibustion which is the burning of herbs near or on the body, Tui na, a therapeutic type of TCM massage, and *Gua sha* therapy, a TCM healing method which involves scraping the skin. A stimulation pad or device is another modern means of using the principles of acupuncture for pain relief that may be safely applied at home.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=32) conducted by naturopathic researchers investigating acupuncture and its related practices. This research includes a total of 2,522 participants and was conducted in Germany (n=10), United States of America (USA) (n=9), India (n=9), Canada (n=3) and Australia (n=1). The study designs include randomized controlled trials (RCTs) (n=23) and case reports (n=5), uncontrolled trials (n=3), a secondary analysis (n=1) and a pooled, secondary analysis (n=1). The studied interventions include practitioner-administered acupuncture (n=12), home-based acupuncture (n=5), electroacupuncture (n=4), acupressure (n=3), auricular acupuncture along with acupuncture of the body (n=2), cupping (n=7) and *Gua sha* Therapy (n=1).

The conditions where acupuncture was used as an intervention include chronic neck pain (n=7) or back pain (n=2), breast cancer (n=5), type II diabetes mellitus (T2DM) (n=1), human immunodeficiency virus (HIV) (n=2), and one study in each area of Parkinson's disease, systemic lupus erythematosus (SLE), fibromyalgia, menopause, primary dysmenorrhea, osteoarthritis of the knee, rheumatoid arthritis, acute inpatient care, hypertension, rhinosinusitis, transverse myelitis, secondary dysfunction, cigarette smoking, anxiety, and healthy volunteers.

Finding an adequate way to perform sham acupuncture in blinding the patient to the lack of treatment while having no physiological effect has long been a controversial issue [12]. Two forms of sham acupuncture were used in these trials, either a sham acupuncture device (n=390) [13, 14], where the needle looks as if it is being pushed into the skin but retracts inside the device, or shallow needling in areas which are not true acupuncture points [15-18]. Sham adhesives were used for ear acupuncture [16], and one study used a sham cupping device (n=141) [19]. Using a waitlist to compare those having treatment with those not having treatment is another way to create a control group, but in this type of trial the patients are not blinded to the treatment. Seven trials (n=688) used a waitlist [16, 20-25] and one (n=46) used slow breathing as an alternative to acupuncture [26]. Of all the naturopathic clinical studies employing acupuncture interventions, 84.8% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 37.1: Clinical research investigating acupuncture interventions conducted by naturopathic researchers*. This body of naturopathic research on acupuncture is also supported by ten observational studies and 15 reviews or meta-analyses conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

Acupuncture has been studied within naturopathic clinical settings to treat a broad range of conditions. Most studies were one-off studies, except for pain associated with breast cancer in postmenopausal women. The breast cancer studies indicated that acupuncture reduced pain of breast cancer in postmenopausal, but not in premenopausal women. Studies on cupping and use of a needle stimulation pad were focused on pain in musculoskeletal complaints, although cupping in TCM has a broader range of therapeutic applications that may be applicable to naturopathic practice.

Given the lack of replication of studies in conditions such as hot flushes and dysmenorrhea, hypertension or sexual dysfunction, more research is needed to establish robust evidence for the use of acupuncture in those conditions by naturopaths/naturopathic doctors. In most cases, acupuncture used by naturopaths and naturopathic doctors was aligned with the TCM paradigm, suggesting that the evidence base for acupuncture treatments applied by naturopaths/naturopathic doctors may be broader than those listed in this chapter, and comparable to the evidence base for acupuncture. Even in countries where acupuncture is not formally integrated into naturopathic training, naturopaths/naturopathic doctors provide a significant level of acupuncture services [27], or a significant amount possess additional qualifications in acupuncture [28], suggesting that acupuncture is a tool that is suitable for and readily accepted in naturopathic applications. Further research is warranted to examine the role of acupuncture in naturopathic practice.

Studies investigating specific interventions:

Combination Acupuncture Interventions

Seven studies investigated a combination of acupuncture-related treatments including needle acupuncture (n=6) [15, 23, 29-32], electroacupuncture (n=3) [30-32], auricular acupuncture (n=4) [15, 23, 29, 30], cupping (n=1) [23], moxibustion (n=1) [30], and tui na massage (n=1) [30]. One study did not report the specific styles of acupuncture treatments as they were substantially varied to suit the requirements of the individual (n=1) [33]. In addition to the acupuncture treatments, one study also

provided yoga, lifestyle counselling and a naturopathic dietary prescription [31], while a second study provided concomitant massage and hydrotherapy interventions [32]. The populations included in these studies encompassed individuals with breast cancer (n=2) [15, 29] , anxiety (n=1) [23], HIV (n=1) [30], transverse myelitis (n=1) [31], and rheumatoid arthritis (n=1) [32], as well as inpatients admitted to hospital for acute care (n=1) [33].

A randomized controlled pilot trial conducted in Canada [23] investigated personalized acupuncture interventions for children and adolescents with anxiety (n=19), compared to a waitlist control. Participants received individualized acupuncture treatments that included needle acupuncture, cupping and auricular acupuncture to stimulate a range of acupuncture points (e.g., LI4, DU4, DU20, HT7, PC6, CV4, CV6, UB14, BL15, BL23, BL25, TW5, Yin Tang, CV12, SP6, SP20, ST36, KI3, KI7). Participants received 30-minute treatments once per week for five weeks. Following treatment, participants had lower anxiety scores on the Multidimensional Anxiety Scale for Parents (-15.4, p=0.025).

An uncontrolled trial conducted in the USA [30] reported the outcomes associated with individualized acupuncture treatments for individuals who were HIV positive (n=27). Participants received a personalized combination of auricular and body acupuncture, moxibustion, electroacupuncture, and *tui na* massage based on their unique tongue and pulse assessments. They were observed for four months prior to receiving the intervention, which they then received for six months. While participants did not identify any significant change in the two validated scales used as outcome measures, in the qualitative post-intervention interviews conducted by the research team 96% of participants reported relief of symptoms and complaints, 89% reported an improved sense of wellness and emotional wellbeing and 48% reported an increased ability to work more with reduced financial worries.

A case report conducted in India [31] with a 32-year-old male patient with transverse myelitis reported on the outcomes of 15 30-minute needle acupuncture and electroacupuncture treatments across a range of acupuncture points (needle: GB34, GB39, ST32, ST36, ST37, ST39, ST41, UB40, UB62, HT7, LI11, LI4, DU14, SP6, UB36, Ex21, Ex36; electro: LI11, LI4, GB36, ST36, SP6) for three weeks. The acupuncture was also combined with yoga, lifestyle counselling and a naturopathic dietary prescription. The participant demonstrated significant improvement over 21 days in the WHO Brief Quality of Life Questionnaire (WHOQOL) in physical, psychological, social and environmental health. There was also improvement in quality of sleep based on the Pittsburg Sleep Quality Index (PSQI) (18 to 8) and reduction for pain intensity (8 to 1) as measured by visual analog scale (VAS).

Another case report conducted in India, this time with a 48-year-old female with rheumatoid arthritis who underwent 3 weeks of acupuncture and electroacupuncture across a range of points (needle: GV20, EX28, EX36; electro: GV20, LI4, LI11, BL11, GB34, SP6, KI3, ST44. The individual received treatments for 30-minutes in total including 20-minutes of electro-stimulation, in 14 sessions over three weeks. She was also administered massage, mud therapy and sauna therapies. At the end of the treatment period she showed a significant reduction in depression, anxiety and stress based on the Depression Anxiety and Stress Scales (depression 31 to 8, anxiety 21 to 8, stress 23 to 6) [32]. There was also improvement on the PSQI scale (11 to 7), the VAS (8.2 to 1.9) and the Short-form 36 Version-2 Health Survey from 12 on day 1 to 63 on day 22.

Standalone Acupuncture

There were ten studies investigating needle-based acupuncture as a standalone intervention in individuals with cancer (n=1) [16]; menopausal hot flushes (n=1) [13] and primary dysmenorrhea (n=1) [25]; sexual dysfunction (n=1) [34]; hypertension (n=1) [26], chronic rhinosinusitis [35], SLE (n=1) [36], HIV [37] and T2DM (n=1) [17]. One further study evaluated the health effects of standalone acupuncture on a healthy population [18].

A randomized controlled trial (n=60) conducted in India investigated the outcomes of acupuncture, compared with usual care, on females from age 17-23 diagnosed with primary dysmenorrhea [25]. The acupuncture intervention included 12 pre-determined acupuncture points: KI3, SP8, ST25, ST29, ST30, ST36, CV4, CV6, BL62, HT7, LI4, and PC6. The acupuncture points were stimulated during 15 sessions, lasting 20-minutes each, per month for three months. The acupuncture was initiated on the sixty day of each participant's menstrual cycle and was not performed during menstruation. Compared to usual care, the acupuncture intervention demonstrated a significant reduction in pain intensity ($p<0.05$) menstrual cramping ($p<0.05$), dizziness (p,0.05), diarrhea ($p<0.05$), faint feeling ($p<0.05$), negative mood ($p<0.05$), tiredness ($p<0.05$), nausea ($p<0.05$) and vomiting ($p<0.05$) at all time points (Day 30, 60 and 90). Headaches were also reduced at Day 90 ($p<0.05$) in the group undergoing acupuncture but not at earlier time points.

An uncontrolled trial (n=35) was conducted in India [34] to investigate the effects of an acupuncture protocol on secondary sexual dysfunction associated with antidepressant medication. The participants received stimulation of five acupuncture points (KI3, GV4, BL23, HT7, PC6) aimed at addressing Heart *Yin* deficiency and Kidney *Qi* deficiency. Acupuncture stimulation was administered weekly for 15 minutes, over 12 weeks with a 4-week follow up. At the end of treatment, participants reported reduced anxiety (Beck Anxiety Inventory: -2.8, p=0.01), increased sexual function (VAS Sexual

Function, total: +62.28, p<0.01) and a reduced impact on their sexual experience (Arizona Sexual Experience Questionnaire, total: -1.59, p=0.027).

A case report was prepared from a patient in India with SLE [36]. The patient received 20-minute sessions of acupuncture daily for 30 days, with a 7-day rest period after 15 sessions. The acupuncture needles were inserted into six acupuncture points: GV20, GV6, LI11, HT7, GB34, KI3. At the end of the treatment period, the patient reported reduced pain (VAS: -4.8), reduced daytime sleepiness (Epworth Sleepiness Scale: -8), reduced sleep problems (PSQI: -8) and increased quality of life (across numerous scales of the Short Form-36).

A second case study conducted in Canada [37] with a patient with Guillain-Barre syndrome associated with HIV underwent acupuncture treatment (points: GB34, GB39, PC6, KI3, BL40, GV4, GV3, BL23) for 30-minutes weekly for seven weeks, then monthly for ten months. The acupuncture intervention was administered alongside dietary changes eliminating reactive foods, weekly vitamin B12 intramuscular injections and a calcium-rich multi-nutrient supplement. The patient experienced 90% recovery of function after 1 year of treatment.

Standalone Cupping Therapy

There were six studies that investigated cupping therapy as an intervention, either as dry (n=5) [19, 20, 22, 24, 38] or wet (n=1) [39]. The studies investigated cupping for the treatment of chronic non-specific low back (n=2) [20, 24] and neck pain (n=3) [22, 39], and fibromyalgia (n=1) [19]. One additional publication presented the pooled analysis of previously unpublished results of four studies examining 2-year follow up outcomes for a range of cupping techniques in individuals with chronic non-specific neck pain [40].

One randomized controlled trial (n=50) [24] conducted in Germany for chronic non-specific neck pain compared dry cupping treatments with a waitlist control. Participants in the treatment phase received 10-minute cupping treatments twice per week for three weeks (five treatments in total). The treatment involved dry cupping massage along the spine and trapezius massage. The results indicated significant reduction in neck pain on movement (-11.7, p=0.019), pain intensity (-14.3; p=0.037) and neck disability (-4.1; p<0.001). They also experienced an increased quality of life in the domains of bodily pain (+16.7, pp=0.002) and mental health (+8.5, p=0.003).

A randomized controlled trial (n=50) [39] conducted in Germany investigated the impact of wet cupping on participants with chronic non-specific neck pain. In those receiving the wet cupping (n=25) superficial incisions were made at areas of pain and covered with double-walled glass cups using flame-generated vacuum for 15 min with 3-day washout. As measured by the VAS, the wet cupping group reported reduced pain at rest (-17.9 p=0.003) and reduced maximum pain on movement (-19.7 p=0.003) compared to the waitlist group. The treatment group also reported increased quality of life based on the Short Form-36 survey.

Other Forms of Standalone Acupuncture-related Treatments

Seven studies investigated other acupuncture-related treatments as standalone interventions. These included electroacupuncture (n=2) [14, 41], self-administered needle pads (n=2) [21, 42], acupressure (n=2) [43, 44], *gua sha* therapy (n=1) [45], and auricular acupuncture (n=1) [46].

A randomized controlled trial conducted in the USA [46] investigated auricular acupuncture to assist with smoking cessation. The study compared auricular acupuncture with an educational smoking cessation program, with a third study arm combining auricular acupuncture and the education program. The auricular acupuncture was used to stimulate acupuncture points commonly used in chemical dependency including four bilateral ear points (Sympathetic, LU, KI, LV) and two wrist points (LI4, HT7). The 30-minute treatments were administered five times per week for four weeks. Compared to the other two groups, a greater proportion of the group receiving auricular acupuncture and education had ceased smoking (p=0.023) or decreased the number of cigarettes smoked (p=0.003) at the end of the intervention.

A randomized controlled trial conducted in Germany [45] investigated *gua sha* therapy for the treatment of chronic non-specific low back pain (n=50). The *gua sha* was applied as paravertebral between cerebral vertebrae 7 (C7) and lumbar vertebrae 5 (L5) and horizontal strokes across the back below C7 and above L5. Paravertebral strokes were also applied between cerebral vertebrae 1 or 2 and C7, with additional strokes along the dorsal surface of gluteus maximus. The treatment was administered twice, with seven days between treatments. Compared to the waitlist control, participants receiving *gua sha* had reduced pain on movement at the end of the study period (Pain on Movement Questionnaire: -24.55 vs -12.3, p<0.001).

A randomized controlled trial conducted in the USA [44] examined the effects of acupressure massage on breast cancer survivors, more than 12 months after cancer treatment. Participants were allocated to receive either relaxing or stimulating acupressure massage, or usual care. The relaxing acupressure intervention was applied to Yin Tang acupuncture points, and bilaterally to Anmian, HT7, SP6 and LV3. The stimulating acupressure treatment was used on Du20, CV6 and bilateral points for LI4, ST36, SP6 and KI3. Each acupuncture point was

massaged daily for 3 minutes in both acupressure groups, for six weeks with an additional follow up conducted four weeks after treatment concluded. Participants in both groups reported improvements in fatigue ($p<0.001$), sleep quality ($p<0.05$) somatic function ($p<0.05$) and fitness ($p<0.05$) compared to the usual care control.

A case study conducted in India with a patient undergoing treatment for Parkinson's disease was treated with 30-minute sessions of electro-acupuncture six times a week, for 5 weeks. The acupuncture included points on the torso and the scalp [41]. The study indicated improvement on all scales assessed and included a decrease in resting heart rate and blood pressure, improvement in balance based on the Berg Balance Scale and improvement in the Parkinson's Disease Questionnaire-39.

Table 37.1 Clinical research investigating acupuncture interventions conducted by naturopathic researchers

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Arankalle and Nair (2013) [India, SEARO] [41]	Case Report	Parkinson's disease (stage III, male)	Electroacupuncture on GV20, BL11, LI11, HT7, LI4, SI19, ST36, GB34 + Scalp acupuncture (motor area and Chorea tremor control area) (24 sessions over 4 wks with 7-day rest period after 12 sessions)	Dietary and lifestyle advice emphasizing water intake and regular physical activity	Nil	1	Resting Heart rate (bpm) [BL to Wk 4]	**Reduced** - 4bpm
							Blood pressure (mmHg) [BL to Wk 4]	**Reduced** Systolic: -20
							Berg Balance Scale [BL to Wk 4]	**Increased** +2
							Parkinson's Disease Questionaire-39 impact on quality of life [BL to Wk 4]	**Reduced impact on quality of life** -10
Bier, et al. (2002) [USA, AMRO] [46]	Randomized controlled trial	Smoking cessation	Auricular acupuncture bilaterally at five ear points and one wrist point commonly used in treatment of chemical dependency: HT7, Sympathetic, LU, KI, LV, LI4 (30 min, 5 sessions per wk for 4 wks)	Educational smoking cessation program (Acupuncture plus)	Comparison: Acupuncture alone. Control: Educational smoking cessation program with sham acupuncture (Sham plus)	141 (38/45/58)	Smoking cessation (smoking or not) [BL to Mth 1, Mth 3, Mth 6, Mth 12, Mth 15, Mth 18]	**Increased cessation Mth 1** Acupuncture alone: +10% Acupuncture plus: +40% Sham plus: +22% Between group: p=0.023
							Percentage decrease in cigarettes smoked [BL to Mth 1, 3, 6, 12, 15, 18]	**Reduced smoking Mth 1** Acupuncture alone: -49% Acupuncture plus: -53% Sham plus: 40% Between group: p=0.003
							Craving intensity [BL to Mth 1, 3, 6, 12, 15, 18]	NS
							Beck Depression Inventory [BL to Mth 1, 3, 6, 12, 15, 18]	NS
							Zung Anxiety Scale [BL to Mth 1, 3, 6, 12, 15, 18]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Cramer, et al. (2011) [Germany, EURO] [20]	Randomized controlled trial	Chronic non-specific neck pain	Pneumatic pulsation therapy: pulsating cupping applied to neck and shoulder areas where manual pressure and lifting of the skin caused the most discomfort (5 treatments over 2 wks)	Nil	Standard care: self-directed standard medical care, including physiotherapy, sports activities, and analgesics as needed	50 (25/25)	Pain intensity (numerical rating scale) [BL to Wk 2.5]	**Reduced pain intensity** Acupuncture: -1.4; Standard care: +0.24 Between group: p=0.001
							Total pain at motion (visual analogue scale) [BL to Wk 2.5]	**Reduced total pain at motion** Acupuncture: -8.1; Standard care: +4.1 Between group: p < 0.001
							Maximum pain at motion (visual analogue scale) [BL to Wk 2.5]	**Reduced maximum pain at motion** Acupuncture: -2.5; Standard care: -0.26 Between group: p=0.004
							Functional disability (Neck Disability Index) [BL to Wk 2.5]	**Reduced functional disability** Acupuncture: -5.5; Standard care: -0.3 Between group: p=0.025
							Short Form-36 (SF-36) health survey – physical component [BL to Wk 2.5]	**Increased physical function** Acupuncture: +3.7; Standard care: -1.2 Between group: p=0.002
							SF-36 health survey – mental component [BL to Wk 2.5]	NS
Crew et al. (2007) [USA, AMRO] [29]	Randomized controlled trial (cross-over)	Breast cancer stage I-IIIa hormone receptor positive – joint pain associated with adjuvant aromatase inhibitor therapy	Acupuncture on TW5, GB41, GB34, LI4, ST41, KD3, auricular acupuncture (Shen Men, kidney, liver, upper lung, and sympathetic), and joint-specific protocols (shoulder (LI-15, SJ-14, SI-10); wrist (SJ-4, LI-5); fingers (SI-5, SI3, Ba Xie, LI-3); lumbar (Du-3, Du-8, UB-23); hip (GB-30, GB-39); and knee (SP-9, SP-10, ST-34)) (30 min, twice per wk for 6 wks)	Non-narcotic, non-steroidal pain medications as needed	Observation with non-narcotic, non-steroidal pain medications as needed	19	Brief Pain Inventory – short form [BL to Wk 6]	**Reduced pain** Pain scores: -3.1 (p=0.01) Pain severity: -2.7 (p=0.02) Functional interference: -1.4 (p=0.02)
							Western Ontario and McMaster Universities Osteoarthritis index [BL to Wk 6]	**Reduced impact on quality of life** Total score: -33.6 (p=0.04) Impact on function: -165.2 (p=0.02) Pain, stiffness: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Functional Assessment of Cancer Therapy – General [BL to Wk 6]	**Increased wellbeing** Physical: +3.5 (p=0.03) Social/family, emotional and functional: NS
							Inflammatory markers (TNF-α, IL-1β) [BL to Wk 6]	NS
Crew et al. (2010) [USA, AMRO] [15]	Randomized controlled trial	Breast cancer stage I-IIIa hormone receptor positive – aromatase inhibitor induced joint pain	Standardized full body and auricular acupuncture (shoulder (LI-15, SJ-14, SI-10); wrist (SJ-4, LI-5); fingers (SI-5, SI3, Ba Xie, LI-3); lumbar (Du-3, Du-8, UB-23); hip (GB-30, GB-39); and knee (SP-9, SP-10, ST-34)) (30 min, twice per wk for 6 wks)	Non-narcotic, non-steroidal pain medications as needed	Sham acupuncture control (superficial needle insertion at body locations not recognised as true acupoints)	38 (20/18)	Brief Pain Inventory – short form [BL to Wk 6]	**Reduced worst pain** Acupuncture: -3.7, Sham: -0.11 Between group: p=0.002 **Reduced pain severity** Acupuncture: -3.34, Sham: +0.10 Between group: p<0.001 **Reduced interference** Acupuncture: -1.99, Sham: -0.02 Between group: p=0.002
							Western Ontario and McMaster Universities Osteoarthritis index [BL to Wk 6]	**Reduced total score** Acupuncture: -96, Sham: +3 Between group: p<0.01 **Reduced pain** Acupuncture: -160, Sham: -14 Between group: p<0.01 **Reduced stiffness** Acupuncture: -69, Sham: +12 Between group: p<0.01 **Reduced functional impact** Acupuncture: -506, Sham: -149 Between group: p=0.01

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Modified Score for the Assessment of Chronic Rheumatoid Affections of the hand (M-SACRAH) [BL to Wk 6]	**Reduced total score** Acupuncture: -87, Sham: -28 Between group: p<0.01 **Reduced pain** Acupuncture: -59, Sham: -13 Between group: p<0.01 **Reduced stiffness** Acupuncture: -55, Sham: -40 Between group: p=0.01 **Reduced functional impact** Acupuncture: -213, Sham: -31 Between group: p=0.02
							Functional Assessment of Cancer Therapy – General [BL to Wk 6]	**Increased physical wellbeing** Acupuncture: +5.7, Sham: -0.7 Between group: p=0.03
Ee, et al. (2016) [Australia, WPRO] [13]	Randomized, controlled trial	Menopause	Standardized needle acupuncture to treat kidney yin deficiency on KI6, KI7, SP6, HT6, CV4, LR3 (8 wk protocol: twice per wk for 2 wks, then weekly for 6 wks)	Unspecified non-HRT vasomotor symptom treatments	Non-insertive sham acupuncture at body locations not recognised as true acupoints	327 (163/164)	Hot flush score (mean) [BL to Wk 8]	NS
							Hospital Anxiety and Depression Scale [BL to Wk 8]	NS
							Menopause-Specific Quality of Life [BL to Wk 8]	NS
Greenlee et al. (2016) [USA, AMRO] [14]	Randomized controlled trial (pilot)	Breast cancer (stage I-III, prevention of chemotherapy-induced peripheral neuropathy)	Electroacupuncture (EA) on GB34, St36, LI4, LI10, Huatuojiaji (L3, L5, C5, C7), Bafeng, Baxie (weekly for 12 wks, within 2 days of weekly chemotherapy infusion)	Nil	Sham acupuncture control	63 (31/32)	Brief Pain Inventory – short form [BL to Wk 6, 12, 16]	**Increased pain** Wk 6, Wk 12: NS Wk 16, between group: p=0.03
							Functional Assessment of Cancer Therapy [BL to Wk 6, 12, 16]	NS
							Neuropathic Pain Scale [BL to Wk 6, 12, 16]	**Increased pain** Wk 6, Wk 12: NS Wk 16, between group: p=0.03

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Hershman et al. (2018) [USA, AMRO] [16]	Randomized controlled trial	Breast cancer (Stage I-III hormone receptor positive – aromatase inhibitor induced joint pain)	Acupuncture joint specific protocol (Acu) (30 – 45 min, twice per wk, for 6 wks)	Nil	Sham acupuncture control, Waitlist (WL) control.	226 (110/59/ 57)	Brief Pain Inventory – Short Form [BL to Wk 6, Wk 12]	**Reduced worst pain** Wk 6 Acu: -2.05, Sham: -1.07, WL: -0.99 Between group: Sham p=0.01, WL p=0.01 Wk 12 Acu: -2.31, Sham: -1.51, Waitlist: -0.19 Between group: Sham NS, Waitlist p<0.001 **Reduced average pain** Wk 6 Acu: -1.45, Sham: -0.76, WL: -0.81 Between group: Sham p=0.04, WL p=0.01 Wk 12 Acu: -1.95, Sham: -1.07, WL: -0.62 Between group: Sham p=0.02, WL: p<0.001 **Reduced pain interference** Wk 6 Acu: -1.69, Sham: -0.82, WL: -0.94 Between group: Sham p=0.02, Waitlist NS Wk 12 Acu: -1.8, Sham: -1.45, WL: -0.7 Between group: Sham NS, Waitlist p=0.003 **Reduced pain severity** Wk 6 Acu: -1.5, Sham: -1.00, WL: -0.82 Between group: Sham p=0.05, WL p=0.01 Wk 12 Acu: -1.82, Sham: -1.34, WL: -0.39 Between group: Sham NS, Waitlist p<0.001
Hohmann et al. (2012) [Germany, EURO] [21]	Randomized controlled trial	Chronic neck pain (CNP) or lower back pain (LBP) (non-specific)	Home-based, self-administered needle stimulation pad: applied to both hands (CNP group) or both feet (LBP group), then to the painful area (neck or back) uncovered. (10 min per day hands or feet, 30 min per day neck or back, for 2 wks).	Nil	Waitlist control	78 (CNP: 17/18, LBP: 21/21)	Pain, Numeric Rating Scale [BL to Dy 14]	**Reduced pain** CNP: -1.6 (p=0.021) LBP: -2.3 (p<.001)
							Mechanical Detection Threshold [BL to Dy 14]	NS
							Vibration Detection Threshold [BL to Dy 14]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Pressure Pain Threshold (area of maximum pain) [BL to Dy 14]	**Increased pressure pain threshold** CNP: +0.106 (p = .032) LBP: +0.082 (p = .013)
							Pressure Pain Threshold (10cm close to area of maximum pain) [BL to Dy 14]	**Increased pressure pain threshold** CNP: NS LBP: +0.073 (p = .018)
							Neck Pain Questionnaire [BL to Dy 14]	**Reduced neck pain** CNP: -7.4 (p = 0.028)
							Oswestry Disease Index [BL to Dy 14]	NS
Huff, Cooley & Waller (2008) [Canada, AMRO] [37]	Case Report	Guillain-Barre syndrome associated with Human Immunodeficiency Virus (HIV)	Acupuncture (GB34, GB39, PC6, KI3, BL40, GV4, GV3, BL23) (30 min weekly for 7 weeks, then monthly for 10 mths (16 treatments total)	Dietary elimination, weekly B12 injections, calcium-rich multinutrient formula	Nil	1	Perceived Sensation, Coordination, Balance, Mobility [BL to 12 mths]	**Increased sensation** **Increased coordination and balance, and confidence in mobility** **90% recovery of functions**
Jisha Mol, et al. (2017) [India, SEARO] [35]	Randomized controlled trial	Chronic rhinosinusitis	Acupuncture (bilateral LI4, LI20, ST2 and ST36; unilateral EX-1 and GV23) (20 min daily for 10 days)	Nil	Steam inhalation (20 min daily: four cycles of steam (3 min) and withdraw (1-2 min)	60 (30/30)	Sino-Nasal Outcome Test [BL to Dy 10]	**Reduced symptoms** Inhalation: -4.83 (p=0.05) Acupuncture: -3.47 (p=0.005)
							Symptom frequency [BL to Dy 10]	**Reduced symptom frequency** Inhalation: -1.03 (p=0.05) Acupuncture: -1.20 (p=0.001)
Khamba, et al. (2013) [Canada, AMRO] [34]	Uncontrolled trial	Secondary sexual dysfunction associated with antidepressant medication	Acupuncture (Kd3, GV4, UB23, Ht7, PC6). Intervention delivered as protocol for Heart *Yin* Deficiency and Kidney *Qi* Deficiency (15 min, weekly for 12 wks with 4 wk follow-up)	Nil	Nil	35	Beck Anxiety Inventory [BL to Wk 12, 1 Mth follow-up]	**Reduced anxiety** Wk 12: -2.8 (p=0.01) 1 Mth follow-up: NS
							Beck Depression Inventory, Second Edition [BL to Wk 12, 1 Mth follow-up]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							The Sexual Function Visual Analogue Scale [BL to Wk 12, 1 Mth follow-up]	**Increased sexual function** Wk 12 Total: +62.28 (p<0.01) Desire/Libido: +13.9 (p=0.030) Erection: +12.0 (p=0.012) Ejaculation delay: +19.2 (p=0.03) Orgasm delay: +17.0 (p=0.025) Frequency of sex: +12.4 (p=0.04) 1 Mth follow-up: NS
							The Arizona Sexual Experience Questionnaire [BL to Wk 12, 1 Mth follow-up)	**Reduced impact on sexual experience** Wk 12 Total: -1.59 (p=0.027) Drive: -0.6 (p=0.014) Arousal: NS Erection: -0.5 (p=0.015) Ability to reach orgasm: -0.5 (p=0.027) Satisfaction from orgasm: NS 1 Mth follow up: NS
Kumar et al. (2017) [India, SEARO] [17]	Randomized controlled trial	Type II diabetes mellitus	Acupuncture on CV12 (30 min)	Nil	Sham acupuncture at non-acupuncture point 1 cun lateral to CV-12 (30 min)	40 (20/20)	Random blood glucose (mg/dL) [BL to 30 mins]	**Reduced blood glucose** Acupuncture: -12.25 (p < 0.001) Sham: NS Between group: NS
Lauche et al. (2011) [Germany, EURO] [38]	Randomized controlled trial (pilot)	Chronic non-specific neck pain	Dry cupping therapy: performed according to patient pain diagram and physical examination to determine areas of muscle tension and myogeloses (10-20 min, every 3-4 days for five treatments)	Nil	Waitlist control	50 (25/25)	Pain at rest, Visual Analog Scale [BL to Dy 18]	**Reduced pain at rest** Cupping: -19.4, Waitlist: +4.8 Between group: p<0.001
							Pain at movement, Visual Analog Scale [BL to Dy 18]	**Reduced pain at movement** Cupping: -33, Waitlist: -13 Between group: p=0.01
							Neck Disability Index [BL to Dy 18]	**Reduced neck disability** Cupping: -6.4, Waitlist: +0.1 Between group: p=0.002

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Short Form-36 (SF-36) health survey [BL to Dy 18]	**Increased quality of life** Bodily pain related quality Cupping: +13.4, Waitlist: +2.9 Between group: p=0.006 Vitality Cupping: +8.9, Waitlist: +0.5 Between group: p=0.006 Social function Cupping: +11.9, Waitlist: +4.7 Between group: p=0.04 Mental health Cupping: +30.6, Waitlist: +20.4 Between group: p=0.01 Physical functioning: NS Role physical: NS General health: NS Role emotional: NS Physical component score: NS Mental component score: NS
							Mechanical-detection, pressure-pain and vibration-detection thresholds [BL to Dy 18]	**Increased pressure-pain threshold** Maximum pain Cupping: +0.05, Waitlist: -0.04 Between group: p=0.026 Adjacent pain Cupping: +0.04, Waitlist: -0.07 Between group: p=0.001 Hand pain Cupping: +0.01, Waitlist: -0.09 Between group: p=0.034 Foot pain Cupping: +0.19, Waitlist: +0.06 Between group: p=0.004 Mechanical detection: NS Vibration detection: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Lauche et. al. (2012) [Germany, EURO] [39]	Randomized controlled trial (pilot)	Chronic non-specific neck pain	Wet cupping therapy: superficial incisions made at areas of pain, and covered with double-walled glass cups using flame- generated vacuum (15 min with 3 day washout)	Nil	Waitlist control	50 (25/25)	Pain at rest, Visual Analog Scale [BL to 15 min]	**Reduced pain at rest** Cupping: -16.4; Waitlist: +3.1 Between group: -17.9 (p=0.003)
							Maximal pain related to movement, Visual Analog Scale [BL to Dy 3]	**Reduced maximum pain at movement** Cupping: -24.8; Waitlist: -11.8 Between group: -19.7 (p = 0.003)
							Neck Disability Index [BL to Dy 3]	NS
							Short Form 36 health survey [BL to Dy 3]	**Increased quality of life** Physical functioning Cupping: +5.5; Waitlist: -1.1 Between group: +7.5 (p = 0.017) Bodily pain Cupping: +15.3; Waitlist: -0.4 Between group: +14.9 (p = 0.007) Physical component score Cupping: +5.5; Waitlist: +1.1 Between group: +5.0 (p = 0.008) Role physical: NS General health perception: NS Vitality: NS Social function: NS Role emotional: NS Mental health: NS Mental Component Score: NS
Lauche, et. al. (2013) [Germany, EURO] [40]	Secondary analysis (pooled)	Chronic non-specific neck pain	Wet cupping treatment (single application), Dry cupping (5 applications), Pulsating cupping (5 applications), of cupping massage (5 applications) (2 year follow-up post-intervention, pooled across four studies)	Not reported	Nil	133	Pain intensity, Visual Analog Scale [BL to Mth 24]	NS
							Neck disability index [BL to Mth 24]	**Reduced disability** -3.5 (p=0.025)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Short Form-36 health survey [BL to Mth 24]	**Increased quality of life** Bodily pain +14.6 ($p<0.001$) Physical component study +3.0 ($p=0.004$)
Lauche, et. al. (2013) [Germany, EURO] [22]	Randomized controlled trial	Chronic non-specific neck pain	Self-directed partner-delivered cupping massage (10-15 min, twice per wk, for 12 wks, with initial 1 hr workshop training)	Nil	Progressive muscle relaxation (PMR) (20 min, twice per wk, for 12 wks)	61 (30/31)	Pain intensity, Visual Analog Scale [BL to Wk 12]	NS
							Pain on motion, Visual Analog Scale [BL to Wk 12]	NS
							Pain Description List [BL to Wk 12]	NS
							Neck Disability Index [BL to Wk 12]	NS
							Hospital Anxiety and Depression Scale [BL to Wk 12]	NS
							Short Form 36 [BL to Wk 12]	NS
Lauche, et. al. (2016) [Germany, EURO] [19]	Randomized controlled trial	Fibromyalgia syndrome	Cupping therapy on upper and lower back (30 min, 5 sessions over 18 days)	Nil	Sham cupping control, Usual care (as waitlist control)	141 (47/48/46)	Pain (Visual Analog Scale) [BL to Dy 18]	**Reduced intensity** Usual care: -12.4 ($p<0.001$), Sham: NS Between group: **Reduced pain** Cupping: 25.5%; Sham: 18.8%; Usual care: 2.2% Between group: $p=0.006$ >50% reduction: NS
							Fibromyalgia Impact Questionnaire [BL to Dy 18]	NS
							Short Form-36 health survey [BL to Dy 18]	**Increased quality of life** Bodily pain Between group: +4.7 Vitality Between group: +6.3 Social role functioning:

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/Control)	Outcome measure	Outcome
								Between group: +7.1 Mental health Between group: +4.5 Mental component Between group: +3.4 Physical functioning: NS Physical role functioning: NS General health: NS Emotional role: NS Physical component: NS
							Pain perception [BL to Dy 18]	NS
							Multidimensional Fatigue Inventory [BL to Dy 18]	**Reduced** Reduced motivation Between group -1.2 General fatigue: NS Physical fatigue: NS Reduced activity: NS Mental fatigue: NS
							Pittsburgh Sleep Quality Inventory [BL to Dy 18]	NS
Leung, et al. (2018) [Canada, AMRO] [23]	Randomized controlled trial (pilot)	Anxiety (children and adolescents)	Personalized acupuncture and cupping and/or ear seeds, examples of points included: LI4, Du20, He7, Pe6, CV4, CV6, CV, AB14, B15, Du4, TW5, Yin Tang, CV12, Sp6, St36, Sp20, Ki3, Ki7, B23 and B25 (30 min, weekly for 5 wks)	Nil	Waitlist control	19 (10/9)	Hamilton Anxiety Rating Scale [BL to Wk 5]	**Reduced** Acupuncture: -11.1 ($p<0.001$) Waitlist control: NS Waitlist post-treatment: +10.38 ($p=0.007$) Between group at endpoint: NS
							Multidimensional Anxiety Scale for Children (MASC-2) [BL to Wk 5]	**Reduced** Acupuncture: NS Waitlist control: NS Waitlist post-treatment: -8.37 ($p=0.022$) Between group at endpoint: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							MASC-Parent [BL to Wk 5]	**Reduced** Acupuncture: -9.5 (p=0.008) Waitlist: NS Waitlist post-treatment: -5.13 (p=0.048) Between group at endpoint: Acupuncture -15.4 (p=0.025)
Louie, et al (2010) [USA, AMRO] [30]	Uncontrolled trial	Human Immunodeficiency Virus (HIV) positive	Individualized acupuncture treatment based on tongue and pulse assessments including: ear and body acupuncture, moxibustion, electroacupuncture, *tui na* massage (6 mths treatment, 4 mths pre-intervention observation)	Nil	Nil	27 (27/0)	Memorial Symptoms Assessment Scale [BL to 6 Mth post-treatment]	NS
							WHO Quality of Life scale [BL to 6 Mth post-treatment]	NS
							Qualitative outcomes (from exit interviews regarding effect of treatment on physical symptoms, ART side effects and quality of life)	Relief of symptoms and complaints: reported by 96% Improved sense of wellness and emotional wellbeing: reported by 89% Increased ability to work more with reduced financial worries: reported by 48%
Mohanty, et al. (2016) [India, SEARO] [18]	Randomized controlled trial (pilot)	Blood glucose levels (healthy young adults)	Acupuncture on CV12 (20 min, single session)	Nil	Control: needling 1 cun lateral to CV12 (no known acupuncture point)	36 (18/18)	Random blood glucose [BL to post-intervention]	NS
Mohanty and Shrestha (2017) [India, SEARO] [31]	Case Report	Transverse myelitis (adult male)	Traditional Chinese acupuncture on GB34, GB39, St32, St36, St37, St39, St41, UB40, UB62, HT7, LI11, LI4, Du14, Sp6, UB36, Ex21, Ex36. Electroacupuncture on LI11, LI4, GB36, ST36, SP6 (30 min, 15 treatments over 3 wks)	Yoga, lifestyle counselling, naturopathic diet	Nil	1	Resting heart rate (beats/min) [BL to Dy 21]	**Reduced** Dy 21: -4
							Blood pressure (mmHg) [BL to Dy 21]	**Reduced** Systolic: -8 Diastolic: -2
							Visual Analog Scale, pain intensity [BL to Dy 21]	**Reduced** Dy 21: -7

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							World Health Organization Brief Quality of Life [BL to Dy 21]	**Increased quality of life** Physical health: +61 Psychological health: +43 Social health: +6 Environmental health: +49
							Pittsburgh Sleep Quality Index [BL to Dy 21]	**Reduced sleep problems** Day 21: -9
Mooventhan and Nivethitha (2014) [India, SEARO] [36]	Case Report	Systemic lupus erythematosus (adult female)	Acupuncture on GV20, GV6, LI11, Ht7, GB34, Kd3 (20 min, daily for 30 days with 7 day rest period after 15 sessions)	Nil	Nil	1	Visual Analog Scale, pain [BL to post-intervention]	**Reduced** -4.8
							Epworth Sleepiness Scale [BL to post-intervention]	**Reduced daytime sleepiness** -8
							Pittsburgh Sleep Quality Index [BL to post-intervention]	**Reduced sleep problems** -8
							Short form-36 health survey [BL to post-intervention]	**Increased quality of life** Physical functioning: +40 Role physical: +43.75 Role emotional: +58.33 Energy/fatigue: +50 Emotional wellbeing: +60 Social functioning: +37.5 Bodily pain (function): +45 General health: +35
Painovich and Herman (2011) [USA, AMRO] [33]	Randomized controlled trial	Inpatient acute care (hospital)	Personalized acupuncture of varied styles (20 – 30 min, daily during stay)	Usual care	Usual care only	431 (288/143)	Length of hospital stay (days)	**Increased length of stay** Acupuncture: +0.8 (p=0.047)
Saha, et al. (2016) [Germany, EURO] [42]	Uncontrolled trial	Chronic low back pain	Mechanical needle stimulation pad (45 min per day, for 14 wks)	Nil	Nil	91	Visual Analog Scale, pain [BL to Wk 2, Wk 14]	NS
							Oswestry Disability Index [BL to Wk 2, Wk 14]	**Reduced disability** Wk 2: -4.6 (p<0.001) Wk 14: -4.3 (p<0.001)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Short form-36 health survey [BL to Wk 2, Wk 14]	**Increased quality of life** Physical component: Wk 2, +3.8 (p<0.001); Wk 14, +2.5 (p=0.008) Physical functioning: Wk 2, +6.4 (p=0.001); Wk 14, +5.6 (p=0.002) Vitality: Wk 2: +3.3 (p=0.045); Wk 14: NS Mental component: NS Physical role functioning: NS Bodily pain: NS General health perception: NS Social role functioning: NS Emotional role functioning: NS Mental health: NS
							Fear avoidance behavior [BL to Wk 2, Wk 14]	NS
							Days under medication per wk [BL to Wk 2, Wk 14]	**Reduced medication use** Wk 2: -1.2 (p=0.015) Wk 14: NS
Saha, et al. (2017) [Germany, EURO] [24]	Randomized controlled trial	Non-specific chronic neck pain	Cupping massages, along spine and trapezius muscles (10 min, twice per wk for 3 wks, 5 treatments in total)	Nil	Waitlist control	50 (25/25)	Pain on Movement Questionnaire [BL to Wk 3]	**Reduced pain on movement** Cupping: -10.4; Waitlist: -2.7 Between group: -11.7 (p=0.019)
							Visual Analogue Scale, pain intensity [BL to Wk 3]	**Reduced pain intensity** Cupping: -29.9; Waitlist: -2.3 Between group: -14.3 (p=0.037)
							Neck Disability Index [BL to Wk 3]	**Reduced disability** Cupping: -3.6 Waitlist: -0.3 Between group: -4.1 (p<0.001)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Short Form 36 [BL to Wk 3]	**Increased quality of life** Bodily pain: Cupping, +15.6 Waitlist, +0.5 Between group, +16.7 points (p=0.002) Mental health: Cupping, +7.7 Waitlist, -0.5 Between group, +8.5 (p=0.003) Mental component: Cupping, +4.3 Waitlist, +0.4 Between group, +4.3 (p=0.036) Physical component: NS Physical functioning: NS Physical role functioning: NS General health perception: NS Vitality: NS Social role functioning: NS Emotional role functioning: NS
							Pressure-pain threshold [BL to Wk 3]	**Increased pressure-pain threshold** Between group: improvement at site of maximal pain (p=0.022)
							Mechanical detection threshold [BL to Wk 3]	NS
							Vibration detection threshold [BL to Wk 3]	NS
							2-point discrimination threshold [BL to Wk 3]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Saha, et al. (2019) [Germany, EURO] [45]	Randomized controlled trial	Non-specific chronic low back pain	*Gua sha* Therapy: paravertebral strokes applied from C7 to L5, horizontal strokes between C7 and L5, additional strokes along dorsal surface of gluteus maximus, paravertebral strokes applied to the neck from C1/2 to C7 (2 treatments, 7 days apart)	Nil	Waitlist control	50 (25/25)	Pain on Movement Questionnaire [BL to Day 12]	**Reduced pain on movement** Gua sha: -24.55; Waitlist: -12.3 Between group: ($p<0.001$)
							Oswestry Low Back Pain Disability Questionnaire [BL to Day 12]	NS
							Pressure-pain threshold [BL to Day 12]	NS
							Mechanical detection threshold [BL to Day 12]	NS
							Vibration detection threshold [BL to Day 12]	NS
Shetty, et al. (2015) [India, SEARO] [32]	Case Report	Rheumatoid arthritis (female)	Acupuncture on GV20, LI4, Li11, BL11, GB34, SP6, KI3, ST44, EX28, EX36. Electroacupuncture at all points except GV20, EX28, EX36. (30 min total, 20 min for electro-stimulation, 14 sessions over 3 wks)	Massage, mud and sauna therapies	Nil	1	Visual Analog Scale, pain [BL to Dy 22]	**Reduced pain** -6.3
							10-meter walk test (m/sec) [BL to Dy 22]	**Increased velocity** -0.28
							Isometric hand grip test (mmHg) [BL to Dy 22]	**Increased grip strength** Right hand: +6 Left hand: +6
							Pittsburgh Sleep Quality [BL to Dy 22]	**Reduced sleep problems** -4
							Depression, Anxiety and Stress Scales [BL to Dy 22]	**Reduced depression, anxiety and stress** Depression: -23 Anxiety: -13 Stress: -17
							Short Form-36 health survey [BL to Dy 22]	**Increased quality of life** Total score: +50.97 Physical functioning: +45 Role physical: +62.5 Role emotional: +58.33 Energy/fatigue: +37.5 Emotional wellbeing: +50 Social functioning: +50 Bodily pain function: +55 General health: +60
							Blood analysis [BL to Dy 22]	**Increased blood cell counts** White blood cell total: +2100 **Reduced inflammation** ESR: -45

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Urine analysis (per hpf) [BL to Dy 22]	**Reduced urinary bacteria** Pus-cells: -21 Epithelial cells: -4
Shetty, et al (2018) [India, SEARO] [25]	Randomized controlled trial	Primary dysmenorrhea (young adult females)	Acupuncture (KI-3, SP-8, ST-25, ST-29, ST-30, ST-36, CV-4, CV-6, BL-62, HT-7, LI-4, and PC-6) (20 min, 15 sessions per mth, initiated on 6th day of menstrual cycle [not performed during menstruation])	Nil	Usual care	60 (30/30)	Pain intensity (10-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced pain intensity** Dy 30: Acupuncture -2.86; Control -0.39 Between group, p<0.05 Dy 60: Acupuncture -4.75; Control -0.34 Between group, p<0.05 Dy 90: Acupuncture -4.76; Control +0.05 Between group, p<0.05
							Muscle/menstrual cramping (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced cramping** Dy 30: Acupuncture -1.20; Control +0.10 Between group, p<0.05 Dy 60: Acupuncture 1.43; Control +0.17 Between group, p<0.05 Dy 90: Acupuncture -1.60; Control +0.10 Between group, p<0.05
							Headache (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced headache** Dy 30: NS Dy 60: NS Dy 90: Acupuncture -0.30; Control -0.03 Between group, p<0.05
							Dizziness (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced dizziness** Dy 30: Acupuncture -0.84; Control -0.10 Between group p<0.05 Dy 60: Acupuncture -1.00; Control +0.03 Between group p<0.05 Dy 90: Acupuncture -1.00; Control +0.06 Between group p<0.05

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Diarrhea (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced diarrhea** Dy 30: Acupuncture -0.46; Control +0.20 Between group p<0.05 Dy 60: Acupuncture -0.53; Control +0.07 Between group p<0.05 Dy 90: Acupuncture -0.56; Control +0.20 Between group p<0.05
							Faint (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced faint feeling** Dy 30: Acupuncture -0.40; Control -0.03 Between group p<0.05 Dy 60: Acupuncture -0.40; Control -0.16 Between group p<0.05 Dy 90: Acupuncture -0.43; Control +0.10 Between group p<0.05
							Mood changes (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced negative mood** Dy 30: Acupuncture -1.00; Control -0.04 Between group p<0.05 Dy 60: Acupuncture -0.90; Control -0.17 Between group p<0.05 Dy 90: Acupuncture -0.97; Control -0.10 Between group p<0.05
							Tiredness (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced tiredness** Dy 30: Acupuncture -1.00; Control -0.04 Between group p<0.05 Dy 60: Acupuncture -1.27; Control -0.04 Between group p<0.05 Dy 90: Acupuncture -1.27; Control -0.24 Between group, p<0.05

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
							Nausea (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced nausea** Dy 30: Acupuncture -0.70; Control -0.07 Between group p<0.05 Dy 60: Acupuncture -0.73; Control +0.13 Between group p<0.05 Dy 90: Acupuncture -0.87; Control +0.16 Between group, p<0.05
							Vomiting (4-point numerical rating scale) [BL to Dy 30, 60, 90]	**Reduced vomiting** Dy 30: Acupuncture -0.47; Control +0.03 Between group p<0.05 Dy 60: Acupuncture -0.47; Control +0.07 Between group p<0.05 Dy 90: Acupuncture -0.47; Control -0.00 Between group, p<0.05
Sriloy, et al. (2015) [India, SEARO] [26]	Randomized controlled trial (parallel)	Hypertension (acupuncture naïve)	Acupuncture, unilateral on left, seeking *de qi*, on GV20, ST36, LV3, HT7 with manual stimulation to all points except GV20 (20 min, single session)	Nil	Slow breathing (abdominal, alternate nostril and sectional breathing) (20 min, seated)	37 (18/19)	Blood pressure – systolic (mmHg) [BL to post-test]	**Reduced systolic BP** Acupuncture: NS Slow breathing: p=0.007
							Blood pressure – diastolic (mmHg) [BL to post-test]	**Reduced diastolic BP** Acupuncture: p=0.02 Slow breathing: NS
Zick, et al. (2011) [USA, AMRO] [43]	Randomized controlled trial	Persistent cancer-related fatigue (adults, >12 wks post cancer treatment)	Stimulatory acupressure on CV6, GV20 and bilaterally on ST36, SP6, KI13, LI3: high (HIS, 2 x per day) or low (LIS, 3 2 per wk) dose; Relaxation acupressure (RA, 2 x per day) on Yin Tang and bilaterally on Anmian, HT7, LV3, SP6 (30 min, 12 wks, self-administered)	Nil	Nil	43 (15/14/ 14)	Brief Fatigue Inventory [BL to Wk 12]	**Reduced Fatigue severity** HIS: -2.2 LIS: -2.7 RA: -4.0 Between group: p=0.027 Adjusted: p=0.013

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or comparison group	No. Participants (Intervention/ Control)	Outcome measure	Outcome
Zick, et al. (2016) [USA, AMRO] [44]	Randomized controlled trial	Breast cancer stage 0-IIII (female survivors, >12 months post cancer treatment)	Relaxing acupressure (RA) on Yin Tang and bilaterally on Anmian, HT7, SP6, LV3; Stimulating acupressure (SA) on Du20, CV6 and bilaterally on LI4, ST36, SP6, KI3 (3 min each point, daily, for 6 wks with 4 wk follow-up)	Nil	Usual care control	270 (94/90/ 86)	Brief Fatigue Inventory (BFI) [BL to Wk 6, Wk 10]	**Reduced fatigue** Wk 6 RA: -2.6, SA: -2.0, Control -1.1 Between group: p<0.001 Wk 10 RA: -2.3, SA: -2.0, Control: -1.0 Between group: p<0.001 BFI score <4 (Wk 6) RA: 66.2%; SA: 60.9%, Control: 31.3% Between group: p<0.001
							Pittsburg Sleep Quality Index [BL to Wk 6, Wk 10]	**Reduced sleep problems** Wk 6 RA: -2.0, SA: -1.4, Control: 0.6 Between group: p<0.05 Wk 10: NS
							Long-Term Quality of Life (LTQL) Instrument – Somatic [BL to Wk 6, Wk 10]	**Increased somatic function** Wk 6 RA: +3.3, SA: +2.0, Control: +0.2 Between group: p<0.05 Wk 10 RA: +3.5, SA: +1.2, Control: +0.6 Between group: p<0.05
							LTQL – Fitness [BL to Wk 6, Wk 10]	**Increased fitness** Wk 6 RA: +1.4, SA: +0.5, Control: -0.1 Between group: p<0.05 Wk 10 RA: +2.2, SA: +0.9, Control: +0.4 Between group: p<0.05
							LTQL – Social support [BL to Wk 6, Wk 10]	**Increased social support** Wk 6 RA: +0.1, SA: -0.4, Control: -0.8 Between group: p<0.05 Wk 10 RA: 0.0, SA: -0.8, Control: -0.7 Between group: p<0.05
							Adverse events	**Non-serious** 6 cases of mild bruising at acupressure sites

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38 Yoga

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HIGHLIGHTS

- Yoga is practiced around the world and is an integral aspect of naturopathic care.
- Yoga practice includes the integration of breath work, specific exercises, dietary recommendations, and mindfulness or meditation.
- Clinical research by the naturopathic community has examined the application of combined yoga practices, yoga breathing, and yoga meditation.
- In line with the role of primary care, naturopathic researchers have investigated the effects of yoga on individuals with cancer, musculoskeletal conditions, endocrine conditions, mental health conditions, neurological conditions, skin conditions gastrointestinal conditions, women's health conditions, and a range of other conditions.

Originating in ancient India, yoga refers to a philosophically based practice and a blend of physical and mental disciplines. Practiced under proper guidance, yoga can be systematically and methodically applied therapeutically in different health conditions and diverse cultures as it adopts a holistic approach to health and life and acknowledges the interconnectedness between the mental, physical, emotional, social, and spiritual dimensions of health and being. Traditionally yoga incorporates physical *asanas* (postures) and practices, but also *pranayama* (breathing exercises), *nidra* (chanting), *kriyas* (cleansing activities), and *dhyana* (meditation), as well as other meditation, spirituality, and dietary and lifestyle modifications that support harmony and balance within the whole person. The term yoga refers to both the entire process of these practices and the goal or end-point philosophically [1].

Outside of India the term yoga is often synonymous with physical exercise and *asanas* in particular can become the singular focus [2]. Interest in yoga from Western scholars and practitioners has been documented since the mid-19th century [3], with the earliest scientific yogic claims such as voluntary control over involuntary body functions through the practice of yoga occurring in the mid-19th century [4]. The Yoga Institute in India was established by Yogendra in 1918 to seek scientific evidence of the potential health benefits of yoga, followed by the first peer-reviewed yoga research journal (Yoga Mimamsa) in 1924 [5]. Since this time there has been a steadily growing body of research examining the effectiveness of yoga in promoting health and wellbeing [6]. In particular, the systematic and methodic therapeutic application of yoga under clinical guidance appears to benefit individuals with various health conditions.

In India, yoga and naturopathy were famously integrated by Mahatma Gandhi. Gandhi studied naturopathy during his time in the United Kingdom, refining his practice in South Africa to then combine yoga and nature cure as core therapeutic elements within the Indian naturopathic profession [7]. Mahatma Gandhi popularized yoga in his many writings on naturopathy, in his practice, and in the naturopathic hospitals and the National Institute of Naturopathy which he helped to establish in India that combine yoga and naturopathy even today [8, 9]. Yoga and naturopathy have a long history outside of India, with the global naturopathic community having a significant role in promoting yoga to new audiences [10]. Yoga articles by Indian authors such as Shri Yogendra and Paramahansa Yogananda appear in early American, Australian and British naturopathic journals. The articles introduce yogic philosophy and practices which were aligned with naturopathic concepts such as *holism* and physical culture [11, 12].

Whilst undergraduate training combining naturopathy and yoga is most developed in India, where a combined naturopathy and yoga degree is awarded [13, 14], the application of yoga within naturopathic practice is seen globally, with practice surveys of Australian naturopaths, for example, indicating that 75% of naturopathic practitioners in that country prescribe yoga to patients [9]. The clinical application of yoga within naturopathic

practice is dependent on the practitioner's training and may include the prescription of physical and mental practices, and the integration of yoga philosophy into the practitioner's understanding of health and disease.

Overview of Studies

This chapter is dedicated to highlighting the original clinical research (n=52, published in 58 papers) conducted by naturopathic researchers investigating yoga. The naturopathic research examining yoga includes a total of 5,474 participants and was conducted in India (n=49) and Germany (n=9). The study designs include randomized controlled trials (n=37), controlled trials (n=6), uncontrolled trials (n=5), secondary analyses (n=5), case reports (n=4), and a follow-up study (n=1). Study settings varied from hospital and out-patient settings, private class practice, home practice, residential programs and schools. The aspects of yoga studied include physical postures/*asanas* (n=47), breath control/*pranayama* (n=47), chanting/meditation (n=42) and cleansing activities/*kriyas* (n=7).

There were various conditions treated with yoga including breast cancer (n=12), neck pain (n=5), type 2 diabetes mellitus (T2DM) (n=5), depression (n=4), migraine (n=3), sleep disorders (n=2), mood disorders (n=2), one study each for individuals with acne, menopause, colorectal cancer, obesity, ulcerative colitis, schizophrenia, uterine bleeding, anorexia, anxiety, tuberculosis, urinary incontinence, and hepatic cirrhosis. Yoga interventions also included healthy volunteers evaluating changes in cognitive function (n=8) and/or changes in autonomic and respiratory or cardiovascular function (n=6). Of all the naturopathic clinical studies employing yoga interventions, 86.3% reported a positive outcome in at least one primary or secondary outcome measure. Details of the studies are available in *Table 38.1 Clinical research investigating yoga interventions conducted by naturopathic researchers.* This body of naturopathic research on yoga is supported by more than 20 observational studies and more than 50 reviews or meta-analysis conducted by naturopathic researchers on this topic, as outlined in Chapter 40.

Implications

The research to date indicates naturopaths/naturopathic doctors use a variety of yogic practices, such as *asanas, pranayama* and meditation, to achieve demonstrable improvements in patient health and wellbeing. The varied application of treatment modalities shown in the research reflects the holistic ontology of naturopathic practitioners, validates the effectiveness of this approach, and supports the role of naturopaths/naturopathic doctors in facilitating yoga-based interventions to improve healthcare. While further research is needed to confirm findings of the uncontrolled studies and case reports presented in this review, and to fully ascertain the physiological mechanisms of action of some yoga practices, the evidence demonstrates the alignment of yoga practices and philosophy with naturopathy/naturopathic medicine and its effectiveness as a treatment modality within naturopathic practice for a diverse range of health conditions.

It is important to note that while yoga may be viewed as largely a form of exercise rather than healing modality in many parts of the world, several of the studies by naturopathic researchers highlight the importance of non-physical aspects of yoga, such as breathwork and meditation. As yoga utilization increases globally, so too do injuries and adverse events most often due to physical over-extension and inappropriate, unsupervised and/or unguided practice [15-17]. The long-standing and complex relationship between naturopathy/naturopathic medicine and yoga positions indicated that naturopaths/naturopathic doctors are well suited to facilitate integration of yoga into primary health care in a critically applied manner that advocates evidence-based applications and safe, therapeutic outcomes whilst respecting yoga's culture and traditions.

Studies investigating specific interventions:

Combination Yoga Practices

The majority of original clinical research studying yoga and conducted by naturopathic researchers have used interventions that combine different elements of yogic practice such as asanas, pranayama, and meditation (n=39; 46 papers published) [18-64]. The studies investigated yoga for populations of individuals with breast cancer (n=9; 12 published papers) [19, 35-41, 48-51], chronic neck pain (n=4; 5 published papers) [34, 56-59], major depressive disorder (n=1; 4 published papers) [21-24], T2DM (n=5) [31, 32, 52, 53, 55], migraine (n=3) [25, 27, 44], one study each investigated yoga practices for menopausal symptoms in breast cancer survivors [60], abdominal obesity [62], colorectal cancer [61], liver cirrhosis [42], anorexia [64], schizophrenia [26] ulcerative colitis [63], acne [18], uterine bleeding [33], urinary incontinence [54]. A further eight studies tested the effects of yoga on various outcomes for healthy volunteers [20, 28-30, 43, 45, 46, 65]. While not always specified in the study methods, the interventions included *asanas* (postures) (n=25) [18-21, 26-35, 43-48, 51-53, 55, 64] *pranayama* (breathing) (n=30) [18-21, 26-36, 38, 39, 41, 43-48, 52, 53, 55, 61, 64], *dhyana* (meditation) (n=22) [19, 20, 28-30, 32-35, 38, 39, 41, 43, 45, 46, 48, 51, 52, 55, 60, 61, 64], relaxation techniques (n=19) [20, 28-31, 33-36, 38, 39, 41, 43-48, 51], *kriyas* (cleansing) (n=8) [18, 20, 28, 29, 46, 47, 55], *nidra* (chanting) (n=7) [19, 21, 26, 31, 44, 51,

61], lectures or counselling on yogic theory (n=10) [21, 30, 32, 34, 40, 46, 51-53, 55] and prescribed home practice (n=10) [19, 21, 35, 36, 44, 48, 57, 59, 63, 64].

An age-matched controlled trial conducted in India with healthy participants examined the effect of an integrated yoga intervention on psychomotor performance and self-efficacy of school children less than 17 years old (n=420) [20]. The intervention included *asana* postures, *pranayama* breathing, meditation *(dhyana)*, relaxation techniques, cleansing *(kriyas)*, and reciting hymns from traditional yoga text, music, yoga games and 'happy assembly'. The intervention was delivered for 10 hours per day for 10 days. The children in the intervention group achieved improved scores on two psychomotor tests *(Trail Making Task A* and *B)*, including reduced wrong attempts (A: p<0.001; B: p<0.001) and increased right attempts (A: p<0.001; B: p<0.001). Participants in the yoga arm also demonstrated a greater increase in self-efficacy at study completion compared to the age-matched control (Self-efficacy Questionnaire for Children: p<0.001).

A randomized controlled trial conducted in India involving adults with elevated blood glucose (n=41) examined the impact of integrated yoga on T2DM risk factors [31]. The yoga intervention required participants to complete 75-minute yoga classes that included a combination of *asana* postures, *pranayama* breathing, loosening exercises, guided relaxation and chanting. This intervention was compared with 30-minute counselling sessions that discussed healthy lifestyle changes (diet, physical activity and smoking) and walking. Both groups attended 3-6 classes of their respective interventions per week for 8 weeks. There was no difference in change from baseline of blood glucose levels, insulin levels or lipid markers for either group, however, participants in the yoga group recorded a greater reduction in body weight (-0.8kg vs +1.4kg, p=0.02), body mass index (-0.2kg/m^2 vs +0.6kg/m^2, p=0.05) and waist circumference (-0.8cm vs +1.4cm, p<0.01) compared to the control group.

One randomized controlled trial conducted in India [19] involved breast cancer patients (n=68) undergoing radiotherapy or adjuvant chemotherapy, and employed a combination of guided meditation, *asana* postures, *pranayama* breathing, *nidra* chanting for 90-minutes per week over six weeks. Participants were also encouraged to practice at home over the study period. The yoga intervention was compared to supportive psychotherapy and was found to have a greater reduction in anxiety (p<0.001), depression (p<0.001), and stress (p<0.001). A second randomized controlled trial conducted in India [36] allocated individuals recently diagnosed with stage II and III breast cancer (n=69) to receive an integrated yoga intervention or supportive counselling sessions and post-operative exercise rehabilitation. The integrated yoga intervention involved *pranayama* breathing and yogic relaxation techniques. In addition, both groups received surgery and related usual care. Participants practiced the interventions for 30-minute daily sessions at home for three weeks. Yoga group participants reported a significant reduction in state (p=0.04) and trait (p=0.004) anxiety, and depression (p=0.01) compared to controls. They also reported a greater reduction in symptom severity (p=0.01) and symptom distress (p<0.01) as well as improvement in quality of life (=0.01). Secondary analysis of this same study [37] examined post-operative outcomes and wound healing. It found reduced drain retention (p=0.001) and interval for suture removal (p=0.031). Duration of hospital stay was also shorter among yoga participants compared to control (p=0.003).

A randomized controlled trial conducted in Germany examined individuals with chronic neck pain (n=51) attending yoga classes compared to self-directed evidence-based exercise routines [57]. The weekly Iyengar classes focused on the precision and alignment of specific yoga postures and included 90-minute classes offered over 9 weeks. Participants in the Iyengar group were also encouraged to undertake 10 minutes home practice daily. The control group was provided with a self-directed evidence-based exercise manual and were also asked to undertake 10 minutes home practice per day. The yoga group demonstrated significantly reduced neck pain (-13.9, p=0.03), disability (-7.8, p=0.006), and increased quality of life (mental component: +6.1, p=0.016; bodily function: +7.8, p=0.0001; social function: +6.0, p=0.027; emotional role: +7.9, p=0.005) compared to the exercise group. They also had increase flexion (+27.1, p=0.036) and extension (+8.3, p=0.025) range of motion, and increased pain thresholds (p<0.001).

A randomized controlled trial conducted in Germany investigated Hatha yoga (asanas plus breathing control) for individuals with ulcerative colitis (n=77), compared to written, evidence-based self-care advice [63]. The Hatha yoga group attended 90-minute classes weekly for 12 weeks and were also encouraged to undertake daily practice, although the latter was optional. Both groups were followed up for 24 weeks. Compared to the self-care group, participants in the yoga group reported increased quality of life at Week 12 (Inflammatory Bowel Disease Questionnaire [IBD-Q]: +14.7, p=0.02) and Week 24 (IBD-Q: +16.4, p=0.02) as well as reduced disease activity at Week 24 (Rachmilewitz clinical activity index: -1.2, p=0.03).

A randomized controlled trial was conducted in India involving individuals with migraines (n=60) [27]. The study compared usual care to a yoga intervention combined with usual care. The yoga intervention involved 1-hour sessions incorporating relaxation and *pranayama* breathing exercises as well as *asanas*, 5 days per week for 6 weeks. Compared to the control group, the study found that the yoga group reported significantly reduced headache impact (p<0.001), headache frequency (p<0.001), and headache intensity (p<0.001) along with a higher proportion of participants indicated self-perceived

benefit from the intervention.

Yoga Breathing

Seven studies examined yogic breathing or *pranayama* as a standalone intervention [66-72] in healthy populations (n=6) [66-70, 72] and in one study involving individuals with pulmonary tuberculosis [71]. A crossover randomized controlled trial was conducted in India with healthy males using 40 min sessions of specific nostril-manipulating yoga breathing practices [66]. Participants were either allocated to practice (1) right nostril yoga breathing and left nostril yoga breathing, (2) alternate nostril yoga breathing, or (3) breath awareness breathing and normal breathing control. Participants demonstrated significant changes in heart rate (30 sec: +4.73, $p<0.01$; 5 minutes post-intervention: +4.73, $p<0.05$) after practicing alternating nostril yoga breathing but no other breathing interventions. Blood pressure was reduced for participants following left nostril yoga breathing (systolic: -4.19, $p<0.01$), alternating yoga breathing (systolic: -1.14, $p<0.05$; diastolic: -0.67, $p<0.05$) and normal breathing control (diastolic: -0.67; $p<0.05$).

A randomized controlled trial was conducted in India involving individuals with pulmonary tuberculosis receiving usual care (n=73) investigated the clinical effect of *pranayama* breathing compared to breath awareness practices [71]. Participants in the *pranayama* group practiced simple breathing, *pranayama* breathing and supine relaxation 60 minutes per day, 6 days per week for 60 days. The study found participants in the *pranayama* group had significantly reduced symptom scores compared to the breath awareness group (*pranayama*: -10.4 vs breath: -2.02, $p<0.05$). It also found, compared to the breath awareness group, a greater proportion of *pranayama* participants had improved sputum microscopy throughout the intervention period (Day 30: *pranayama* 19/25, breath 10/23, p=0.045; Day 45: *pranayama* 24/25, breath 4/19, p=0.002; Day 60: *pranayama* 10/13, breath 4/19, p=0.005), and improved postero-anterior chest x-ray at the end of the study (*pranayama* 19/25, breath 3/22, p=0.001). 30 studies integrated *pranayama.*

Yoga Meditation

In addition to the studies conducted by naturopathic researchers that examine mind-body medicine practices as presented in *Chapter 34: Mind-Body Medicine Counselling*, five studies explored meditation or other mindfulness practices as a sole therapy, measuring its effects both physically and psychologically [42, 65, 73-75]. In a randomized crossover trial conducted in India, healthy individuals (n=30) demonstrated that *dharana* and *dhyana* meditative practices significantly improved individual stress response as measured through breath and heart rate factors [65].

An uncontrolled trial conducted in India involving 18- to 25-year-old female college students (n=72) investigated the effects of a yoga-based meditation technique on emotional regulation [73]. The technique was described as 'Mastering Emotions Technique' and was practiced for 45 minutes per day for 2 weeks. The participants emotional regulation was measured using the Emotional Regulation Questionnaire and found an increase from baseline in cognitive reappraisal (+1.62, $p<0.001$) and a reduction in expressive suppression (-1.25, $p<0.001$). Participants also showed increased positive affect (+1.23, $p<0.001$) and reduced negative affect (-1.25, $p<0.001$), as measured by the Positive and Negative Affect Schedule. Furthermore, participants demonstrated increased self-compassion (Self Compassion Scale: +0.09, $p<0.01$) and mindfulness (Mindfulness Attention Awareness Scale: +0.53, $p<0.001$).

A crossover randomized controlled trial was conducted in India involving healthy male yoga students (n=50) examined the effects of cyclic meditation on oxygen consumption [74]. The study group compared to a control group practicing *shavasana* (supine rest) for 30 minutes whereas the cyclic meditation group practiced meditation for 20 minutes with 5 minutes supine rest before and after. Participants practicing cyclic meditation group showed increased oxygen consumption during the intervention ($p<0.001$) and reduced after the intervention ($p<0.001$). In comparison, the participants demonstrated reduced oxygen consumption during and after the intervention when practicing *shavasana* ($p<0.001$).

Table 38.1 Clinical research investigating yoga interventions conducted by naturopathic researchers

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Allende, et al. (2018) [Germany, EURO] [56]	Randomized controlled trial	Chronic non-specific neck pain	Iyengar yoga (90 min classes, weekly for 9 weeks, with 10 min daily home practice)	Nil	Self-directed exercise	47 (23/24)	Visual Analogue Scale, neck pain intensity (weekly average of daily diary) [BL to Wk 10]	**Reduced pain** Trend in reduction of neck pain intensity, with substantial variation between participants
Ameya and Nair (2017) [India, SEARO] [18]	Case report	Acne vulgaris	Yoga: *asanas, pranayama* breathing, cleansing *kriyas* (45 min, daily on non-fasting days)	Dietary plan, therapeutic fasting and naturopathy	Nil	1	Acne lesions and inflammation [BL to Dy 30, 60]	**Reduced lesions** Dy 30: noticeable reduction in lesions, with no noticeable inflammation or swelling. Dy 60: No relapse of symptoms reported.
Banerjee, et al. (2007) [India, SEARO] [19]	Randomized controlled trial	Breast cancer (undergoing radiotherapy or adjuvant chemotherapy)	Guided meditation, *asanas, pranayama* breathing, *nidra* chanting and home practice (90 min progression sessions for 6 wks)	Nil	Supportive counselling	68 (35/33)	Hospital Anxiety and Depression Scale [BL to Wk 6, pre- and post-radiation]	**Reduced anxiety** Yoga (-4.4, p<0.001) Control (+2.3, p<0.001) **Reduced depression** Yoga (-4.6, p<0.001) Control (+1.9, p<0.001)
							Perceived Stress Scale [BL to Wk 6, pre and post radiation]	**Reduced Stress** Yoga (-5.5, p<0.001) Control (+1.4, p<0.001)
							Radiation-induced DNA damage – Alkaline Single-Cell Gel Electrophoresis (Comet) Assay [BL to Wk 6, pre and post radiation]	**Increased radiation-induced DNA damage** Yoga (+21.7, p<0.001) Control (+26, p<0.001) Between groups difference 14.5% (p<0.001)
Cramer, et al. (2013) [Germany, EURO] [57]	Randomized controlled trial	Chronic neck pain	Iyengar yoga (90 min classes, weekly for 9 wks, with 10 min daily home practice)	Nil	Exercise, self-directed using evidence-based manual (10 min daily)	51 (25/26)	Visual Analogue Scale, pain intensity (100mm) [BL to Wk 9]	**Reduced pain intensity** Yoga -28.6; exercise -3.1 Between group 13.9 (p=0.030) Pain at motion NS
							Functional disability – Neck Disability Index [BL to Wk 9]	**Reduced disability** Yoga: -10.0; Exercise: -0.4 Between group: -7.8 (p=0.006)

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Health related quality of Life Short form-36 [BL to Wk 9]	**Improved quality of life** Between groups: Bodily pain (7.8, p=0.001) Social functioning (6.0, p=0.027) Emotional role functioning (7.9, p=0.005) Mental quality of life (6.1, p=0.016)
							Range of Motion [BL to Wk 9]	**Increased ROM** Yoga 32.5; exercise -1.0 Between group 27.1 (p=0.036)
							Joint position errors [BL to Wk 9]	**Reduced errors** Yoga: -2.0; Exercise: -0.9 Between group: -1.8 (p=0.006)
							Pressure pain threshold (PPT) – Site of maximal pain [BL to Wk 9]	**Increased threshold** Yoga: +66.9; Exercise: -21.1 Between group: +99.5 (p<0.001)
							PPT – Levator scapulae muscle, right side [BL to Wk 9]	**Increased threshold** Yoga: +47.2; Exercise: +2.7 Between group: +56.4 (p<0.001)
							PPT – Levator scapulae muscle, left side [BL to Wk 9]	**Increased threshold** Yoga: + 24.3; Exercise: -23.1 Between group: 47.5 (p=0.028)
							PPT – Trapezius muscle, right side [BL to Wk 9]	**Increased threshold** Yoga: +55.6; Exercise: +2.7 Between group: +0.83 (p=0.026)
							PPT – Trapezius muscle, left side [BL to Wk 9]	**Increased threshold** Yoga: +57.5; Exercise: +14.3 Between group: +54.1 (p=0.044)

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Cramer, et al. (2013) [Germany, EURO] [58]	12 month follow-up					36 (22/14)	PPT – Semispinalis capitis, right side [BL to Wk 9]	**Increased threshold** Yoga: +33.9; Exercise: -7.6 Between group +50.0 ($p<0.001$)
							PPT – Semispinalis capitis, left side [BL to Wk 9]	**Increased threshold** Yoga: +52.2; Exercise: -11.4 Between group: +63.8 ($p<0.001$)
							Visual Analog Scale, pain intensity [BL to Mth 12]	**Reduced pain** Mth 12: -16.5 ($p<0.001$)
							Neck Disability Index [BL to Mth 12]	**Reduced disability** Mth 12: -5.77 ($p=0.001$)
							Generic disability (days non-functioning) [BL to Mth 12]	NS
							Short Form-36 (SF-36) health survey [BL to Mth 12]	**Increased bodily function** Pain-related bodily function: +9.98 ($p=0.005$) Physical functioning: NS Physical role: NS General health: NS Vitality: NS Social functioning: NS Emotional role: NS Mental health: NS: Total physical component: NS Total mental component: NS
Cramer, et al. (2013) [Germany, EURO] [59]	Secondary sub-analysis					18	Participant drawings and semi-structured interview – Physical dimension [Wk 9]	**Improved physical dimension** Renewed awareness of and approach to bodily functions. More balanced and natural perception of body.

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Participant drawings and semi-structured interview – Cognitive dimension [Wk 9]	**Improved cognitive dimension** Greater perceived control over body, health and general wellbeing in daily life. Feeling less controlled by pain.
							Participant drawings and semi-structured interview – Emotional dimension [Wk 9]	**Improved emotional dimension** Deep relaxation, less irritability and different perceptions of emotions. Improved coping and pain acceptance.
							Participant drawings and semi-structured interview – Behavioural dimension [Wk 9]	**Improved behavioral dimension** Use of yoga as self-help/ coping strategy to relieve or prevent stress and pain. Reduced reliance on pain medication.
							Participant drawings and semi structured interview – Social dimension [Wk 9]	**Improved social dimension** Re-engagement with preferred social activities, greater self-determination. Enriched work and social lives.
Cramer, et al. (2015) [Germany, EURO] [60]	Randomized controlled trial (open label)	Menopausal symptoms (breast cancer survivors)	Hatha yoga and meditation (Tibetan Buddhism) (90 min, weekly, 12 wks)	Nil	Control (usual care)	40 (19/21)	Menopausal Rating Scale (MRS) – Total score [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -5.6 (p=0.004) Wk 24: -4.5 (p=0.023)
							MRS – Somatovegetative symptoms [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -1.8 (p=0.035) Wk 24: -1.9 (p=0.028)
							MRS – Psychological symptoms [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -2.4 (p=0.012) Wk 24: NS
							MRS – Urogenital symptoms [BL to Wk 12, 24]	**Reduced symptoms** Wk 12: -1.5 (p=0.025) Wk 24: -1.3 (p=0.025)

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Functional Assessment of Cancer Therapy – Breast (FACT-B) – Total score [BL to Wk 12, 24]	**Increased function** Wk 12: +12.5 (p=0.002) Wk 24: +12.6 (p=0.004)
							FACT-B – Physical function [BL to Wk 12, 24]	**Increased function** Wk 12: NS Wk 24: +3.6 (p=0.01)
							FACT-B – Social function [BL to Wk 12, 24]	**Increased function** Wk 12: +2.4 (p=0.24) Wk 24: +2.6 (p=0.16)
							FACT-B – Emotional function [BL to Wk 12, 24]	**Increased function** Wk 12: +2.8 (p=0.005) Wk 24: +1.6 (p=0.036)
							FACT-B – Functional [BL to Wk 12, 24]	**Increased function** Wk 12: +3.3 (p=0.024) Wk 24: NS
							FACT-B – Breast cancer-specific [BL to Wk 12, 24]	NS
							Functional Assessment of Chronic Illness Therapy – Fatigue [BL to Wk 12, 24]	**Increased energy** Wk 12: +6.0 (p=0.10) Wk 24: (7.3, p=0.012)
							Hospital Anxiety and Depression Scale [BL to Wk 12, 24]	Anxiety: NS Depression: NS
Cramer, et al. (2016) [Germany, EURO] [61]	Randomized controlled trial (open label)	Colorectal cancer (stage I-III)	Hatha yoga, *pranayama* breathing, meditation, *yoga nidra* (90 min, weekly, 10 wks)	Nil	Waitlist control	54 (27/27)	Functional Assessment of Cancer Therapy – Colorectal [BL to Wk 10, 22]	**Increased emotional wellbeing** Wk 10: NS Wk 22: Emotional: +1.59 (p=0.019) Physical: NS Social: NS Functional: NS Colorectal cancer-specific: NS Total: NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Functional Assessment of Chronic Illness Therapy [BL to Wk 10, 22]	Fatigue: NS Spiritual wellbeing: NS
							Sleep disturbance – Pittsburgh Sleep Quality Inventory [BL to Wk 10, 22]	**Reduced sleep disturbance** Wk 10: NS Wk 12: -1.08 (p=0.043)
							Hospital Anxiety and Depression Scale [BL to Wk 10, 22]	**Reduced** Wk 10: Anxiety: -1.14 (p=0.034) Depression: -1.34 (p=0.038) Wk 22: NS
							Bodily awareness and dissociation – Scale of Body Connection [BL to Wk 10, 22]	NS
							Treatment expectancy – Body-Efficacy Expectation Scale [BL to Wk 10, 22]	NS
Cramer, et al. (2016) [Germany, EURO] [62]	Randomized controlled trial	Abdominal obesity (females, abdominal obesity)	Traditional Hatha yoga (full day workshop followed by 2 x weekly 90 min classes)	Nil	Waitlist control	60 (40/20)	Impact on Quality of Life, Short form-23 [BL to Wk 12]	**Reduced impact on quality of life** Yoga: -3.7; Wait list: +0.01 Between group: -3.8 (p=0.001)
							Impact on Self-Esteem, Rosenberg Self Esteem Scale [BL to Wk 12]	**Reduced impact on self-esteem** Yoga: -0.02; Wait list: -0.0 Between group: -0.02 (p=0.03)
							Perceived Stress Scale [BL to Wk 12]	**Reduced stress** Yoga: -3.1; Wait list: -1.7 Between group: -3.1 (p=0.016)
							Body Awareness Questionnaire [BL to Wk 12]	**Increased body awareness** Yoga: +6.1; Wait list: -1.0 Between group: +9.3 (p=0.001)

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Body Responsiveness Scale [BL to Wk 12]	**Increased body responsiveness** Trust in bodily sensations Yoga: +3.5; Wait list: -0.5 Between group: +4.4 (p<0.001)
							Waist circumference (cm) [BL to Wk 12]	**Reduced waist circumference** Yoga: -3.7; Wait list: +.01 Between group: -3.8 (p=0.001)
							Waist-hip ratio [BL to Wk 12]	**Reduced waist-hip ratio** Yoga: -0.02; Wait list: -0.0 Between group: -0.02 (p=0.03)
							Body weight (kg) [BL to Wk 12]	**Reduced body weight** Yoga: -1.5; Wait list: +0.7 Between group: -2.4 (p=0.003)
							Body mass index (BMI) [BL to Wk 12]	**Reduced BMI** Yoga: -0.5; Wait list: +0.3 Between group: -0.8 (p=0.008)
							Percentage of body fat (%) [BL to Wk 12]	**Reduced body fat** Yoga: -1.4; Wait list: -0.1 Between group: -1.7 (p=0.01)
							Percentage of body muscle mass (%) [BL to Wk 12]	**Increased body muscle fat** Yoga: +0.6; Wait list: -0.0 Between group: +0.8 (p=0.01)
							Blood pressure (mmHg) [BL to Wk 12]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Cramer, et al. (2017) [Germany, EURO] [63]	Randomized controlled trial	Ulcerative colitis	Hatha yoga (90 min classes, weekly for 12 wks, with optional daily practice)	Nil	Written self-care advice (evidence-based informative books)	77 (39/38)	Inflammatory Bowel Disease Questionnaire [BL to Wk 12, 24]	**Increased quality of life** Wk 12: Yoga: +16.3; Self-care: +0.8 Between group: +14.7 (p=0.02) Wk 24: Yoga: +21.5; Self-care: +9.6 Between group: +16.4 (p=0.02)
							Disease activity – Rachmilewitz clinical activity index [BL to Wk 12, 24]	**Reduced disease activity** Wk 12 : NS Wk 24: Yoga: -1.8; Self-care: +0.8 Between group: -1.2 (p=0.03)
Das, et al. (2016) [India, SEARO] [20]	Controlled trial (matched)	Psychomotor performance and self-efficacy (healthy volunteers – school children)	Yoga: *asana* postures, *pranayama* breathing, meditation (*Dhyana*), relaxation techniques, cleansing (*Kriyas*), and reciting hymns from traditional yoga texts, music, yoga games, and happy assembly (10 hrs per day for 10 days)	Nil	Age-matched control without any experience of yoga	420 (210/210)	Psychomotor tests – Trail Making Task A (numeric drawing task) [BL to Dy 10]	**Reduced wrong attempts** Yoga: -0.56 (p<0.001); Control: -0.68 (p<0.001) **Increased right attempts** Yoga: +0.56 (p<0.001); Control: +0.67 (p<0.001) **Increased total attempts** Yoga: +0.12 (p=0.026); Control: NS **Reduced time (s)** Yoga: -9.44 (p<0.001); Control: NS
							Psychomotor tests – Trail Making Task B (alpha-numeric drawing task) [BL to Dy 10]	**Reduced wrong attempts** Yoga: -1.13 (p<0.001); Control: NS **Increased right attempts** Yoga: +1.12 (p<0.001); Control: NS **Increased total attempts** Yoga: +0.25 (p<0.001); Control: NS

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								Reduced time (s) Yoga: -23.05 (p<0.001); Control: -1.51 (p=0.002)
							Self-efficacy questionnaire for children (SEQ-C) – Total score [BL to Dy 10]	**Increased self-efficacy** Yoga: +14.7 (p<0.001); Control: +1.55 (p<0.001)
							SEQ-C – Academic domain [BL to Dy 10]	**Increased academic self-efficacy** Yoga: +4.2 (p<0.001); Control: NS
							SEQ-C – Social domain [BL to Dy 10]	**Increased social self-efficacy** Yoga: +4.86 (p<0.001); Control: +0.46 (p=0.004)
							SEQ-C – Emotional domain [BL to Dy 10]	**Increased emotional self-efficacy** Yoga: +5.72 (p<0.001); Control: +0.63 (p=0.001)
Gangadhar, et al. (2013) [India, SEARO] [21]	Controlled trial (comparative, open label)	Major depressive disorder (non-suicidal hospital out-patients)	Yoga therapy module developed for patients with depression: *asana* postures, stretching, *pranayama* breathing, chanting, yogic counselling (60 min, daily for 10 days, then weekly for 2 wks, booster class at Wk 12, and home practice)	Nil	Comparison: Yoga with anti-depressant medication OR Anti-depressant medication alone.	58 (15/27/16) (yoga alone, yoga with medication, medication alone)	Hamilton Depression Rating Scale [BL to Mth 1, Mth 3]	**Reduced depression** Mth 1: Yoga only, -12.5; Yoga + medication, -10.00; Medication only, -7.1 Between group: p=0.029 Mth 3: Yoga only, -14.9; Yoga + medication, -12.7; Medication only, -9.0 Between group: p=0.001
							Clinical Global Impression Scale (CGI) – Depression Severity [BL to Mth 1, Mth 3]	**Reduced depression severity** Mth 1: Yoga only, -2.2; Yoga + medication, -1.7; Medication only: -0.9 Between group: p=0.001 Mth 3: Yoga only, -2.9; Yoga + medication, -2.5; Medication only, -1.6 Between group: p=0.001

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Naveen, et al. (2013) [India, SEARO] [22]	Secondary analysis					62 (19/22/21) (yoga alone, yoga with medication, medication alone)	CGI – Depression Improvement (lower score represents greater improvement) [Mth 1 to Mth 3]	**Increased symptom improvement** Mth 3: Yoga only, -0.6; Yoga + medication, -0.7; Medication only: -0.6 Between group: p=0.001
							Responders/Remitters (no. of participants) [BL to Mth 1, Mth 3]	**Increased response to treatment** Mth 1: Yoga only, +11; Yoga + medication, +11; Medication only, +2 Between group: p=0.003 Mth 3: Yoga only, +14; Yoga + medication, +22; Medication only, +5 Between group: p=0.001
							Hamilton Depression Rating Scale [BL to Wk 12]	**Reduced depression** Yoga only: -14.0; Yoga and medication: -13.5; Medication only: -8.3 Between group: p=0.005
							Clinical Global Impression (of depression severity) [BL to Wk 12]	**Reduced depression** Yoga only: -2.8; Yoga and medication: -2.7; Medication only: -1.9 Between group: p=0.001
							Brain-derived neurotrophic factor – serum (ng/mL) [BL to Wk 12]	**Increased levels** Yoga only: +1.1; Yoga and medication: +1.9; Medication only: +2.1 Between group: p=0.02
Thirthalli, et al (2013) [India, SEARO] [23]	Secondary analysis				Plus control (healthy hospital staff volunteers)	54 (19/19/16) (Plus 18 healthy volunteers)	Serum cortisol [BL to Mth 3]	**Reduced cortisol** Yoga groups: p=0.006 Medication alone group: NS Control group: NS

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Naveen, et al. (2016) [India, SEARO] [24]	Secondary analysis				Comparison: Yoga with anti-depressant medication, Anti-depressant medication alone.	54 (19/19/16) (yoga alone, yoga with medication, medication alone)	Hamilton Depression Rating Scale [BL to Mth 3]	**Direct correlation between reduction in depression and reduction in cortisol** Treatment groups total: p=0.001 Yoga alone: p=0.008 Yoga and medication: NS Medication alone: NS Control group: NS
							Cortisol, serum (reduction vs. increase [BL to Wk 12]	**Reduced cortisol** Yoga only: 68.4%; Yoga and medication: 68.4%; Medication only: 31.3% Between group: p=0.042
							Brain-derived neurotrophic factor (BDNF), serum (ng/mL) [BL to Wk 12]	**Increased with cortisol reduction** Negative correlation between change in BDNF and change in cortisol. Yoga only: p=0.008; Yoga and medication: NS; Medication only: NS
Geethanjali, et al. (2016) [India, SEARO] [25]	Randomized controlled trial	Migraine without aura	Yogi *kriyas – jaleneti* nasal flush, *vamanakriya* water-induced self-emesis, *kaplabhathi* postures *cancer* and breathing (30 days – *jaleneti*: 5 days per wk, *vamanakriya:* 2 days per wk followed by *kaplabhathi*)	Nil	Waitlist control	60 (30/30)	Migraine Disability Assessment Score [BL to Dy 30]	**Reduced disability** Yoga: -13.0; Waitlist: -8.0 Between group: p<0.0001
							Pain Visual Analogue Score [BL to Dy 30]	**Reduced pain** Yoga: -3.15; Waitlist: -1.52 Between group: p=0.008
							Headache Impact Test [BL to Dy 30]	**Reduced headache impact** Yoga: -16.8; Waitlist: -12.06 Between group: p<0.0001
							Physical Health – WHO Quality of Life-BREF (WHO QoL-BREF) [BL to Dy 30]	**Increased physical health quality of life** Yoga: +35.9; Waitlist: +27.0 Between group: p<0.07

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							Psychological Health – WHO QoL-BREF [BL to Dy 30]	NS
							Social relationships – WHO QoL-BREF [BL to Dy 30]	**Increased social relationships quality of life** Yoga: +9.9; Waitlist: +6.6 Between group: p<0.0001
							Environment – WHO QoL-BREF [BL to Dy 30]	**Increased environment quality of life** Yoga: +4.8; Waitlist: +2.8 Between group: p<0.0001
Govindaraj, et al. (2018) [India, SEARO] [26]	Uncontrolled trial (pilot study)	Schizophrenia (stabilized patients on antipsychotic medications)	Yoga: *asana* postures, *pranayama* breathing, and AUM chanting (1 hr sessions, 20 sessions over 6 wks)	Nil	Nil	15 (15/0)	Scale for Assessment of Negative Symptoms (of schizophrenia) [BL to 1 Mth]	**Reduced symptoms** Mth 1: -30.36 (p<0.001)
							Scale for Assessment of Positive Symptoms (of schizophrenia) [BL to 1 Mth]	**Reduced symptoms** Mth 1: -21.34 (p<0.001)
							Socio-occupational dysfunction – Groningen Social Disability Scale [BL to 1 Mth]	**Reduced dysfunction** Mth 1: -25.01 (p<0.001)
							Social cognition – Social Cognition Rating Tool for Indian Setting [BL to 1 Mth]	**Increased social cognition** Mth 1: +18.97 (p<0.001)
Kisan, et al. (2014) [India, SEARO] [27]	Randomized controlled trial	Migraine (frequent, with or without aura)	Yoga: loosening and breathing exercises, *asanas* posture (1 hr sessions, 5 days per wk, for 6 wks)	Conventional care	Conventional care alone	60 (30/30)	Headache impact test (HIT-6) [BL to Wk 6]	**Reduced headache impact** Yoga: -27.7 (p<0.001); Usual care: -6.8 (p<0.001) Between group: p<0.001
							Headache frequency (per Mth) [BL to Wk 6]	**Reduced headache frequency** Yoga: -9.5 (p<0.001); Usual care: -5.3 (p<0.001) Between group: p<0.001

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							Headache intensity (Visual analogue scale) [BL to Wk 6]	**Reduced headache intensity** Yoga: -6.67 ($p<0.001$); Usual care: -1.57 ($p<0.001$) Between group: $p<0.001$
							Self-perceived benefit scale [BL to Wk 6]	**'Greatly improved my clinical condition'** Yoga: 96.7%; Usual care: 30.0% **'More helpful than harmful'** Yoga: 100.0%; Usual care: 73.3%
							Heart rate [BL to Wk 6]	NS
							Heart rate variability (HRV) [BL to Wk 6]	NS
Manjunath, et al. (2001) [India, SEARO] [28]	Randomized controlled trial	Executive functioning (healthy volunteers – adolescent girls)	Yoga: *asana* postures, *pranayama* breathing, internal cleansing *kriyas*, meditation, *bhajans* singing, relaxation techniques (75 min per day, for 1 mth)	Nil	Physical training: standing and sitting exercises, jogging and lifting dumbbells (1 hr 15 min per day, for 1 mth)	20 (10/10)	Tower of London (ToL) test of executive function – Time for planning (secs) [Dy 1 to Dy 30]	**Reduced time** 2 Moves test: Yoga, -13.0 ($p<0.02$); Physical training, NS 4 Moves test: Yoga, -28.00 ($p<0.01$); Physical training, NS 5 Moves test: NS
							ToL test – Time for execution (secs) [Dy 1 to Dy 30]	**Reduced time** 2 Moves test: NS 4 Moves test: Yoga, -42.4 ($p<0.02$); Physical training, NS 5 Moves test: Yoga, -56.7 ($p<0.001$); Physical training, NS
							ToL test – Number of moves (to complete task) [Dy 1 to Dy 30]	**Reduced moves** 2 Moves test: NS 4 Moves test: Yoga, -3.6 ($p<0.01$); Physical training, NS 5 Moves test: NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Manjunath, et al. (2004) [India, SEARO] [29]	Controlled trial (comparative)	Spatial and verbal memory (healthy volunteers – adolescent girls)	Yoga camp: *asana* postures, *pranayama* breathing, *kriyas* cleansing techniques, meditation, guided relaxation, games, story-telling (8 hrs per day for 10 days)	Nil	Fine arts camp: creative activities, games, presentations (8 hrs per day for 10 days). No intervention control: routine vacation activities.	90 (30/30/30)	Spatial memory tests (recall of visual materials through drawing) [BL to Dy 10]	**Increased spatial memory** Yoga: +1.7 (p=0.002) Fine arts: NS Control: NS
							Verbal memory tests (written recall of visual materials) [BL to Dy 10]	NS
Manjunath, et al. (2005) [India, SEARO] [30]	Randomized controlled trial	Sleep (aged care residents)	Yoga training: breathing exercises, loosening exercises, *asana* postures, guided relaxation, devotional songs, lectures on theory and philosophy of yoga, meditation (60 min, 6 days per wk)	Nil	Ayurveda: herbal tonic and milk (dosed morning and evening). Waitlist control.	69 (23, 23, 23)	Time taken to fall asleep (min) [BL to Mth 3, Mth 6]	**Reduced time** Mth 3: Yoga, -7.3 (p<0.05); Ayurveda, NS Control, NS Mth 6: Yoga, -10.47 (p<0.01); Ayurveda, NS Control: NS
							Duration of sleep (hrs per night) [BL to Mth 3, Mth 6]	**Increased sleep** Mth 3: NS Mth 6: Yoga, +1.1 (p<0.05); Ayurveda, NS Control: NS
							Feeling of being rested rating scale [BL to Mth 3, Mth 6]	**Increased** Mth 3: NS Mth 6: Yoga, +0.4 (p<0.05); Ayurveda, NS Control: NS
							Sleep in the afternoon (min) [BL to Mth 3, Mth 6]	NS
							Number of awakenings at night [BL to Mth 3, Mth 6]	NS

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McDermott, et al. (2014) [India, SEARO] [31]	Randomized controlled trial (pilot)	Type II diabetes mellitus risk (elevated blood glucose) (adults)	Yoga (*pranayama* breathing, loosening exercises, *asana* postures, guided relaxation, chanting) (75 mins, 3-6 classes per Wk, for 8 Wks)	Counseling session on healthy lifestyle changes covering diet, physical activity and smoking (8 Hrs)	Counseling session on healthy lifestyle changes and walking (30 mins, 3 – 6 days per Wk, for 8 Wks)	41 (21/20)	Fasting blood glucose (mmol/L) [BL to Wk 8]	NS
							Postprandial blood glucose (mmol/L) [BL to Wk 8]	NS
							Body mass index (BMI) (kg/m^2) [BL to Wk 8]	**Reduced BMI** Yoga: -0.2 (NS); Control: +0.6 (NS) Between group: p=0.05
							Weight (kg) [BL to Wk 8]	**Reduced body weight** Yoga: -0.8 (NS); Control: +1.4 (NS) Between group: p=0.02
							Waist circumference (cm) [BL to Wk 8]	**Reduced waist circumference** Yoga: -4.2 ($p<0.05$); Control: +0.7 (NS) Between group: $p<0.01$
							Blood pressure – systolic (mmHg) [BL to Wk 8]	NS
							Blood pressure – diastolic (mmHg) [BL to Wk 8]	NS
							Insulin (fasting) (pmol/L) [BL to Wk 8]	NS
							Insulin resistance [BL to Wk 8]	NS
							Low-density lipoprotein (mmol/L) [BL to Wk 8]	NS
							Total cholesterol (mmol/L) [BL to Wk 8]	NS
							Triglycerides (mmol/L) [BL to Wk 8]	NS
							Hospital Anxiety and Depression Scale (HADS) [BL to Wk 8]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Positive affect – Positive and Negative Affect Schedule (PANAS) [BL to Wk 8]	NS
							Negative affect – PANAS [BL to Wk 8]	NS
							Stress – Perceived Stress Scale [BL to Wk 8]	NS
Mooventhan, et al. (2014) [India, SEARO] [72]	Randomized controlled trial	Pulmonary function (healthy volunteers – young adults)	Bhramari pranayama and OM chanting, under supervision (10 min, 6 mornings per wk, for 2 wks)	Nil	Control	79 (40/39)	Weight (kg) [BL to Wk 2]	**Reduced body weight** Yoga: -0.56 ($p<0.001$); Control: NS Between group: $p=0.038$
							Body mass index (BMI) (kg/m^2) [BL to Wk 2]	**Reduced BMI** Yoga: -0.53 ($p<0.001$); Control: NS Between group: NS
							Pulmonary function (PF) – Slow vital capacity (SVC) [BL to Wk 2]	**Increased pulmonary function** Yoga: +0.09 ($p=0.004$); Control: NS Between group: NS
							PF – Forced vital capacity (FVC) and [BL to Wk 2]	NS
							PF – FEV_1 (first sec forced expiratory volume) [BL to Wk 2]	**Increased FEV_1** Yoga: +0.1 ($p=0.006$); Control: NS Between group: NS
							PF – FEV_1/SVC (%) [BL to Wk 2]	NS
							PF – Peak expiratory flow (PEF) (L/sec) [BL to Wk 2]	**Increased PEF** Yoga: +0.29 ($p=0.011$); Control: NS Between group: $p=0.015$

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							PF – Forced expiratory flow (FEF) (25%, 50%, 75%) [BL to Wk 2]	**Increased (yoga), Reduced (control)** $FEF_{25\%}$: Yoga, +0.25 (p=0.028); Control, NS Between group: p=0.019 $FEF_{50\%}$: NS $FEF_{75\%}$: Yoga, NS; Control, -0.18 (p=0.038) Between group: NS
							Maximal voluntary ventilation (MVV) (L/min) [BL to Wk 2]	**Increased MVV** Yoga: 5.53 (p=0.008); Control: NS Between group: p=0.048
Nagasukeerthi, et al. (2017) [India, SEARO] [32]	Randomized controlled trial	Type II Diabetes Mellitus (Adults)	Integrated approach of yoga therapy (IAYT) residential program: *asana* postures, *pranayama* breathing, meditation, devotional songs, lectures on yoga, counselling, vegetarian diet (4 days, 05:30 to 21:00)	Bell pepper juice (*capsicum annuum var grossum* – 100mL morning and evening, for 4 days)	Comparison of IAYT with or without bell pepper juice	50 (25/25)	Fasting blood glucose [BL to Day 4]	NS
							Postprandial blood glucose (mg/dL) [BL to Day 4]	**Reduced postprandial blood glucose** IAYT+Juice: -68.3 (NS); IAYT only: -42.7 (NS) Between group: p<0.001
							Weight [BL to Day 4]	NS
							BMI [BL to Day 4]	NS
							Systolic blood pressure (mmHg) [BL to Day 4]	**Reduced systolic blood pressure** IAYT+Juice: -14.5 (p<0.05); IAYT only: -6.8 (p<0.05) Between group: p=0.002
							Diastolic blood pressure (mmHg) [BL to Day 4]	NS
							Pulse rate [BL to Day 4]	NS
							Mean arterial pressure [BL to Day 4]	NS
							Pulse pressure (mmHg) [BL to Day 4]	**Reduced pulse pressure** IAYT+Juice: -9.7 (p<0.05); IAYT only: +0.48 (NS) Between group: p=0.003

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							Rate pressure product [BL to Day 4]	**Reduced rate pressure product** IAYT+Juice: -19.7 ($p<0.05$); IAYT only: -8.7 ($p<0.05$) Between group: p=0.001
							Double product [BL to Day 4]	**Reduced double product** IAYT+Juice: -12.6 ($p<0.05$); IAYT only: -7.9 ($p<0.05$) Between group: p=0.03
Nalgirkar, et al. (2018) [India, SEARO] [33]	Randomized controlled trial (pilot study)	Dysfunctional uterine bleeding	Integrated approach of yoga therapy: loosening exercises, *asana* postures, *pranayama* breathing, meditation, deep relaxation technique (60 min, 3 days per wk, for 3 mths)	Nil	Waitlist control receiving standard gynecological care (3 Mths)	28 (14/14)	Hemoglobin (g/dl) [BL to Wk 12]	**Increased hemoglobin in control** Yoga: no change; Control: +0.43 ($p<0.01$)
							PBAC (Pictorial blood loss assessment) [BL to Wk 12]	NS
							Endometrial thickness (mm) [BL to Wk 12]	NS
							Perceived Stress Scale [BL to Wk 12]	**Reduced stress** Yoga: -4.69 ($p<0.05$); Control: NS
							Strait-Trait Anxiety Inventory [BL to Wk 12]	**Reduced anxiety** Yoga: -12.79 ($p<0.05$); Control: NS
							Pittsburg Sleep Quality Index (PSQI) – Global score [BL to Wk 12]	**Reduced difficulties with sleep** Yoga: -2.41 ($p<0.001$); Control: NS
							PSQI – Subjective Sleep Quality [BL to Wk 12]	NS
							PSQI – Sleep latency (time to fall asleep) [BL to Wk 12]	NS
							PSQI – Sleep duration [BL to Wk 12]	NS
							PSQI – Habitual sleep efficiency [BL to Wk 12]	NS

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							PSQI – Sleep disturbances [BL to Wk 12]	**Reduced disturbances** Yoga: -3.75 ($p<0.001$); Control: -1.92 ($p<0.05$)
							PSQI – Use of sleeping medication [BL to Wk 12]	**Reduced medication use** Yoga: 0.58 ($p<0.01$); Control: NS
							PSQI – Daytime dysfunction [BL to Wk 12]	NS
Nandini, et al. (2018) [India, SEARO] [34]	Randomized controlled trial	Neck pain (non-specific or common)	Yoga: stretching, *asana* postures, *pranayama* breathing, relaxation techniques, meditation, lecture on yoga philosophy (5 day program)	Hot sand fomentation (15 min per day), diet, sesame oil application	Yoga, diet, sesame oil application without hot sand fomentation	60 (30/30)	Pain, Visual Analog Scale [BL to Dy 5]	**Reduced pain** Hot Sand: -5.18; Control: -1.54 Between group: $p<0.001$
							Neck Disability Index [BL to Dy 5]	**Reduced neck disability** Hot Sand: -23.27; Control: -11.07 Between group: $p<0.001$
							Pittsburg Sleep Quality Index [BL to Dy 5]	NS
							Short Form-36 health survey, version 2 [BL to Dy 5]	**Increased quality of life** Social Functioning Hot Sand: +26.5; Control: +15.25 Between group: $p=0.035$ Pain Hot Sand: +28.25; Control: +10.09 Between group: $p<0.001$ Physical functioning: NS Physical health: NS Emotional problem: NS Energy: NS Emotional wellbeing: NS General Health: NS
Ostermann, et al. (2019) [Germany, EURO] [64]	Case report	Anorexia (38 years old, female)	Hatha yoga: *asana* postures, *pranayama* breathing, meditation (initially as part of inpatient care, then as home practice)	Intermittent rehabilitative inpatient care	Nil	1 (1/0)	Weight (kgs) [BL to post-intervention]	**Increased body weight** Post-intervention: +12.2
							Body mass index (BMI) (kg/m^2) [BL to post-intervention]	**Increased BMI** Post-intervention: +4.45

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Qualitative interview findings [post-intervention]	Personal developments allowing reconnection with self and body (reduced dissociation), sense of inner peace and security. Improved progress with psychotherapy attributed by the patient to influence of yoga. Patient better able to respect and respond to physical needs such as hunger.
Patel, et al. (2018) [India, SEARO] [73]	Uncontrolled trial	Emotional regulation (healthy volunteers – young adult females)	Yoga-based meditation technique: Mastering Emotions Technique (45 mins, daily, for 2 wks)	Nil	Nil	72 (72/0)	Emotional Regulation Questionnaire – cognitive reappraisal and expressive suppression [BL to Wk 2]	**Increased cognitive reappraisal** Wk 2: +1.62 ($p<0.001$) **Reduced expressive suppression** Wk 2: -1.25 ($p<0.001$)
							The Positive and Negative Affect Schedule [BL to Wk 2]	**Increased positive affect** Wk 2: +1.23 ($p<0.001$) **Reduced negative affect** Wk 2: -1.25 ($p<0.001$)
							Self-Compassion Scale [BL to Wk 2]	**Increased self-compassion** Wk 2: +0.09 ($p<0.01$)
							Mindful Attention Awareness Scale [BL to Wk 2]	**Increased mindfulness** Wk 2: +0.53 ($p<0.001$)
Raghavendra, et al. (2007) [India, SEARO] [35]	Randomized controlled trial	Breast cancer (stage II and III operable) with chemotherapy-induced nausea and emesis	Yoga: *asana* postures, *pranayama* breathing, meditation and yogic relaxation techniques with imagery (60 min, 6 days per wk, during chemotherapy – taught by instructor, then practiced from home, plus a supervised session once in 10 days)	Conventional therapy, including 4-6 cycles of chemotherapy and standard anti-emetic medications.	Control (psychodynamic supportive – expressive therapy with coping preparation)	62 (28/34)	Nausea frequency and intensity – Morrow Assessment of Nausea and Emesis (MANE) [after 4th cycle of chemotherapy (CT)]	**Reduced nausea** Post-CT frequency: Between group: Yoga -0.9 ($p=0.01$) Post-CT intensity: Between group: Yoga -1.1 ($p<0.001$) Anticipatory frequency: Between group: Yoga -0.6 ($p=0.06$) Anticipatory intensity: Between group: Yoga -1.1 ($p=0.003$)

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Emesis frequency and intensity – MANE [after 4th cycle of CT]	**Reduced emesis** Post-CT frequency: Between group: Yoga -0.6 (p=0.06) Post-CT intensity: Between group: Yoga -0.6 (p=0.05) Anticipatory frequency: NS Anticipatory intensity: Between group: Yoga -0.57 (p=0.04)
							State Trait Anxiety Inventory (STAI) [after 4th cycle of CT]	**Reduced anxiety** Between group: Yoga -8.3 (p<0.001)
							Beck Depression Inventory [after 4th cycle of CT]	NS
							Distressful treatment-related symptoms (number of) [after 4th cycle of CT]	**Reduced no. symptoms** Between group: Yoga -3.3 (p=0.002)
							Severity of treatment-related symptoms [after 4th cycle of CT]	**Reduced severity** Between group: Yoga -9.7 (p<0.001)
							Symptom distress experienced [after 4th cycle of CT]	**Reduced distress** Between group: Yoga -13.3 (p<0.001)
							Functional Living Index for Cancer – Overall quality of life [after 4th cycle of CT]	**Increased quality of life** Between group: Yoga +30.4 (p<0.001)
							Total chemotherapy toxicity score [after 4th cycle of CT]	**Reduced toxicity** Between group: Yoga -3.8 (p<0.001)

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Raghuraj and Telles (2008) [India, SEARO] [66]	Randomized controlled trial (crossover)	Healthy volunteers (adult males)	Specific nostril manipulating *yoga* breathing practices (right (RNYB), left (LNYB), and alternate (ANYB) nostril yoga breathing) (40 min per session)	Nil	Breath awareness (BAW) breathing, Normal breathing control (CTL)	21 (five conditions per participant)	Heart rate (bpm) [BL to 22.5 sec, 30 sec, 5 min post]	**Increased** 22.5 sec: NS 30 sec: RNYB/LNYB, NS; ANYB, +4.73 ($p<0.01$); BAW/CTL, NS 5 min post: RNYB/LNYB, NS; ANYB, +4.73 ($p<0.05$); BAW/CTL, NS
							Skin conductance level (μS) [BL to 22.5 sec, 30 sec, 5 min post]	**Increased** 22.5 sec: NS 30 sec: NS 5 min post: RNYB, +1.16 ($p<0.05$); LNYB, NS; ANYB, +1.26 ($p<0.05$); BAW/CTL, NS
							Finger plethysmogram amplitude (cm) [BL to 22.5 sec, 30 sec, 5 min post]	**Reduced** 22.5 sec: RNYB, -0.18 ($p<0.05$); LNYB/ ANYB, NS; BAW, NS; CTL, -0.16 ($p<0.05$) 30 sec: RNYB, -0.21 ($p<0.01$); LNYB, NS; ANYB, -0.15 ($p<0.05$); BAW, -0.2 ($p<0.05$); CTL, -0.24 ($p<0.01$) 5 min post: RNYB, -0.26 ($p<0.001$); LNYB/ ANYB: NS; BAW, -0.3 ($p<0.001$); CTL, -0.24 ($p<0.05$)
							Breath rate (cpm) [BL to 22.5 sec, 30 sec, 5 min post]	**Reduced** 22.5 sec: RNYB, -5.05 ($p<0.001$); LNYB, -5.31 ($p<0.01$); ANYB, -7.74 ($p<0.001$); BAW/CTL: NS 30 sec: RNYB, -5.21 ($p<0.001$); LNYB, -5.17 ($p<0.01$); ANYB, -7.7 ($p<0.05$); BAW/CTL: NS 5 min post: RNYB/ LNYB: NS; ANYB, -3.21 ($p<0.05$); BAW/ CTL: NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Heart rate variability – Low frequency (LF) power (n.u.) [BL to 22.5 sec, 30 sec, 5 min post]	**Increased** 22.5 sec: NS 30 sec: RNYB/ LNYB: NS; ANYB, +7.16 ($p<0.05$); BAW/ CTL: NS 5 min post: NS
							Heart rate variability – High frequency (HF) power (n.u.) [BL to 22.5 sec, 30 sec, 5 min post]	**Reduced** 22.5 sec: NS 30 sec: RNYB/ LNYB, NS; ANYB, -7.92 ($p<0.05$); BAW, CTL, NS 5 min post: NS
							Heart rate variability – LF/HF ratio [BL to 22.5 sec, 30 sec, 5 min post]	**Increased** 22.5 sec: NS 30 sec: RNYB/LNYB, NS; ANYB, +0.43 ($p<0.05$); BAW/ CTL, NS 5 min post: NS
							Blood pressure (BP) – Systolic (mmHg) [BL to 5 min post]	**Increased** RNYB, +6.1 ($p<0.001$) **Reduced** LNYB, -4.19 ($p<0.01$); ANYB, -1.14 ($p<0.05$); BAW, CTL, NS
							BP – Diastolic (mmHg) [BL to 5 min post]	**Increased** RNYB: +3.33 ($p<0.001$) **Reduced:** ANYB, -0.67 ($p<0.05$); RBYN, NS; CTL, -0.67 ($p<0.05$); BAW, NS
							Blood pressure – Mean pressure (mmHg) [BL to 5 min post]	**Increased** RNYB: +4.12 ($p<0.01$) **Reduced** LNYB, -2.16 ($p<0.01$); ANYB, NS; CTL, -0.67 ($p<0.05$); BAW, NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Rao, et al. (2008) [India, SEARO] [36]	Randomized controlled trial	Breast cancer (stage II and III, states, quality of life and immune outcomes following surgery)	Integrated yoga program: *pranayama* breathing and yogic relaxation techniques (home practice, 30 min daily for 3 wks)	Surgery and related usual care	Control (supportive counselling sessions and postoperative exercise rehabilitation) (30 min, daily, at home, for 3 wks)	69 (33/36)	State Trait Anxiety Inventory [BL to Wk 3 post surgery]	**Reduced anxiety state** Yoga: -10.2 ($p<0.01$); Control: NS Between group: $p=0.04$ **Reduced anxiety trait** Yoga: -9.4 ($p<0.01$); Control: NS Between group: $p=0.002$
							Beck Depression Inventory [BL to Wk 3 post surgery]	**Reduced depression** Yoga: NS; Control: NS Between group: $p=0.008$
							Functional Living Index of Cancer [BL to Wk 3 post surgery]	**Increased quality of life** Yoga: NS; Control: NS Between group: $p=0.01$
							Distressful treatment-related symptoms (number of) [BL to Wk 4 post-surgery]	NS
							Severity of treatment-related symptoms [BL to Wk 4 post surgery]	**Reduced severity of symptoms** Yoga: NS; Control: NS Between group: $p<0.01$
							Symptom distress experienced [BL to Wk 4 post-surgery]	**Reduced symptom distress** Yoga: -2.9 ($p=0.05$); Control: NS Between group: $p<0.01$
							Immune assays – immunoglobulins (serum IgA, IgG, IgM in g/L) [BL to Wk 4 post surgery]	**Increased IgA in control** IgA: Yoga, NS; Control, +0.64 ($p=0.005$) Between group: $p=0.001$ IgM: NS IgG: NS

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Rao, et al. (2008) [India, SEARO] [37]							Immune assays – lymphocytes (CD4+, CD8+, CD56+ counts in %) [BL to Wk 4 post-surgery]	**Reduced lymphocytes in control** CD4+:Yoga, NS; Control, -3.5 (p=0.002) Between group: NS CD8+: Yoga, NS; Control, -3.7 (p=0.001) Between group: NS CD56+: Yoga, NS; Control, -4.3 (p=0.001) Between group: p=0.019
							Drain retention following surgery (days) [BL to wk 4]	**Reduced drain retention** Yoga -1.74 (p=0.001)
							Duration of hospital stay (days) [BL to wk 4]	**Reduced duration of hospital stay** Yoga: -1.3 (p=0.003)
							Postoperative duration (days) [BL to wk 4]	NS
							Interval for suture removal (days) [BL to wk 4]	**Reduced interval for suture removal** Yoga: -2.4 (p=0.031)
							Postoperative complications (% yes/no) [BL to wk 4]	NS
							Plasma cytokines (TNF-alpha) [BL to wk 4]	**Reduced plasma cytokines** Yoga: -6.8 (p<0.001)
Rao, et al. (2009) [India, SEARO] [38]	Randomized controlled trial	Anxiety related to breast cancer (Stage II and III) and associated treatment	Integrated yoga program: *pranayama* breathing, meditation and yogic relaxation techniques (60 min, 4 sessions pre- and post-operatively, 3 sessions per wk during 6-wk radiotherapy, during each chemotherapy session)	Usual care (surgery, radiotherapy, chemotherapy)	Control (supportive therapy as part of routine care)	38 (18/20)	State Trait Anxiety Inventory [Between group – BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced anxiety state** Post-surgery: p<0.05 During and post-RT: p<0.05 During and post-CT: p<0.001 Reduced anxiety trait Post-surgery: p<0.001 Post-RT: p<0.01 Post-CT: p<0.001

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Symptom distress [Between group – BL to post-surgery, BL to during RT, post-RT, BL to during CT, post-CT]	**Reduced distress** Post-surgery: p<0.001 During and Post-RT: p<0.001 During CT: p<0.001 Post-CT: p<0.05
Rao, et al. (2015) [India, SEARO] [39]	Randomized controlled trial	Depression related to breast cancer (Stage II and III) and associated treatment	Integrated yoga program: *pranayama* breathing, meditation and yogic relaxation techniques (60 min, during hospital visits and stays, with at home practice at least three days per wk)	Usual care (surgery, radiotherapy, chemotherapy)	Control (supportive therapy as part of routine care) (60 min initial session, 15 min session during subsequent hospital visits, additional as required)	69 (33/36)	Beck Depression Inventory [Between group – BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced depression** Post-surgery: p<0.01 During and Post-RT: p<0.001 During CT: p<0.001 Post-CT: p<0.01 Positive correlation between depression scores with symptom severity and distress post-surgery, mid RT and mid CT (p<0.001)
Rao, et al. (2017) [India, SEARO] [40]	Secondary analysis	Mood states, quality of life and toxicity related to breast cancer (stage II and III) and associated treatment					State Trait Anxiety Inventory [Between group – BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced anxiety state** Post-surgery: p=0.04 Pre-RT: p=0.005 During RT: p=0.009 Post-RT: p<0.001 During CT: p<0.001 Post-CT: p<0.05
							Beck Depression Inventory [Between group – BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Reduced depression** Post-surgery: p=0.01 Pre-RT: p=0.007 During RT: p=0.001 Post-RT: p<0.001 Pre-CT: p=0.02 During CT: p<0.001 Post CT p<0.002
							Subjective symptoms – no. of symptoms, severity, total distress [Between group – BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to	**Reduced no. symptoms** During RT: p=0.009 During and Post-CT: p=0.003 **Reduced severity** Post-surgery: p<0.001

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							during chemotherapy (CT), post-CT]	During RT: p<0.001 During CT: p<0.001 Post-CT: p=0.002 **Reduced distress** Post-surgery: p<0.001 During RT: p<0.001 During CT and Post-CT: p<0.001
							Functional Living Index of Cancer [BL to post-surgery; BL to during radiotherapy (RT), post-RT; BL to during chemotherapy (CT), post-CT]	**Increased quality of life** Between group: Post-surgery: p=0.01 During RT: p<0.001 During CT: p<0.001
							Chemotherapy-related toxicity – WHO toxicity criteria [during CT]	**Reduced overall toxicity** Between group: p=0.01
Rao, et al. (2017) [India, SEARO] [41]	Randomized controlled trial	Sleep quality related to breast cancer (stage IV)	Integrated yoga-based stress-reduction program: didactic lectures, *pranayama* breathing, meditation and yogic relaxation techniques (60 min, at least twice per wk, for 12 wks)	Informal individual counselling sessions	Control (education and supportive therapy sessions)	91 (45/46)	Pittsburgh Insomnia Rating Scale [Between group – BL to Wk 12]	**Reduced insomnia** Symptom distress: p<0.001 Insomnia parameters: p=0.02 Impact on quality of life: p=0.001 Total score: p=0.001
							Diurnal salivary cortisol [mean of 3 consecutive days at 0600h, 0900h, 2100h, overall mean [BL to Wk 12]	**Reduced at 0600h** Yoga: p=0.31 Control: NS
							Natural killer cells (NK) [BL to Wk 12]	**Increased NK cells** Between group: p=0.03
							Absolute lymphocyte count [BL to Wk 12]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Revadi, et al (2018) [India, SEARO] [42]	Case report	Hepatic cirrhosis & ascites	Integrated yoga: cyclic meditation, breathing exercises (2 hrs, daily for 2 wks)	Integrated with naturopathy (acupuncture, massage, hydrotherapy, mud therapy, diet therapy), Ayurveda tonic, conventional medications (4 wk protocol, beginning 2 wks before yoga)		1	Blood pressure (BP) (mmHg) [BL to Wk 4]	**Reduced BP** Systolic: -10; Diastolic: -12
							Weight (kg) [BL to Wk 4]	**Reduced body weight** Wk 4: -17
							Body mass index (kg/m^2) [BL to Wk 4]	**Reduced BMI** Wk 4: -6.3
							Abdominal girth (in) [BL to Wk 4]	**Reduced abdominal girth** Wk 4: -12
							Breath holding time (seconds) [BL to Wk 4]	**Increased breath holding time** Wk 4: +6
							Bilirubin, total (mg/dL) [BL to Wk 4]	**Reduced total bilirubin** Wk 4: -0.6
							Bilirubin, direct (mg/DL) [BL to Wk 4]	**Reduced direct bilirubin** Wk 4: -0.2
							Serum albumin (g/dL) [BL to Wk 4]	**Increased serum albumin** Wk 4: +1.3
							Aspartate aminotransferase (AST) (U/L) [BL to Wk 4]	**Reduced AST** Wk 4: -6
							Alanine transaminase (ALT) (U/L) [BL to Wk 4]	**Reduced ALT** Wk 4: -14
							Urea (mg/dL) [BL to Wk 4]	**Reduced urea** Wk 4: -8
							Creatinine (mg/dL) [BL to Wk 4]	**Reduced creatinine** Wk 4: -0.4
Saoji, et al. (2017) [India, SEARO] [75]	Randomized controlled trial (crossover)	Cognitive performance (healthy volunteers – adult medical students)	Yogic advanced deep relaxation meditation: Mind sound resonance technique (MSRT) (10 day orientation, 30 min test session)	Nil	Supine rest (SR) (30 min test session)	42	Six-Letter Cancellation Task (total attempted minus no. incorrect) [BL to post-test]	**Increased cognitive performance** MSRT: +2.32 ($p<0.001$) SR: +2.7 ($p<0.01$)
							Digit Letter Subsitution Task (total attempted minus no. incorrect) [BL to post-test]	**Increased cognitive performance** MSRT: +2.97 ($p<0.001$) SR: +1.65 ($p<0.01$)

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Saoji, et al. (2018) [India, SEARO] [67]	Randomized controlled trial	Pyschologcal functions (healthy volunteers – experienced yoga practitioners)	Yoga-based breathing intervention based on classic yogic text (8 Wks training in 20 min intervention)	Routine daily yoga practice (60 min)	Control: Routine daily yoga practice only (60 min)	116 (60/56)	State mindfulness attention awareness scale [BL to Wk 8]	**Increased mindfulness** Yogic breathing: +0.21 ($p<0.01$) Control: NS
							Mind Wandering Questionnaire [BL to Wk 8]	**Reduced mind wandering** Yogic breathing: -4.84 ($p<0.001$) Control: -1.03 ($p<0.05$)
							State Trait Anxiety Inventory [BL to Wk 8]	**Reduced anxiety** Yogic breathing: -0.5 ($p<0.001$) Control: -0.15 ($p<0.01$)
Saoji, et al. (2018) [India, SEARO] [68]	Randomized controlled trial (crossover)	Autonomic and cardiovascular variables (healthy volunteers-yoga students)	Yoga-based intermittent breath holding based on classic yogic text (8 Wks training, 6 days per week, in 20 min)	Nil	Control: breath awareness (20 min)	39	Heart rate (beats/min) [pre- and post-test]	**Reduced** Yogic breathing: -3.62 ($p<0.001$) Control: -2.73 ($p<0.01$)
							Heart rate variability (HRV) – Standard deviation of NN intervals [pre- and post-test]	**Increased** Yogic breathing: +10.29 ($p<0.01$) Control: NS
							HRV – Root mean of sum of squares (RMSSD) [pre- and post-test]	**Increased** Yogic breathing: +6.41 ($p<0.001$) Control: +5.58 ($p<0.05$)
							HRV – Proportion (pNN50) (%) [pre- and post-test]	**Increased** Yogic breathing: +3.73 ($p<0.01$) Control: +5.47 ($p<0.01$)
							HRV – Low frequency (LF) band (0.04-0.15 Hz) power [pre- and post-test]	**Increased** Yogic breathing: +5.79 ($p<0.05$) Control: NS
							HRV – High frequency (HF) band (0.15-0.5Hz) power [pre- and post-test]	**Reduced** Yogic breathing: -5.88 ($p<0.05$) Control: NS
							HRV – LF:HF ration [pre- and post-test]	NS

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							Respiratory rate (cycles/ min) [pre- and post-test]	NS
							Blood pressure – Systolic and diastolic (mmHg) [pre- and post-test]	**Increased in BP control** Systolic: Yogic breathing, NS; Control, +2.39 ($p<0.001$) Diastolic: NS
							Mean arterial pressure (mmHg) [pre- and post-test]	**Reduced mean arterial pressure** Yogic breathing: -1.53 ($p<0.05$) Control: NS
							Stroke volumn (ml) [pre- and post-test]	**Reduced in intervention** Yogic breathing: -2.15 ($p<0.05$) **Increased in control** Control increase: +1.86 ($p<0.001$)
							Cardiac output (l/min) [pre- and post- test]	**Reduced cardiac output** Yogic breathing: -0.39 ($p<0.001$) Control: -0.06 (<0.01)
							Total peripheral resistance [pre- and post-test]	**Increased total peripheral resistance** Yogic breathing: +0.05 ($p<0.001$) Control: NS
							Baroflex sensitivity (ms/mmHg) [pre- and post- test]	**Increased baroflex sensitivity** Yogic breathing: +1.25 ($p<0.01$) Control: NS
Saoji, et al. (2018) [India, SEARO] [69]	Randomized controlled trial (within-subject)	Cognitive response inhibition (healthy volunteers – young adult yoga students)	Yogic breathing with intermittent breath holding (YBH) (8 wk training)	Nil	Yogic breath awareness (YBA) (8 wk training) as comparison, Baseline as control	36	Stop-signal task – Reaction time [BL to post-test]	**Reduced reaction time** YBH: -13.65 ($p<0.05$) YBA: -18.83 ($p<0.05$)

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Sarang and Telles (2006) [India, SEARO] [74]	Randomized controlled trial (crossover)	Oxygen consumption (healthy volunteers – male yoga students)	Cyclic meditation (20 min with 5 min supine rest before and after)	Nil	Shavasana (SH) supine rest (30 min)	50	Oxygen consumption (ml/min) [BL to Min 5, Min 10, Min 15, Min 20, post-test]	**Increased during CM** Min 5, Min 10, Min 15: $p<0.001$ Min 20: NS **Reduced post-CM** Post test: $p<0.001$ **Reduced during and** post-SH Min 5, Min 10, Min 15, Min 20 and post-test: $p<0.001$
							Breath rate (cycles/min) [BL to Min 10, Min 15, Min 20, Min 30, post-test]	**Increased during CM** Min 10, Min 15: $p<0.001$ Min 5, Min 20: NS **Increased post-CM** Post-test: $p<0.001$ During and post-SH: NS
							Tidal volume (L) [BL to Min 10, Min 15, Min 20, Min 30, post-test]	**Increased during CM** Min 5, Min 15: $p<0.001$ Min 10: $p<0.05$ Min 20: NS **Reduced post-CM** Post-test: $p<0.001$ During and post-SH: NS
							Minute ventilation (L/min) [BL to Min 10, Min 15, Min 20, Min 30, post-test]	**Increased during CM** Min 5, Min 10, Min 15: $p<0.001$ Min 20: NS **Reduced post-CM** Post-test: $p<0.001$ During and post-SH: NS
Satish, et al. (2018) [India, SEARO] [43]	Randomized controlled trial	Cardio-respiratory fitness (healthy volunteers – adolescent school children)	Yoga training: *asana* postures, *pranayama* breathing, meditation and relaxation (60 min, 6 days per wk, for 2 mths)	Nil	Physical activity training (60 min, 6 days per wk, for 2 mths)	748 (377/371)	Aerobic power – Maximum multistage 20m shuttle run (beep test) [Level/speed, Rounds and Velocity, pre- and post-test]	**Increased level** Yoga: +0.52 ($p<0.001$); Physical activity: +0.39 ($p<0.001$) Between group: NS **Increased rounds** Yoga: Increased (NS); Physical activity: Reduced (NS) Between group: $p<0.05$ **Increased velocity** Yoga: +1.77 ($p<0.001$); Physical activity: +1.32 ($p<0.001$) Between group: NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Sharma, et al. (2018) [India, SEARO] [44]	Controlled trial (prospective)	Migraine headache (adults)	Yoga: *asana* postures, *pranayama* breathing, relaxation techniques, chanting (40 min, daily for 1 wk, then 5 days per wk home practice until day 90)	Ayurveda: herbal medicine, oil application, steam bath, dietary protocol (90 days)	Control: usual care	60 (30/30)	Comprehensive Headache-related Quality of Life Questionnaire [BL to Dy 90]	**Increased quality of life** Yoga: +32.09; Usual care: -1.61 Between group: p<0.001
							Visual Analog Scale, pain [BL to Dy 90]	**Reduced pain** Yoga: -5.1; Usual care: +0.24 Between group: p<0.05
Shetty, et al. (2018) [India, SEARO] [45]	Randomized controlled trial	Flexibility and psychomotor skills (healthy volunteers – yoga naïve young adults)	Yoga: *asana* postures, *pranayama* breathing, deep relaxation, meditation (60 min, 6 days per wk, for 3 mths)	Nil	Control	100 (50/50)	Flexibility – Sit and Reach (SAR) test [BL to post-test]	**Increased flexibility** Yoga: +5.44 (p<0.05); Control: NS Between group: p<0.05
							Psychomotor performance – Digit Letter Substitution Test (DLST) [BL to post-test]	**Increased psychomotor performance** Yoga: +3.4 (p<0.05); Control: NS Between group: p<0.05
Telles, et al. (2004) [India, SEARO] [46]	Controlled trial	Voluntary heart rate reduction (healthy volunteers-yoga novices)	Yoga: *asana* postures, *pranayama* breathing, *kriya* cleansing practices, meditation, devotional sessions, guided relaxation, lectures (6.5 hrs per day for 30 days)	Nil	Control	24 (12/12)	Heart rate (HR) (lowest achieved in 6 min attempt to voluntarily reduce) [pre- to post- test]	**Reduced lowest HR achieved** Yoga: -9 (p<0.05); Control: NS **Reduced baseline HR** Yoga: -10.6 (p<0.05)
Telles, at el. (2006) [India, SEARO] [47]	Randomized controlled trial	Visual discomfort (healthy volunteers – professional computer users)	Yoga: *asana* postures, *pranayama* breathing, joint exercises, visual cleansing eye exercises, relaxation (60 min, 5 days per wk, for 60 days)	Nil	Waitlist control (usual routine)	117 (62/55)	Visual discomfort questionnaire (self-rated, mean of 12 items) [BL to Dy 60]	**Reduced visual discomfort** Yoga: -0.33 (p<0.001); Control: +0.45 (p<0.001) Between group: p<0.001
Telles, at al. (2007) [India, SEARO] [70]	Controlled trial (crossover)	Cognitive performance (healthy volunteers – adult males)	Specific nostril manipulating *yoga* breathing practices (right, left, and alternate nostril yoga breathing, and breath awareness) (30 min per session)	Nil	Nil	20	Performance in Letter Cancellation task (letters left out, letters wrongly cancelled, total errors) [BL to post-test]	**Reduced letters left out** Right nostril: -1.8 (p<0.02) Left nostril: NS Alternate nostril: -1.55 (p<0.02) Breath awareness: NS Letters wrongly cancelled: NS

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								Reduced total errors: Right nostril: NS Left nostril: NS Alternate nostril: -1.65 ($p<0.01$) Breath awareness: NS
Telles, et al (2013) [India, SEARO] [65]	Randomized crossover trial	Autonomic and respiratory function (healthy volunteers – adult males)	Meditative states from traditional yoga texts: *Dharana* meditative focusing and *Dhyana* effortless meditation (20 min sessions, 3 mth orientation program)	Nil	Non-meditation controls: *Cancalata* random thinking and *Ekagrata* non-meditative focus (20 min sessions)	30	Breath rate (cycles per min) [BL, during, post-test]	**Reduced in meditation** Dharana during: NS; Dharana post-test: $p<0.05$; Dhyana during: $p<0.001$; Dhyana post-test: $p<0.001$ Increased in control Cancalata control during: $p<0.05$; Cancalata control post-test: NS; Ekagrata control: NS Between group: $p=0.01$
							Heart rate (beats per min) [BL, during, post-test]	**Reduced heart rate** Dharana: NS; Dhyana during: $p<0.001$; Dhyana post-test: $p<0.05$; Control groups: NS Between group: $p=0.001$
							Photo-plethysmogram amplitude (μ/V) [BL, during, post-test]	**Increased levels** Dharana: NS; Dhyana during: $p<0.05$; Dhyana post-test: NS; Control groups: NS Between group: $p=0.05$
							Skin resistance [BL, during, post-test]	**Increased skin resistance** Dharana during: $p<0.05$; Dharana post-test: NS Dhyana during: $p<0.001$ Dhyana post-test: $p<0.001$ Cancalata control during: $p<0.05$ Cancalata post-test: NS

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								Ekagrata control during: $p<0.05$ Ekagrata control post-test: $p<0.01$ Between group: $p=0.001$
							Low frequency [BL, during, post-test] (LF) power (Hz) [BL, during, post-test]	**Reduced in meditation** Dharana: NS Dhyana during: $p<0.001$ Dhyana post-test: $p<0.05$ Increased in control Cancalata control during: $p<0.001$ Cancalata control post-test: $p<0.05$ Ekagrata control during: $p<0.05$ Ekagrata control post-test: $p<0.05$ Between group: $p=0.05$
							High frequency (HF) power (Hz) [BL, during, post-test]	**Increased in meditation** Dharana: NS Dhyana during: $p<0.001$ Dhyana post-test: $p<0.05$ **Reduced in control** Cancalata: NS Ekagrata during and post-test: $p<0.05$ Between group: NS
							LF/HF ratio [BL, during, post-test]	**Increased in control** Dharana: NS Dhyana: NS Cancalata control: NS Ekagrata control during and post-test: $p<0.05$ Between group: NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
							Heart rate variability (RR) (mean, ms) [BL, during, post-test]	**Increased heart rate variability** Dharana: NS Dhyana during: $p<0.05$ Dhyana post-test: NS Cancalata control: NS Ekagrata control during: $p<0.01$ Ekagrata control post-test: NS Between group: $p=0.05$
							HRV – Root mean of sum of squares (RMSSD) (ms) [BL, during, post-test]	Within group: NS Between group: $p=0.05$
							HRV – NN50 count [BL, during, post-test]	**Increased levels** Dharana: NS; Dhyana during: $p<0.001$; Dhyana post-test: NS; Controls: NS Between group: $p=0.01$
							HRV – Proportion (pNN50) (%) [BL, during, post-test]	**Increased levels** Dharana: NS; Dhyana during: $p<0.001$; Dhyana post-test: NS; Controls: NS Between group: $p=0.01$
Vadiraja, et al. (2009) [India, SEARO] [48]	Randomized controlled trial	Breast cancer symptom management (Stage II & III, receiving radiotherapy)	Integrated yoga program: *asana* postures, *pranayama* breathing, meditation, yogic relaxation (60 min, at least 3 time per wk, with home practice encouraged, for 6 wks)	Nil	Control: brief supportive therapy with education (15 min, 3-4 sessions over 6 wks)	88 (44/44)	Rotterdam Symptom Check list – psychological, physical, activity level [pre- and post-radiotherapy]	**Reduced psychological distress** Yoga: -2.5 ($p<0.001$); Control: NS Between group: $p<0.001$ **Reduced physical distress** Yoga: -3.23 ($p<0.01$); Control: NS Between group: NS Activity level: NS

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Vadiraja, et al. (2009) [India, SEARO] [49]		Cortisol rhythm and mood states in breast cancer (Stage II-III) (adjuvant radiotherapy)					European Organization for the Research and Treatment of Cancer – Quality of Life (EORTC QoL C30 questionnaire V1) [pre- and post-radiotherapy]	**Reduced fatigue** Yoga: -12.22 ($p<0.001$); Control: NS Between group: $p=0.001$ **Reduced pain** Yoga: -9.63 ($p<0.01$); Control: NS Between group: $p<0.01$ **Reduced insomnia:** Yoga: -23.71 ($p<0.001$); Control: NS Between group: $p=0.04$ **Reduced appetite loss** Yoga: NS; Control: +9.89 ($p=0.005$) Between group: $p=0.002$ Dyspnoea: NS Nausea and vomiting: NS Diarrhea: NS Constipation: NS
							Hospital Anxiety and Depression Scale [BL to wk 6]	**Reduced anxiety** Yoga: -3.17 ($p<0.001$); Control: -1.23 ($p<0.05$) Between group -3.34 ($p<0.001$) **Reduced depression** Yoga: -3.43 ($p<0.01$); Control: -1.47 ($p<0.01$) Between group: -2.39 ($p<0.01$)
							Perceived Stress Scale [BL to wk 6]	**Reduced stress** Yoga: -5.61 ($p<0.001$); Control: NS Between groups -4.96 ($p<0.001$)
							Diurnal salivary cortisol [collected 6am, 9am, 9pm for 3 consecutive days, BL to Wk 6]	**Reduced in yoga group** Between group: 6am, $p=0.009$; 9am, NS; 9pm, NS Pooled mean: $p=0.03$

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Vadiraja, et al. (2009) [India, SEARO] [50]		Breast cancer (Stage II and III, undergoing adjuvant radiotherapy) associated quality of life				88 (44/44) [final number of patients contributing 75 (42/33)]	Positive and Negative Affect Schedule (PANAS) [BL to Wk 6]	**Increased positive affect** Yoga: +3.8 (p<0.001); Control: NS Between group: p=0.007 **Reduced negative affect** Yoga: -9.24 (p<0.001); Control: -3.37 (p=0.02) Between group: p<0.001
							European Organization for the Research and Treatment of Cancer – Quality of Life [BL to Wk 6]	**Increased physical function** Yoga: NS; Control: +6.24 (p=0.03) Between group: NS **Increased emotional function** Yoga: +18.67 (p<0.001); Control: +7.65 (p=0.009) Between group: p=0.001 **Increased cognitive function** Yoga: +5.28 (p=0.05); Control: NS Between group: p=0.03 Role function: NS Social function: NS
Vadiraja, et al. (2017) [India, SEARO] [51]	Randomized controlled trial	Fatigue in breast cancer	Integrated yoga program: *asana* postures, *pranayama* breathing, meditation, yogic relaxation, chanting, self-appraisal and counselling (at least 2 individual sessions per week over 3 mths)	Nil	Control: supportive counselling sessions	65 (42/33)	Perceived Stress Scale [BL to Wk 12]	**Reduced stress** Yoga: -32.6% (p=0.01); Control: NS Between group: p<0.001
							Fatigue Symptom Inventory – severity, frequency, interference, diurnal variation [BL to Wk 12]	**Reduced severity** Yoga: -61.15% (p<0.001); Control: NS Between group: p<0.001 **Reduced frequency** Yoga: -52.64% (p<0.001); Control: NS Between group: p<0.001 **Reduced interference** Yoga: -72.6% (p<0.001); Control: NS Between group: p<0.001

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
								Reduced diurnal variation Yoga: -52.33% ($p<0.001$); Control: NS Between group: $p<0.001$
Venugopal, et al. (2017) [India, SEARO] [53]	Uncontrolled trial	Type II diabetes mellitus (Adults)	Yoga-based Lifestyle intervention (Stop Diabetes Movement): loosening exercises, *asana* postures, *pranayama* breathing, theorectical lecture (90 min daily, for 10 days)	Nil	Nil	1292 (primary outcome data on 896)	Fasting blood glucose [BL to Dy 10]	**Reduced fasting blood glucose** Dy 10: -11.2 ($p<0.001$)
Vijayakumar, et al (2018) [India, SEARO] [52]	Uncontrolled trial	Type II diabetes mellitus (Adults)	Yoga evening vs. morning: loosening exercises, *asana* postures, *pranayama* breathing, theoretical lecture (90 min daily, for 10 days)	Nil	Healthy control	310 (189/121)	Fasting blood glucose [BL to Dy 10]	**Reduced in evening practice** T2DM between group (morning vs. evening): -20.4 ($p<0.001$) Control, female evening practice -23.06 ($p=0.001$) Control, male evening practice: NS
Vinchurkar and Arankelle (2015) [India, SEARO] [54]	Case report	Urinary incontinence	Yoga: *asana* postures, *pranayama* breathing, neuromuscular locks and *mudras*, meditation (twice daily, 3 hrs total, for 21 days)	Vegetarian diet, fluid management, counselling, walking exercise.	Nil	1	Resting heart rate (beats/min) [BL to Dy 21]	**Reduced resting heart rate** Dy 21: -2
							Blood pressure (BP) (mmHg) [BL to Dy 21]	**Reduced systolic BP** Systolic: -6; Diastolic: -0.0
							Weight (kg) [BL to Dy 21]	**Reduced body weight** Dy 21: -1.9
							Body mass index (BMI) (kg/m^2)	**Reduced BMI** Dy 21: -0.7
							Frequency volume chart score	**Reduced frequency volume** Dy 21: -2
							International Consultation on Incontinence Modular Questionnaire – Urinary Incontinence Short Form	**Reduced incontinence** Dy 21: -7

Author (year) [Country, World region]	Design	Study Population	Intervention(s)	Concomitant Therapies	Control or Comparison	Participants (Intervention/ Control)	Measure of Outcome	Outcome
Vinutha, et al. (2015) [India, SEARO] [55]	Uncontrolled trial	Type 2 diabetes mellitus (Adults)	Integrated Approach of Yoga Therapy: *asana* postures, *pranayama* breathing, cleansing techniques *(kriyas)*, meditation, devotional songs and lectures on yoga (1 wk residential program, 5.30am-9pm)	Nil	Nil	15	Fasting plasma glucose (mg/dL) [BL to Wk 1]	**Reduced fasting plasma glucose** -24.4 ($p<0.05$)
							Heart rate variability [BL to Wk 1]	NS
							Heart rate response to deep breathing [BL to Wk 1]	NS
							Blood pressure response to sustained handgrip (mmHg) [BL to Wk 1]	**Increased BP response to handgrip** +3.2 ($p<0.01$)
							Post prandial plasma glcuose [BL to day 7]	NS
Visweswaraiah and Telles (2004) [India, SEARO] [71]	Randomized controlled trial	Pulmonary tuberculosis	Yoga: simple breathing, *pranayama* breathing, supine relaxation (60 min, 6 days per wk, for 60 days)	Anti-tuberculosis treatment (usual care)	Breath awareness	73 (36/37)	Symptom scores [BL to day 60]	**Reduced symptoms** Dy 60: Yoga -10.4 ($p<0.001$); Breath -2.02 ($p<0.05$)
							Body weight (kg) [BL to day 60]	**Increased body weight** Dy 60: Yoga + 4.5 ($p<0.001$); Breath +0.8 ($p=<0.01$)
							FVC (litres) [BL to day 60]	**Increased FVC** Dy 60: Yoga +0.6 ($p<0.001$); Breath NS
							FEV (litres) [BL to day 60]	**Increased FEV** Dy 60: Yoga +0.5 ($p<0.001$); Breath +0.2 ($p<0.05$)
							FEV/FVC (%) [BL to day 60]	NS
							Improved sputum microscopy [BL to Dy 30, Dy 45, Dy 60]	**Reduced microscopy** Dy 30: Yoga, 19/25; Breath, 10/23 Between group, p=0.045 Dy 45: Yoga, 24/25; Breath, 12/23 Between group, p=0.002 Dy 60: Yoga, 10/13; Breath, 4/19 Between group, p=0.005
							Improved posteroanterior chest x-ray [BL to Dy 60]	**Increased chest x-ray** Yoga: 19/25; Breath: 3/22 Between group: p=0.001

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39 Optimizing Pharmaceutical-based Interventions

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HIGHLIGHTS

- Most patients that seek naturopathic care are taking one or more prescription medication.
- Comparing naturopathic interventions and conventional treatments warrants further investigation.
- The side-effects of pharmaceutical medications may be minimized with the inclusion of adjunctive therapies.
- Naturopaths/NDs have unparalleled expertise in drug-herb and drug-nutraceutical interactions.
- Clinical research by the naturopathic community has examined the applications of pharmaceuticals and adjunctive treatments for disease or symptom management and for pharmaceutical side-effect management, as well as comparing pharmaceuticals with non-pharmacological treatments.
- In line with the role of primary care, naturopathic researchers have examined the clinical effects of pharmaceutical drug treatments in the context of naturopathic practice in individuals with depression and cancer.

Pharmaceutical drugs play an integral role in the prevention and treatment of disease and are relied on by health care practitioners throughout the world in the care of their patients. Pharmaceuticals are chemically defined molecules with defined pharmacological mechanisms of action and therapeutic targets [1]. They are scheduled substances and are generally prescribed by medical doctors and/or dispensed by licensed pharmacists.

In some countries within jurisdictions, particularly the USA and Canada, naturopathic doctors are licensed to prescribe a limited schedule of pharmaceutical drugs as part of their naturopathic scope of practice (e.g. bioidentical hormones, high-dose nutrients, nutrients for Intravenous Therapies, etc.) [2]. The prevalent use of both non-prescription and prescription pharmaceutical drugs by people in the general population means most people seeking the care of naturopaths/naturopathic doctors will have used or be using at least one pharmaceutical medication [3-5]. Although naturopathic treatment primarily focuses on non-pharmacological therapies, the naturopathic therapeutic order identifies that in some circumstances therapies such as pharmaceutical medications are required [6].

Within the global context, the naturopathic workforce with prescribing rights as part of their scope of naturopathic practice are a minority [2, 7]. However, it is common for naturopaths and naturopathic doctors to provide care to patients who: want an alternative to pharmaceutical drugs; would like to limit the number of pharmaceutical drugs they are taking; are seeking to manage unwanted medication side effects; are looking for advice about supportive treatments that improve medication treatment outcomes and/or; would like to reduce potential drug-herb/nutrient interactions [3]. This is especially relevant for people with chronic complex conditions of whom many seek the care of naturopaths/naturopathic doctors [3]. The focus of this chapter is to synthesize the available literature reporting clinical studies conducted by naturopathic researchers that have involved naturopathic interventions as adjunctive treatments to improve pharmaceutical drug effects, studies focused on reducing pharmaceutical drug side effects, and those that are a direct comparison to pharmaceutical drug effects.

Overview of Studies

A total of eight papers reporting original clinical research conducted by naturopathic researchers examined the effects of pharmaceutical interventions. This research includes a total of 725 participants and was conducted in Australia (n=5), India (n=2) and Canada (n=1). The study designs included randomized controlled trials (n=6), prospective cohort study (n=1), and a non-randomized controlled trial [8]. Seven studies examined outcomes from adjunctive use of pharmaceuticals and other interventions, either to improve treatment outcomes (n=4) or to

reduce pharmaceutical treatment side effects (n=3). One study compared the clinical effects of pharmaceutical drug treatment and naturopathic interventions (n=1). The studies involved patients with depression (n=6) and cancer (n=2). All studies were conducted in hospital settings, with four occurring in hospital outpatient health care clinics and another four as inpatient hospital interventions. Details of the studies are available in *Table 39.1: Clinical research investigating pharmaceutical interventions conducted by naturopathic researchers.*

Implications

To date, the research indicates that naturopaths/naturopathic doctors are involved in developing and evaluating interventions to support safer and more effective pharmaceutical medication interventions with a view to improving patient outcomes. The key focus of most of these studies were to address pharmaceutical medication side effects and improve treatment responses. All studies involved concurrent use of pharmaceutical treatments with either nutraceuticals, yoga, or acupuncture. Such an approach supports the evolving and emerging role of naturopaths/naturopathic doctors in integrated and multidisciplinary models of patient's health care and their interest in rigorously evaluating interventions that may already be incorporated in clinical practice. Importantly, studies of integrated pharmaceutical management to improve outcomes involved naturopaths/naturopathic doctors even in jurisdictions where naturopaths/naturopathic doctors did not have prescribing rights, indicating the potential value in incorporating and integrating naturopathic perspectives in all aspects of conventional treatment as part of a multi-disciplinary team. This may be particularly relevant considering naturopaths/naturopathic doctors put a greater focus on the impact of concurrent complementary and pharmaceutical management than other health professionals [9]. For naturopathic doctors with a license to prescribe pharmaceutical medications, such research may be of even more practical relevance.

One of the potential primary benefits of naturopathic prescribing is that naturopathic doctors may be particularly well-equipped to help patients reduce doses or stop medications that are not useful, no longer needed, may be causing harm, or to facilitate changing to safer therapeutic agents or non-pharmacological approaches to care. This practice – deprescribing – is an increasingly important clinical innovation being promoted to ensure medication efficacy, reduce harms and costs and to mitigate polypharmacy [10]. Further research on how naturopaths/naturopathic doctors may be able to facilitate this globally important agenda are warranted.

The patient populations to whom these interventions were applied also indicates naturopathic researchers are contributing to the body of knowledge for conditions associated with significant health burdens to both individuals and health systems i.e., cancer and mental health. While further research is needed to confirm the findings of uncontrolled studies involving yoga and acupuncture, there is sufficient evidence that these intervention approaches taken by naturopathic practitioners in every day clinical practice provides demonstrable improvements in patient health and wellbeing. Equally, for those studies involving nutraceuticals that did not find significant improvements in the primary outcomes, the results of several secondary outcomes measured warrant further research. However, this is an emerging research area for naturopathic researchers and, in addition to the examination of adjunctive treatments to reduce pharmaceutical side-effects and improve clinical symptoms, there is also a need for research that offers a better understanding about interactions between naturopathic interventions and pharmaceutical treatments. While naturopathic researchers have engaged with the contributions of the wider health research community by conducting reviews of existing evidence regarding drug-herb and drug-nutrient interactions [11-25], it is only once naturopaths'/naturopathic doctors' specialized knowledge of their treatments are used to inform the design and conduct of such research, and that this research is translated to practice, that real gains will be made.

Studies investigating specific interventions:

Pharmaceuticals and adjunctive treatments for disease or symptom management

Five of the included studies investigated the effects of pharmaceutical medication when administered in conjunction with at least one other naturopathic intervention to improve symptoms or reduce disease progression [8, 26-29]. These studies were conducted in Australia (n=3) [26, 28, 29], India (n=1) [8], and Canada (n=1) [27]. All of these studies investigated the effects of antidepressant medication – such as selective-serotonin reuptake inhibitors (SSRIs) [26, 27, 29], selective-noradrenalin reuptake inhibitors (SNRIs) [27, 29], tetracyclics [29] or 5HT2c antagonists [29] (– although in some studies the specific class of antidepressant medication was unspecified [8, 28]. The adjunctive naturopathic interventions included in these studies were clinical nutrition (n=3) [26, 28, 29], yoga (n=1) [8], and acupuncture (n=1) [27].

A randomized controlled trial from Australia investigated the clinical effects of antidepressant medication (inclusive of SSRIs, SNRIs, tetracyclics, or 5-HT2c

antagonists) on individuals with major depressive disorder (n=158) [29]. The study compared the outcomes associated with using a multinutrient formula or a placebo in conjunction with the antidepressant medication and involved participants taking two tablets per day which contained S-Adenosyl methionine (SAMe) (800 mg/day), folinic acid (500mcg/day); and Vitamin B12 (200mcg/day). In addition to their anti-depressant medication, participants were also asked to take an additional two capsules per day of a placebo, or a multinutrient formula containing omega-3 fatty acid concentrate (EPA-esters 1000 mg/day, DHA-esters 656 mg/day) 5-HTP (200 mg/day) zinc picolinate (30 mg elemental/day); vitamin B6 (100 mg/day), vitamin C (60 mg/day), and magnesium (amino acid chelate, elemental 40 mg/day) for 8 weeks. The results suggested the placebo was superior to the adjunctive treatment as measured by the primary treatment outcome, results of the validated clinical assessment tool Montgomery and Asberg Depression Rating Scale (MADRS).

In a randomized controlled trial (n=46) conducted in Australia an adjunctive treatment with a single ingredient nutraceutical containing L-theanine (450 – 900 mg) was administered to partial or non-responders who were stable users of anti-depressants for the management of generalized anxiety disorder (GAD) [28]. The intervention lasted for 8 weeks plus a one-week pre-study and two-week post-study single-blinded observational period. While the L-theanine did not outperform placebo for anxiety reduction on the Hamilton Anxiety Rating Scale (HAM-A) ($p = 0.73$) nor insomnia severity using the insomnia severity index (ISI) ($p = 0.35$), L-theanine treatment resulted in greater self-reported sleep satisfaction (ISI item 4; $p = 0.015$).

Pharmaceuticals and adjunctive treatments for pharmaceutical side-effect management

Two studies, one conducted in India [30] and one in Australia [31], evaluated the use of pharmaceuticals in combination with adjunctive treatments to reduce pharmaceutical side-effects. Both studies examined chemotherapeutic pharmaceuticals [30, 31] and one of these also included radiotherapy [30]. One investigated clinical nutrition as the adjunctive intervention [31], while the other investigated yoga [30].

The study conducted in India was a randomized controlled trial evaluating the effect of yoga therapy when combined with radiotherapy (RT) or chemotherapy (CT) to reduce mental health symptoms and symptoms of toxicity among individuals with Stage II and Stage III breast cancer (n=98) [30]. The yoga group received daily 60-minute yoga sessions for 24 weeks while the control group received supportive counselling during their hospital visits. The yoga group reported reduced anxiety and depression for participants receiving RT (anxiety: -4.72, $p<0.05$; depression: -5.74, $p<0.05$) or CT (anxiety: -7.7, $p<0.05$; depression: -7.25, $p<0.05$) compared to control. They also reported a reduced incidence (RT: -2.34, $p<0.05$; CT: -2.97, $p<0.05$) and severity (RT: -6.43, $p<0.05$; CT: -8.83; $p<0.05$) of symptoms. Participants receiving CT were also reported a more significant reduction in toxicity ($p=0.01$) compared to control, but this was not the case for participants receiving RT. Both cancer treatment groups reported an increased quality of life (RT: +23.9, $p<0.05$; CT+31.2, $p<0.05$) compared to control.

Pharmaceuticals compared to non-Pharmacological treatments

One randomized controlled trial conducted in Australia compared a pharmaceutical intervention to another naturopathic treatment [32]. This study investigated 10-20mg of escilatopram for 12 weeks with a titrated dose of SAMe or placebo to reduce the symptoms of individual with major depressive disorder (n=144). The titration of SAMe was undertaken in two stages: participants were administered 1600mg per day for the first six weeks and, if they were not responsive, received an increased dose of 3200mg per day for the remaining six weeks of the study. A greater proportion of the participants allocated to the group receiving SAMe with escitalopram had a clinical response to treatment ($\geqslant$50% reduction from baseline in Hamilton Rating Scale for Depression [HAM-D] scores) (SAMe: 45%, escitalopram: 31%; placebo: 6%), and achieved remission (HAM-D score $\leqslant$7 at study completion) (SAMe: 34%; escitalopram: 23%; placebo: 6%), compared to all other groups.

Table 39.1 Clinical research investigating pharmaceutical interventions conducted by naturopathic researchers

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Bambling, et al. (2015) [Australia, WPRO] [26]	Randomized controlled trial	Depression (adults, sub-optimal treatment response to SSRI)	Selective serotonin reuptake inhibitor	15 weeks: Either 800mg or 1600 mg daily of SAMe. 2 weeks: washout 8 weeks: SAME non-responders supplemented with 1600 mg of Magnesium Orotate	Nil	36 (SAMe non-responders given magnesium orotate: 8)	ICD-DSM Mini International Neuropsychiatric Interview [BL to Wk15, Wk25]	NS
							Beck Depression Inventory [BL to Wk15, Wk25]	**Reduced SAMe** (38.2 – 11.4, p<0.001) NS difference between 800mg and 1600mg dose of SAMe. Reduced Mg orotate (33.8 – 14.1, p=0.001)
							Depression, Anxiety and Stress Scale [BL to Wk15, Wk25]	NS
							Structured Interview for the DSM-IV [BL to Wk15, Wk25]	NS
							Outcome questionnaire [BL to Wk15, Wk25]	**Reduced** functional distress scores SAMe: 113.9 vs 57.0 (p <0.001) Mg orotate and SAMe: 86.6 vs 54.2 (p<0.001)
							Quality of Life scores [BL to Wk15, Wk25]	**Increased quality of life** SAMe: 53.8 vs 75.0 (p<0.001) Mg orotate: 55.2 – 76.0 (p=0.001)
Gangadhar, et al. (2013) [India, SEARO] [8]	Non-randomized controlled trial	Major depression	Antidepressant medication (unspecified)	Yoga classes led by an advanced yoga teacher. Wks 1-2: 1-hour yoga class per day; Wks 3-4: two classes one week apart; Mth 2 – 3: one session per month. Encouragement to practice yoga at home daily.	Yoga only OR Drugs only	137 (Drugs and yoga: 36/ Yoga only: 23/ Drugs only: 78)	Hamilton Rating Scale for Depression [BL to Mth 1, Mth 3]	**Decreased in all groups (improved)** Drugs only: BL, 19.4+14.2; Mth 1, -12.3+5.43 (p=0.02); Mth 3, -10.4+5.82 (p=0.002) Yoga and drugs: BL, 7.7+13.91; Mth 1, -17.7+14.9 (p=0.02); Mth 3, -5+5.2 (p=0.001) Yoga only: BL, 17+4.5; Mth 1, -4.5+2.8 (p=0.02); Mth 3, -2.1+2.5 (p=0.001)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Clinical Global Impression [BL to Mth 1, Mth 3]	**Decrease in all groups (i.e., Improved)** BL, 4.0+0.38 Drugs only: Mth 1, -3.10+0.63 (p=0.001); Mth 3, -2.4+0.81 (p=0.001) Yoga and drugs: Mth 1, -2.3+0.78 (p=0.001); Mth 3, -1.6+0.79 (p=0.001) Yoga only: Mth 1, -1.7+0.0 (p=0.001); Mth 3, -1.1+0.35 (p=0.001)
Khamba, et al. (2013) [Canada, AMRO] [27]	Prospective cohort	Sexual dysfunction secondary to SSRIs and SNRIs (men and women)	Anti-depressant medication (SSRIs and SNRIs)	Acupuncture for 12 weeks (KI 3, GV 4, BL 23, with HT 7 and PC 6.) and various aspects of sexual function based on participant's feedback	Nil	35 (Men: 18/ Women: 17)	Mini International Neuropsychiatric Interview (MINI)	Not provided
							Beck Anxiety Inventory (BAI)	**Reduced** -2.8 (p=0.01)
							Beck Depression Inventory, Second Edition (BDI-II)	NS
							The Sexual Function Visual Analogue Scale (SFVAS)	**Increased** Total: +62.28 (p=<0.01) Desire/Libido: +13.9 (p=0.030) Erection: +12.0 (p=0.012) Ejaculation delay: +19.2 (p=0.03) Orgasm delay: +17.0 (p=0.025) Frequency of sex: +12.4 (p=0.04)
							The Arizona Sexual Experience Questionnaire (ASEX)	**Reduced impact** Total: -1.59 (p=0.027) Drive: -0.6 (p=0.014) Arousal: NS Erection: -0.5 (p=0.015) Ability to reach orgasm: -0.5 (p=0.027) Satisfaction from orgasm: NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Rao, et al. (2017) [India, SEARO] [30]	Randomized controlled trial	Breast cancer (Stage II and III)	Radiotherapy or chemotherapy	60-min yoga sessions, daily (24 weeks)	Supportive counselling therapy during their hospital visits.	98 (45/53)	State-trait anxiety inventory [BL to Wk 24]	**Reduced anxiety** Radiotherapy: Wk 24, -4.72 ($p<0.05$) Chemotherapy: Wk 24, -7.7 ($p<0.05$)
							Beck Depression Inventory [BL to Wk 24]	**Reduced depression** Radiotherapy: Wk 24, -5.74 ($p<0.05$) Chemotherapy: Wk 24, -7.25 ($p<0.05$)
							Symptom checklist [BL to Wk 24]	**Reduced incidence** Radiotherapy: Wk 24, -2.34 ($p<0.05$) Chemotherapy: Wk 24, -2.97 ($p<0.05$) Reduced severity Radiotherapy: Wk 24, -6.43 ($p<0.05$) Chemotherapy: Wk 24, -8.83 ($p<0.05$)
							Common toxicity criteria [BL to Wk 24]	**Reduced toxicity** Radiotherapy: NS Chemotherapy: $p=0.01$
							Functional living index – cancer [BL to Wk 6, Wk 12, Wk 18, Wk 24]	**Increased quality of life** Radiotherapy: Wk 24, +23.9 ($p<0.05$) Chemotherapy: Wk 24, +31.2 ($p<0.05$)
Sarris, et al. (2014) [Australia, WPRO] [32]	Randomized controlled trial	Major Depressive Disorder	Escitalopram 10-20mg/ day (SSRI) (12 weeks)	Nil	S-adenosyl methionine 1600 to 3200 mg/d (titration at 6 weeks if no response) OR Placebo	144 (35/32/ 35)	Hamilton Rating Scale for Depression – Total [BL to Wk 12]	**Reduced depression** SSRI: 20.83+4.6 to 6.69+5.1 SAMe: 19.09+4.5 to 7.3+5.90 Placebo: 20.63 +4.4 to 4.00+5.6 Between group: ($p=0.039$)

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
							Hamilton Rating Scale for Depression – Response (HAMD-17⩾50% reduction) [BL to Wk 12]	**Increased clinical response** SAMe: 45% Escitalopram: 31% Placebo: 26%
							Hamilton Rating Scale for Depression – Remission (HAM-D⩽7) [BL to Wk 12]	**Remission rates Increased** SAMe: 34% (p=0.003) Escitalopram: 23% Placebo: 6%
Sarris, et al. (2019) [Australia, WPRO] [28]	Randomized controlled trial	Generalised anxiety disorder (partial or non-responders to stable use of anti- depressants)	Anti-depressant medication (unspecified)	L-theanine (450 – 900 mg) for 8 weeks plus a 1-wk pre-study and 2-wk post-study single-blinded observational period	Placebo	46 (22/24)	Hamilton Rating Scale for Anxiety [BL to Wk 8]	NS
							Insomnia Severity Index [BL to Wk 8]	**Improves sleep quality** Severity: NS (ISI item 4; p = 0.015) LT treatment resulted in greater self-reported sleep satisfaction.
							STROOP [BL to Wk 8]	NS
							Montgomery and Asberg Depression Rating Scale [BL to Wk 8]	NS
							Beck Anxiety Inventory [BL to Wk 8]	NS
							Penn State Worry Questionnaire [BL to Wk 8]	NS
							World Health Organisation Quality of Life-BREF [BL to Wk 8]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Sarris, et al. (2019) [Australia, WPRO] [29]	Randomized controlled trial	Major depressive disorder	Anti-depressant medication (SSRI, NaRI, tetracyclic or 5-HT2c antagonist) (8 weeks)	Multinutrient combination: (a) Two tablets per day – SAMe (800mg) folinic acid (500 mcg); Vitamin B12 (200mcg). (b) Two capsules per day provided omega-3 fatty acid concentrate (EPA-esters 1000mg, DHA-esters 656mg) 5-HTP (200mg) zinc picolinate (30mg elemental); vitamin B6 (100mg), vitamin C (60mg), and magnesium (amino acid chelate, elemental 40mg)	Placebo	158 (81/77)	Montgomery and Asberg Depression Rating Scale [BL to Wk 8]	NS
							Beck Depression Inventory, 2nd edition [BL to Wk 8]	NS
							Hamilton Anxiety Rating Scale [BL to Wk 8]	NS
							SF-12 -Short Form Survey-12 [BL to Wk 8]	NS
							Leeds Sleep Evaluation Questionnaire [BL to Wk 8]	NS
							Arizona Sexual Experience Questionnaire [BL to Wk 8]	NS
							CORE Assessment of Psychomotor Change [BL to Wk 8]	NS
							Clinical Global Impression Scale and Improvement [BL to Wk 8]	NS
							The Systematic Assessment for Treatment Emergent Effects [BL to Wk 8]	NS
							The Sternbach and Hunter Serotonin Toxicity Criteria [BL to Wk 8]	NS

Author (year) [Country, World region]	Design	Study Population	Intervention	Concomitant therapies	Control or Placebo	No. Participants (Intervention/ Placebo)	Measure of Outcome	Outcome
Schloss, et al. (2017) [Australia, WPRO] [31]	Randomized controlled trial	Cancer (newly diagnosed)	Taxanes, oxaliplatin or vincristine induced neuropathy with a B vitamin complex. Each tablet contained or placebo	B complex (2x/ day): Thiamine 50 mg, riboflavin 20 mg, niacin 100 mg, pantothenic acid 163.5 mg, pyridoxine 30 mg, folate 500 µg, cyanocobalamin 500 µg, biotin 500 µg, choline 100 mg, inositol 500 µg	Placebo	71 (38/33)	Total Nueropathy Score [BL to Wk 12, Wk 24, Wk 26]	NS
							Perceived Sensory peripheral nueropathy scores [BL to Wk 12, Wk 24, Wk 26]	**Reduced peripheral neuropathy** Wk 12, (p = 0.03); Wk 24, (p = 0.005); Wk 36, (p = 0.021)
							Serum vitamin B levels [BL to Wk 12, Wk 24, Wk 26]	NS
							Quality of Life [BL to Wk 12, Wk 24, Wk 26]	NS
							Pain inventory [BL to Wk 12, Wk 24, Wk 26]	NS
							Patient Neurotoxicity Questionnaire [BL to Wk 12, Wk 24, Wk 26]	**Reduced neurotoxicity** Taxanes: Lower (p=0.03); Oxaliplatin: NS; Vincristine: NS

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40 Other Research Publications Regarding Naturopathic Therapies and Practices

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HIGHLIGHTS

- Naturopathic researchers have conducted over 1203 peer-reviewed journal articles examining the broad range of therapies commonly used in naturopathic practice.
- Observational studies on specific therapies and treatments can provide information about patient experiences and preferences towards treatments, or practitioner perspectives towards the use and usability of therapies for specific conditions or populations.
- Naturopathic researchers have published over 195 observational studies in the last 30 years.
- Reviews and meta-analyses provide a detailed insight into the breadth of clinical research pertaining to the safety, efficacy, and mechanism of action of therapies and treatments, either as a group or as single interventions.
- Naturopathic researchers have published over 297 reviews and metanalysis related to health conditions in the last 30 years.

Naturopathic researchers have conducted extensive clinical research, yet it only represents one quarter of the total published peer-reviewed journal articles produced by the naturopathic research community examining the broad range of therapies commonly used in naturopathic practice (n=1203). A substantial proportion of observational studies including research using survey, interview or focus group methods (n=195; 16.2%), and reviews and meta-analyses (n=297; 24.6%) have been published by naturopathic researchers.

While it is beyond the scope of this report to provide details for such a substantial body of knowledge, a summary of the characteristics and topics of the observational studies and the reviews and meta-analyses and further details for the two therapies receiving the most research attention to date is outlined below.

Implications

Naturopathic researchers show a strong commitment to recognizing and translating knowledge between stakeholder groups and from different systems of medicine for the benefit of the wider community. In the context of health research examining treatments and therapies widely used in naturopathic practice, this manifests through research capturing the real-world observations of treatment and therapies which may inform other health professions and policymakers about the experiences, insights, beliefs, and attitudes of those using and prescribing these therapies and treatments. It also manifests as concerted effort to consolidate the extensive and ever-growing clinical effectiveness and safety evidence related to naturopathic therapies and treatments for the benefit of naturopaths/naturopathic doctors in clinical practice, and any other health professionals, prescribing these treatments.

The degree to which herbal medicine and clinical nutrition are a focus of the reviews and meta-analyses as well as the observational research published by naturopathic researchers further reinforces the importance that it plays in contemporary naturopathic practice globally. The prominence of these therapeutic modalities is also seen in international surveys of the naturopathic curriculum [237] and practice behaviours of naturopaths/naturopathic doctors [238]. However, it is also important to note that naturopathic researchers are not only exploring the effectiveness of their treatments, but also their safety and mechanisms of action.

The naturopathic reviews and meta-analyses directly and indirectly benefit members of the community who might be self-prescribing these treatments to better understand the potential benefits and risks associated with their use. Furthermore, naturopathic researchers are paying close attention to their role in the health system and exploring the nature of their relationship with other health professionals and the characteristics and experiences of individuals who consult with naturopaths/naturopathic doctors. Overall, naturopathic researchers are generating new knowledge to share with the broader health research, policy and consumer communities while also synthesizing existing knowledge to increase its reach and impact.

Observational studies

Observational studies in health research provide real-world insights. Observational studies on specific therapies and treatments can provide information about patient experiences and preferences towards treatments, or practitioner perspectives towards the use and usability of therapies for specific conditions or populations.

The naturopathic observational studies, inclusive of survey research and those employing interview or focus group methods, were conducted in the USA (n=84), Australia (n=47), Canada (n=21), Germany (n=15), India (n=13), Saudi Arabia (n=5), United Kingdom (n=3), Sub-Saharan Africa (n=2), New Zealand (n=1), Israel (n=1), Uganda (n=1), France (n=1), and Japan (n=1). Modalities and therapies used in naturopathic practice that were most frequently researched were complex interventions (n=72), clinical nutrition (n=54), pharmaceuticals (n=43), lifestyle (n=39), and herbal medicine (n=36). While less frequent, observational studies also examined naturopathic physical medicine (n=26), yoga (n=25), applied nutrition (n=20), acupuncture (n=10), and mind-body-medicine/counselling (n=5).

The naturopathic observational studies investigating complex interventions primarily focused on aspects of naturopathic clinical practice including exploring the role naturopathy/naturopathic medicine may play in supporting underserved and vulnerable communities [1-9], the characteristics and experience of patients accessing naturopathic care or natural health products [2, 4, 5, 10-15], and the interface between naturopaths/naturopathic doctors or natural health products and other health professions [3, 8, 16-24]. A number of studies describe various aspects of naturopathic practice by describing the general clinical practice behaviours of naturopaths/naturopathic doctors [8, 20, 21, 25-32] as well as the approach taken by naturopaths/naturopathic doctors to the clinical management of health conditions such as cardiometabolic conditions [33-37], gastrointestinal disorders [38], mental health [39], women's health [40, 41], and cancer [30, 42, 43]. A number of studies also examine naturopathic approaches to public health challenges [5, 44, 45] as well as their application of knowledge and evidence within clinical practice and naturopathic education [6, 9, 18, 38, 46-52]. Naturopathic researchers also employed observational study designs to advance research priorities, capacity, and methodologies to support robust, rigorous, and relevant naturopathic research for the future [6, 9, 18, 37, 38, 43, 47, 53, 54].

Naturopathic observational studies examining clinical nutrition commonly investigated the relationship between nutrient deficiencies and the risk, progression, or outcome of disease [55-62]. Naturopathic researchers have also studied the incidence of nutritional deficiency [57, 59, 63-65] and the use of nutritional supplements [66-79] in populations with defined health conditions. Some studies focused on specific stages across the life course such as children [62, 80-82], pregnancy [80, 83] and older adults [60, 68, 75, 84]. Other naturopathic observational studies explored the potential importance of nutritional biomarkers in the disease diagnosis and management [85-88]. The research encompassed a range of nutrients including vitamins [55, 61-63, 67, 72, 73, 76, 87, 89], minerals [59, 64, 65, 73, 81], essential fatty acids [56, 58, 60, 69, 86, 87, 90] and non-essential nutraceuticals [57, 68, 85, 91].

Reviews and meta-analyses

Within the accepted hierarchy of evidence for health research, reviews and meta-analyses are acknowledged as providing the highest level of evidence. Reviews and meta-analyses consolidate a wider range of research evidence than is possible from any one single study and from more than one system of medicine. As such, reviews and meta-analyses provide a more comprehensive view of the available evidence pertaining to the research question being investigated. Reviews and meta-analyses can, for example, provide the reader with a more detailed insight into the breadth of clinical research pertaining to the safety, efficacy, and mechanism of action of therapies and treatments, either as a group or as single interventions. Reviews and meta-analyses are often used to help inform clinical intervention studies and to guide naturopathic practice decisions.

Reviews and meta-analyses have been published in peer-reviewed journals by naturopathic researchers from Australia (n=94), USA (n=84), Canada (n=78), Germany (n=31), India (n=9), and New Zealand (n=1). The therapies most frequently examined in these reviews are herbal medicine (n=121), clinical nutrition (n=93), lifestyle (n=66), yoga (n=52), pharmaceuticals (n=34), and applied nutrition (n=32). While less frequent, naturopathic researchers have also conducted reviews and meta-analyses on complex interventions (n=19),

acupuncture (n=15), mind-body-medicine/counselling (n=8), and bodywork (n=7).

Naturopathic researchers have undertaken reviews and meta-analyses to consolidate published research examining herbal medicines for several purposes. The most common purpose is to identify and evaluate research examining the effectiveness of herbal medicines in the management of health conditions. This may include focusing on herbal medicines for specific illnesses such as musculoskeletal [92-101], cancer-related [102-115], cardiometabolic [116-123], women's reproductive [124-129], and mental health [130-144] conditions. Some reviews also focused on specific populations such as children [145-150] and pregnant women [126, 129, 151-160]. The herbal medicine reviews published by naturopathic researchers also had a strong focus on safety [102, 104, 116, 124, 126, 129, 133, 151-156, 158, 159, 161-167], particularly for pregnancy and lactation [129, 151-156, 158-160] and within the context of drug-herb interactions [118, 149, 162, 164, 168-171]. Another topic focus among the published herbal medicine reviews is phyto-pharmacognosy and manufacturing or delivery methods [140, 149, 163, 164, 166, 172-174].

Naturopathic researchers have undertaken these reviews and meta-analyses to consolidate published research examining clinical nutrition from different perspectives. One such perspective is the role of clinical nutrition in the management of a range of health conditions including mental health [78, 133, 175-190], cardiometabolic disease [116, 120, 191-198] and cancer [105, 112, 113, 199-217] and populations such as pregnant women [218, 219] and children [150, 218, 220-223]. In addition to specifically examining nutrients – vitamins and minerals [99, 177, 184, 200-202, 205, 206, 211, 216, 221, 222, 224-228], essential fatty acids [176, 180, 183, 186, 191, 192, 197, 199, 220, 229], and non-essential nutraceutical compounds [105, 112, 181, 185, 187, 203, 207, 208, 213, 230-233] -, some research also investigated the concurrent use of nutrients and pharmaceutical medications to understand potential clinical benefits, risks, and interactions [24, 130, 175, 195, 206, 212, 225, 226, 234]. The physiological effects and pharmacognosy of specific nutrients were also explored in some of the reviews and meta-analyses [116, 180, 181, 189, 194, 196, 197, 206, 224, 235, 236].

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41 Discussion

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HIGHLIGHTS

- Naturopathy is one of the most common T&CM professions globally and has a practice presence in all WHO Regions.
- Naturopaths/NDs treat patients throughout all stages of life. Naturopathic care focuses on prevention and chronic conditions, but also in the treatment of patients with acute conditions and those in palliative care.
- Naturopathic practice is therapeutically diverse with a consistent holistic and person-centered approach centered on a core philosophical and traditional knowledge framework that focuses on the effective prioritization of non-invasive or non-pharmacological interventions and preventive care.
- Naturopathy/naturopathic medicine treats a wide spectrum of conditions and can decrease the risks of conditions with a high disease burden, especially non-communicable diseases.
- The naturopathic profession is a leader in research supporting T&CM practice and has been active in developing research capacity in other health and medical areas beyond naturopathy/naturopathic medicine.
- The holistic and inter-systems nature of naturopathic practice is being increasingly recognized as being well-suited to complex health problems.
- The current research supports the effectiveness and efficacy of multiple aspects of naturopathic practice.

This Health Technology Assessment (HTA) on Naturopathy was initiated by the World Naturopathic Federation (WNF), the non-profit organization representing the global naturopathic profession, and developed in consultation with international stakeholder groups including the World Health Organization (WHO). The protocol for this HTA was drafted in line with the WHO guidelines for HTAs [1] and adapted to meet the specific requirements and nature of the naturopathic profession, and the specific evidence gaps, and requirements identified by external stakeholders as important for decision-making. The protocol was also informed by HTAs on other Traditional and Complementary Medicine (T&CM) health care professions, systems and therapies that were previously commissioned by governments to inform policy decision-making [2-4]. This report provides a detailed overview of the global naturopathic profession and evaluates the efficacy/effectiveness, appropriateness, and economics of naturopathy/naturopathic medicine through a systematic review of the research written by the naturopathic community.

Although informed by long-standing traditional European medical practices, naturopathy formally developed as a discrete and distinct traditional system of medicine in Germany in the mid-1800s [5]. The system rapidly spread, and by the early 1900s professional naturopathic communities had been established in every WHO Regions [5]. Today naturopathy/naturopathic medicine is a truly global profession, practiced in 108 countries around the world, spanning all WHO Regions [6], with over 110,000 naturopaths/naturopathic doctors in practice [7].

As detailed in Section 1, as a traditional medicine system the foundational basis of naturopathic practice is its philosophical approach to health and disease [5], defined by two philosophies and seven principles [8]. This focus has allowed the profession to adapt assessment, diagnosis, and treatment to evolving environments and develop a therapeutically diverse practice that retains a consistent holistic and person-centred approach to clinical treatment that focuses on the effective prioritization of non-invasive or non-pharmacological interventions and preventive care. This core philosophical and principles-based approach to treatment has also allowed naturopathy/naturopathic medicine to be successfully translated and implemented into a wide variety of geographic and socio-cultural settings and practice environments.

This HTA report covered questions that have been identified by extensive consultation with stakeholders as important for policy and practice decision-making at systems and organizational levels. These are:

- What is the international landscape of the naturopathic profession?
- What is the foundational, educational and regulatory bases of the naturopathic profession?
- What research and scientific publications are available to support naturopathic practice?
- What conditions are commonly treated by naturopaths/naturopathic doctors?
- What is the evidence on the effectiveness and efficacy of naturopathic practice?
- How widespread is the use of naturopathy/naturopathic medicine by the general population?
- What is the access and equity to naturopathic health services?
- What role does the naturopathic workforce currently play in health promotion and community education?
- Which adverse effects or complications can occur or have been observed and what safety precautions are required in naturopathic practice?
- What are the economic considerations when evaluating naturopathic care and what is the cost-effectiveness of naturopathic care?

Literature Search and Selection

The literature informing this HTA was drawn from the extensive bibliometric analysis of naturopathic research – that is research on interventions conducted by the naturopathic research community – which identified 2218 manuscripts published in peer-reviewed indexed journals by naturopathic researchers from 22 countries. Authors selected for each chapter were primarily naturopathic researchers with clinical and research expertise in their assigned areas. In total 52 authors from ten countries in six WHO Regions contributed to the literature review and summary charts in this document. Authors were, with few exceptions, naturopathic researchers or research-active naturopathic practitioners and, in all instances, were affiliated with naturopathic professional or educational institutions, universities or research organizations.

The articles identified were published between 1987 and 2019 with 80.9% published in the last 10 years. The bibliometric analysis showed a substantial increase in the original research undertaken by naturopathic clinicians since 2004, which is also supported by data showing that the naturopathic profession is increasingly becoming one of the most active T&CM professions engaging in competitively-funded government research programs [9]. Naturopathic researchers engage in a diverse range of research topics, with the main countries contributing to being naturopathic researchers form the USA (37.2%), Australia (27.8%), Canada (15.2%), India (9.2%) and Germany (8.3%). Naturopathic researchers are also involved in diverse methodological approaches to research, with the main study designs being systematic reviews and meta-analysis (23%), clinical trials (19%), surveys and Delphi studies and focus groups (18%). The holistic nature of naturopathic practice is well-suited to complexity systems studies and this form of research is becoming more accepted and promoted [10], it is anticipated that the type of study designs adopted by naturopathic clinician researchers will change over time. Twenty-four percent of the studies identified focused on treatments or naturopathic interventions for specific conditions and 19% focused on the effectiveness of naturopathic treatment modalities.

Effectiveness and Efficacy of Naturopathy/Naturopathic Medicine

One hundred and two of the 237 studies (81.1%) indicated a positive clinically relevant outcome in either the primary or secondary measurements of studies included in this review. Five studies also included cost-effectiveness measures, all of which reported cost-effectiveness of naturopathic interventions. In most cases these studies also showed naturopathic intervention to be safe and tolerable, with only seven of the 237 studies reporting adverse events, most of which were categorized as mild (these are reported in more detail in Chapter 7 and appendices). In total 53% of original research studies were RCTs with the majority of those being either double-blind or placebo-controlled, primarily on standardized treatment interventions or individual therapies. However, as discussed in Chapter 2, as a traditional system of medicine, naturopathy/naturopathic medicine is defined by the application of its overarching philosophical frameworks in all aspects of naturopathic care, rather than its specific use of natural treatments and therapies. The results from studies identified in this review process demonstrate that naturopathic researchers have undertaken a significant body of research on specific and complex interventions which demonstrate effectiveness and efficacy of naturopathic treatment across a wide variety of conditions and clinical settings. Additionally, naturopaths/naturopathic doctors appear to have been active in the development and growth of emerging clinically key areas and disciplinary fields. Topics such as the impact of the gut microbiome on health, nutritional psychiatry and advancements in integrative approaches to oncology have long been cornerstones of naturopathic practice – informed by philosophical and principles-based naturopathic theories and are now being increasingly recognized and adopted

across wider health and research disciplines [11-13]. As the naturopathic research community develops, there are increasing opportunities for naturopathic theories of practice to inform optimal approaches to health care.

However, it should be noted that many interventions in the studies identified in this HTA were modified or controlled to adhere to methodological norms and relatively few studies have explored the intervention of individualized whole naturopathic care as it is practiced in real-world settings. This is particularly important given that the international practice survey highlighted in this HTA noted that naturopathic practitioners typically use four or more treatment interventions per visit, and that many studies in this review that reported results from complex interventions often had better outcomes than those that assessed more limited treatments. Whilst the results of these studies do offer insights into naturopathic interventions applied in naturopathic settings by naturopaths, such limitations may omit the therapeutic impact of important foundational aspects of naturopathic care that are difficult to account for in conventional research methodologies, such as inter-systems approaches to co-morbidities, individualization of treatment and patient-centeredness, all of which may be more amenable to modified RCT designs such as whole practice studies or research designs other than RCTs [14, 15]. Accounting for such factors is not likely to reduce the positive impact of naturopathic intervention, as where whole practice studies have been undertaken using pragmatic research designs reflective of real-world context and practice, they have also shown the clinical effectiveness and efficacy of naturopathic treatment across a wide variety of conditions and clinical settings [16]. Observational studies may also offer insights into the impact of naturopathic treatment but are hampered by the lack of integration of naturopathic practitioners into health care delivery at a systems level. One of the few areas where such evaluation has occurred has been on the impact of inclusion of naturopathic care in third party insurance plans, which has shown economic benefit from reduced costs and improved health outcomes (see Chapter 8 for more details), further supporting the value of whole practice naturopathic care.

Results from the studies identified in this HTA noted several important implications around the potential integration of the naturopathic workforce with other health care interventions. An important finding was the potential for naturopathy/naturopathic medicine to work collaboratively and effectively as part of multi-disciplinary teams. Results demonstrated that the integration of naturopathic care supported usual care, often through increasing or adding to the therapeutic effect of conventional treatments as part of an integrative approach to treatment, with many studies highlighting the significant effectiveness of naturopathic treatment compared to usual care alone. Moreover, naturopathy/naturopathic medicine was also able to reduce or assist in the management of adverse side effects of effective, but otherwise unpleasant, treatments in areas such as oncology where such side-effects have been associated with poor treatment compliance. Another important finding was the effective role that naturopathy/naturopathic medicine appears to have in addressing the modifiable risk factors associated with non-communicable diseases. Consultation with naturopathic practitioners is known to be associated with positive health behaviours, consistently show a positive role for naturopathy/naturopathic medicine as an effective intervention in a wide variety of non-communicable diseases. In many cases, the naturopathic philosophical focus on non-pharmacological approaches and a therapeutic hierarchy of healing has meant that it has often been able to achieve such results even in the absence of conventional drug treatment [17]. The naturopathic focus on clinical nutrition, herbal medicine, physical therapies and dietary and lifestyle counselling offers novel, innovative and potentially effective strategies to improve health outcomes while reducing pharmaceutical reliance and invasive interventions.

A striking feature of naturopathic research is the diversity in conditions and modalities that are included in naturopathic research. This diversity is analogous to results obtained in the international practice survey and indicates that naturopaths/naturopathic doctors treat a wide range of conditions ranging from acute to chronic, spanning all ages including preventive health and palliative care. Of particular importance to policy and practice decision-makers is that while naturopathy/naturopathic medicine treats a wide spectrum of conditions, it is particularly focused on those areas of increasing disease burden, particularly non-communicable diseases. One challenge with the wide range of conditions and treatments in the naturopathic clinical studies is that there was often an inability to pool results across different naturopathic studies in meta-analyses, providing a more definitive confirmation of effectiveness and efficacy. This absence should be viewed in the context that multiple meta-analyses do exist for many of the treatments employed by naturopaths and covered in this HTA, a substantial number undertaken by the naturopathic community itself to inform and improve evidence-based naturopathic practice. However, despite such limitations the level of positive outcomes arising from this research warrants consideration and provides a foundation for future research into the impact of naturopathy/naturopathic medicine.

It should be noted that these reviews are not exhaustive of the biomedical or traditional, complementary or integrative interventions employed in naturopathic practice, but a reflection of the naturopathic community's direct contribution to the evidence base for these interventions as applied in a naturopathic context. Some previous HTAs have queried the applicability of the broader

evidence base for clinical interventions to the evidence for their implementation by individual therapeutically eclectic professions such as naturopathy/naturopathic medicine [4, 18]. The broader evidence base for interventions commonly employed by the naturopathic workforce (covered in Chapter 28) should be considered in any assessment of the naturopathic profession, however the approach used by this HTA (limiting to evaluating studies conducted by naturopathic clinician researchers in naturopathic settings) *unequivocally* has direct relevance to assessment of naturopathy/naturopathic medicine and as such form a *minimum* foundational base upon which such assessments should be made.

Policy Relevance and Implementation of Findings

The WHO has consistently called for the appropriate regulation and integration of traditional medicine systems [6]. The WHO Traditional Medicine Strategies defined a framework for policy action, including the promotion of universal health coverage by integrating T&CM services into health service delivery and health care, where appropriate to do so [19, 20]. Global health's defining statement on primary health care – the Alma-Ata

Commitments of the Declaration of Astana

Health For All Policies

Naturopath's/naturopathic doctor's holistic view naturally engages with economic, social, and environmental factors when providing care to their patients. Although the biopsychosocial approach to health care has long underpinned naturopathic practice, the profession is not readily engaged in policy decisions and stakeholder engagements. However, where they have been engaged, the naturopathic community has been an effective advocate for multi-sectoral change and have been actively engaged in translational activities such as educating the public about environmental risk factors [22]. The holistic perspective of the naturopathic community would bring a unique view to providing care to the community and to addressing these factors, as well as lifestyle factors, which may be of value to policy makers.

Build Sustainable Primary Health Care

Disease prevention and health promotion are core principles in naturopathy/naturopathic medicine that are not only reflected in the preventive treatments investigated through clinical research, but also through the active role naturopaths/naturopathic doctors play in educating their patients and the wider community. Naturopaths/naturopathic doctors appear to be more active in health promotion and community education than most other primary care practitioners, and research suggests that they are an effective tool for translating research health promotion tools into clinical practice. Naturopaths/naturopathic doctors offer a broad scope of practice, providing a comprehensive range of services commensurate with their primary health care role, including screening, preventive health care and the treatment and/or management of noncommunicable and infectious diseases. Utilization studies also demonstrate that naturopaths/naturopathic doctors treat a diverse array of patients from across their life span. Even within the constraints of limited integration and associated resource issues, naturopaths/naturopathic doctors provide significant care to underserved populations. Although better collaboration and communication with other primary health care services is needed to ensure continuity of care for patients, naturopaths/naturopathic doctors have shown a commitment to multi-disciplinary care and de-fragmentation of the health care system by actively referring to and engaging with other providers where that option is available to them.

Empower Individuals and Communities

Naturopaths/naturopathic doctors have a philosophically strong focus on empowerment and building capacity in individuals and communities to self-manage their health. Educating patients to improve their health literacy and ability to maintain their own health forms one of the key principles of naturopathic practice – *Docere* – as evidenced by the active role of the naturopathic community in knowledge mobilization and dissemination to a wide variety of audiences using a variety of information sources specific to their community and their patient populations [23-25]. For example, health promotion education is a cornerstone of naturopathic practice, both philosophically and in terms of healthcare delivery, which has resulted in sustained and long-term clinical improvements among naturopathic patients due to improved self-management of health [17, 26]. The empowering nature of naturopathic treatment has also been supported by research that highlighted the intrinsic qualities of naturopathic consultation

and treatment as facilitating patient empowerment, empathy and patient-centredness [27], even more so than many other T&CM professions [28, 29].

Align Stakeholder Support to National Policies, Strategies, and Plans.

Naturopaths/naturopathic doctors are undertaking clinical, research and policy work that already aligns with national and international policies, strategies and plans such as person-centred care, management of chronic illness, and disease prevention. The holistic philosophy and principles-based naturopathic approach to health has many overlaps with public health paradigms. Moreover, research suggests that the naturopathic community is a translational profession, able to implement and facilitate health outcomes of interventions known to be effective. However, naturopaths/naturopathic doctors are often not effectively engaged with policymakers so that they are limited in their ability to fully integrate into plans and strategies as they are implemented. Where the naturopathic community has been engaged to work with policymakers, it has been able to effectively mobilize efforts that support public health. For example, during the COVID-19 pandemic the naturopathic community was asked by numerous international stakeholders to review the evidence for several T&CM products being actively and widely promoted to inform decision-making, resulting in the publication of a rapid review series, a *WNF White Paper on the Role of Naturopathy in a Pandemic* [5, 30], and the development of appropriate practise guidelines for naturopathic practice in the management of COVID-19, including the management of non-communicable disease implications from lockdown interventions or post-infectious recovery [31].

Drivers of Success

Knowledge and Capacity Building

Naturopathic researchers are contributing an immense amount of new knowledge through conducting studies, but also synthesizing existing knowledge to improve its translation and access to the naturopathic profession and the wider health community. The therapeutically eclectic nature of naturopathic practice has resulted in the naturopathic community being actively involved in knowledge and capacity building in multiple disciplinary fields. There are also numerous naturopathic institutions, and naturopaths/naturopathic doctors in other institutions, supporting the next generation of naturopathic clinician and researcher. The philosophically-based naturopathic approach on education – *Docere* – further facilitates this role.

Human Resources for Health

The growth in the practice, training and development of naturopaths/naturopathic doctors has increased, and formalization of standards has resulted in a workforce capable of primary health care practice, particularly where the profession is well-regulated. Even where regulation is absent, the naturopathic profession has historically encouraged initiatives to self-governance, or has been involved in regulating new areas (for example, the leading role of the naturopathic profession in the initiation and implementation of natural health products regulations in Canada [32]). The global naturopathic workforce of over 100,000 practitioners represents an untapped resource with significant potential to improve primary health care delivery and outcomes.

Technology

The diversity of treatment and therapies employed by naturopaths/naturopathic doctors, coupled with the range of conditions and populations they treat, and the unique consistent philosophically and principles-based naturopathic approach to using therapeutic tools, places naturopaths/naturopathic doctors in a strong position for identifying, testing, and assisting with the understanding of new treatment options for existing and emerging conditions. The therapeutically eclectic nature of naturopathic practice, coupled with a deep understanding and experience of both traditional and biomedical approaches to healthcare may also position naturopathy/naturopathic medicine as an ideal bridge between T&CM and conventional services.

Financing

Whilst most naturopathic care is financed by third party funding or direct patient expense, there is evidence that integration of naturopathic services has both clinical and economic benefits at an individual and systems level. Furthermore, naturopathic care may reduce resource requirements by reducing reliance on pharmaceutical medications or invasive interventions. However, despite evidence of clinical and cost-effectiveness, lack of integration creates inequities in the accessibility of naturopathic care.

Declaration – noting that primary health care relied on a multi-disciplinary workforce, including T&CM practitioners. The role of T&CM was expanded in the update to this document – the Astana Declaration – an expansion which is partly evidenced by the extension of a formal invitation to the World Naturopathic Federation to participate. The Astana Declaration again acknowledged the importance of multi-disciplinary approaches to health, but also noted the importance of traditional knowledge as a tool to strengthen primary health care and identified T&CM medicines as important tools to achieve primary health care aims. Given the role of naturopathy/naturopathic medicine in primary health care, and the directives to identify appropriate integration strategies for T&CM in the Astana Declaration, the policy relevance of this HTA, and decision regarding implementation of its findings, should be considered within the context of the commitments outlined in the Declaration of Astana [21], as outlined below.

While the evidence base uncovered in this review points to naturopathy/naturopathic medicine being a safe and effective intervention, there are some caveats that warrant consideration. Although there is a global consistency in the application of traditional naturopathic philosophies and principles by the global naturopathic community, there is significant heterogeneity in training, education, regulation and scope of practice (see Chapters 5 & 6). While the naturopathic profession has supported multiple initiatives to address these concerns, such initiatives are naturally self-limiting without the formal assistance or action of policymakers in government. This heterogeneity of standards, more than any other factor, impacts the potential risks identified as being associated with naturopathic practice, the types of which do not differ significantly from other professions with a primary health care scope (see Chapter 7). Importantly, measures that both reduce risks associated with naturopathic practice and support safe and effective naturopathy/naturopathic medicine are well-known – primarily centering around improved standards of regulation and accreditation – and are within the jurisdiction and capacity of policy decision-makers globally. Regulation of T&CM professions such as naturopathy/naturopathic medicine has generally failed to keep up with growing public utilization of those professions, even though such regulation consistently shows public benefit, with lack of regulatory action serving only to deny minimum standards of accountability in groups already perceived by the public as legitimate by virtue of their significant utilization [33]. Moreover, initiatives to improve regulatory arrangements for naturopathy/naturopathic medicine align with WHO recommendations [20, 34] and also tend to have wide support from the profession and the public [35].

Summary

Naturopathy/naturopathic medicine is a safe and effective intervention that has utility across different geographic regions, clinical settings and conditions, and naturopathic practitioners are trusted and consulted by the global public for a wide range of conditions. Studies demonstrate the clinical effectiveness and efficacy of naturopathic interventions in a wide variety of conditions, and the limited cost-effectiveness studies conducted appear to suggest integration of naturopathic care can generate cost savings at individual clinic and health systems levels. Definitive conclusions on the effectiveness of naturopathy/naturopathic medicine are hampered by the lack of integration of naturopathy/naturopathic medicine into broader health care, research or academic initiatives. Nevertheless, despite such barriers, particularly in areas of global health priority such as non-communicable diseases, naturopaths/naturopathic doctors have been actively engaged in both the conduct and translation and implementation of research, which provides a solid foundation for future integration into future clinical and research endeavors. The potential of naturopathy/naturopathic medicine to deliver consistently positive outcomes for the public is likely to be improved by the development of regulations that support minimum practice and education standards. Given the promising emerging evidence base for naturopathy/naturopathic medicine shown in this HTA, it is warranted that individual policy-decision makers consider how to regulate and integrate naturopathy/naturopathic medicine in the manner most appropriate to their individual setting.

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Appendix I: Observational Studies Published by Naturopathic Researchers

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Appendix III: Abbreviations

2hrPG	Plasma Glucose two hour
2PD	2-point discrimination threshold
25(OH)D	25-hydroxycholecalciferol
5-HETE	5-hydroxyeicosatetraenoic acid
5-MTHF	Methyltetrahydrofolate
8OHdG	8-hydroxy-2′-deoxyguanosine
AA	Arachidonic acid
AANMC	Association of Accredited Naturopathic Medical Colleges
AANP	American Association of Naturopathic Physicians
AC	Alternating compresses
Acu	Acupuncture
ADAS-cog	Alzheimer's Disease Assessment Scale – cognitive subscale
ADCS-ADL	Alzheimer's Disease Cooperative Study – activity of daily living subscale
AEs	Adverse Events
ADHD	Attention deficit/hyperactivity disorder
ADL	Activities of Daily Living
ADOS	Autism Diagnostic Observation Schedule
AFRO	African Region
AIOS	Arizona Integrative Outcome Scale
ALP	Alkaline phosphatase
ALSWH	Australian Longitudinal Study on Women's Health
ALT	Alanine transferase
AMH	Anti-mullerian hormone
AMRO	Region of the Americas
ANC	Adjunctive naturopathic care
AQLQ	Asthma Quality of Life Questionnaire
AQoL-4D	Assessment of Quality of Life
ARONAH	Australian Register of Naturopaths and Herbalists
ARS	Adequate Relief Scale
ART	Antiretroviral treatment
ASDs	Autism spectrum disorders
ASES-D	Arthritis Specific Self-Efficacy Short Form Scale
ASEX	Arizona Sexual Experience Questionnaire
AST	Aspartate aminotransferase
ATEC	Autism Treatment Evaluation Checklist
AYUSH	Ayurveda, Yoga and Naturopathy, Unani Medicine, Siddhu and Homeopathy
BAI	Beck Anxiety Index
BAQ	Body Awareness Questionnaire
BBS	Berg Balance Scale
BD	Bilirubin direct
BDI	Becks Depression Inventory
BDI-II	Becks Depression Inventory 2nd edition
BDNF	Brain derived neurotrophic factor
BF	Body fat
BFI	Brief Fatigue Index
BFM	Body fat mass
BI	Bilirubin indirect
BL	Baseline
BMI	Body mass index
BNYS	Bachelor of Naturopathy and Yogic Studies
bp	Back pain
BP	Blood pressure
BPI	Brief Pain Inventory
BPI-SF	Brief Pain Inventory – Short Form
BPI-WP	Brief Pain Inventory – Worst Pain
BR	Breathing rate
BRS	Body Responsiveness Questionnaire
BRUMS	Brunel Mood Scale
BSI	Brief Symptom Inventory
BSQ	Bowel Symptoms Questionnaire
BUN	Blood urea nitrogen
C-IBS	Constipation-predominant IBS
CAGB	coronary artery bypass graft
CAINS	Clinical Assessment Interview Negative Symptoms
CAM	Complementary and Alternative Medicine
CANRA	Canadian Alliance of Naturopathic Regulatory Authorities
CAP	Cold abdominal pack
CAR	Cortisol awakening response
CBT	Cognitive behavioural therapy
CCNM	Canadian College of Naturopathic Medicine
CCRYN	Central Council for Research in Yoga & Naturopathy
CD4	CD4+ lymphocyte white blood cell
CD8	CD8+ lymphocyte white blood cell
CD-RISC	Conner-Davidson Resilience Scale
CDR	Clinical Dementia Rating
CFQ	Chalder Fatigue Scale
CFS	Chronic fatigue syndrome
CFU	Colony forming units
CGI	Clinical Global Impression Scale
CGI-S	Clinical Global Impression Scale – Severity
CGI-I	Clinical Global Impression Scale – Improvement
CINV	Chemotherapy-induced nausea and vomiting
CIPN	Chemotherapy-induced peripheral neuropathy
CLS	Conjugated linoleic acid
CK	Creatine kinase
CNME	Council on Naturopathic Medical Education
COMPASS	Computerised Mental Performance Assessment System
CNP	Chronic neck pain
COAT	Comprehensive Arthritis Test

COMT	Catechol-O-methyltransferase
COPD	Chronic Obstructive Pulmonary Disease
COQ10	Coenzyme Q10
Cp	Ceruloplasmin
CPRS	Conners Parent Rating Scale
CPSS	Cohen Perceived Stress Scale
CRP	C-reactive protein
CSIRO	Common-Wealth Scientific and Industrial Research Organisation
CST	Craniosacral therapy
CT	Computed tomography
CVD	Cardiovascular disease
CWS	Cancer Worry Scale
CYRM	Child and Youth Resilience Measure
CZSD	Copper-zinc superoxide dismutase
CV	Conception vessel
D	Day
DA-IBS	Alternating bowel habit IBS
DASS	Depression Anxiety Stress Scale
Db	Double blind
DBP	Diastolic blood pressure
DBRPCT	Double-blind randomized placebo-controlled trial
DD	Depression Detection
DHA	Doxosahexaenoic acid
DHEA	Dehydroepiandrosterone
DMSA	Dimercapto succinic acid
DNA	Deoxyribonucleic acid
Do-P	double product (heart rate X MAP/100)
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5th Edition
DUFA	Double-up food bucks
EBM	Evidence-based medicine
EBP	Evidence-based practice
EC	Enteric coated
eCCS	Erythrocyte CCS
EDTA	Ethylenediaminetetraacetic acid
EGCG	Epigallocatechin-3-gallate
eGFR	Estimated glomerular filtration rate
ELSP	Exercise-based Life Style Modification Program
EMRO	Eastern Mediterranean region
EORTC	European Organisation of Research and Treatment of Cancer
EPA	Eicosapentaenoic acid
EPI	Electrophotonic imaging
EQ-5D	EuroQoL questionnaire
ERDA	Emotional/Rational Disease Acceptance Questionnaire
ERQ	Emotional Regulation Questionnaire
eSOD1	Erythrocyte superoxide dismutase
ESR	Erythrocyte sedimentation rate
ESS	Epworth Sleepiness Scale
ETCO2	End-Tidal Carbon Dioxide
EUC	Enhanced usual care
EURO	European region
FACIT	Functional Assessment of Chronic Illness Therapy
FACT	Functional Assessment of Cancer Therapy
FACT-B/ES	Functional Assessment of Cancer Therapy – Breast and Endocrine System
FACT-C	Functional Assessment of Cancer Therapy – Colorectal
FACT-ES	Functional Assessment of Cancer Therapy – Endocrine System
FACT-G	Functional Assessment of Cancer Therapy – General
FACT-NTX	Functional Assessment of Cancer Therapy – Neurotoxicity
FACT-TAX	Functional Assessment of Cancer Therapy – Taxane
FACT-TOI	Functional Assessment of Cancer Therapy – Taxane Trial Outcome Index
FAS	Food allergy/sensitivity symptoms
FFI	Foot Functional Index
FGID	Functional gastrointestinal disorders
FIQ	Fibromyalgia Impact Questionnaire
FLIC	Functional Living Index for Cancer
FMD	Flow-mediated dilatation
FNMRA	Federation of Naturopathic Medical Regulatory Authorities
FODMAP	fructo-, oligo-, mono-saccharides and polyols
FPG	Fasting plasma glucose
FQ	Fatigue Questionnaire
FRD	Fatigue Reduction Diet
FSH	Follicle stimulating hormone
g	Grams
GAD	Generalized Anxiety Disorder
GAD-7	Generalized Anxiety Disorder – 7 item scale
GAF	Global Assessment of Functioning
Gf	Gluten free
GGT	Gamma-glutamyl transferase
GHC	General health curriculum
GI	Gastrointestinal
GIQLI	Gastrointestinal Quality of Life Index
GIS	Global Improvement Scale
GSDS-II	Groningen Social Disability Scale
GSH	Oral glutathione
HADS	Hospital Anxiety and Depression Scale
HAM-A	Hamilton Anxiety Rating Scale
HAM-D	Hamilton Depression Rating Scale
Hb	Hemoglobin
HbA1C	Blood glycohemoglobin
HBOT	Hyperbaric oxygen treatment
HC	Healthy controls
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Systems
HCT	Hematocrit
HCV	Chronic hepatitis C
HCv	Homocysteine
HCSE	Horse chestnut *(Aesculus hippocastanum)* seed extract
HDL	High density lipoprotein

HETE	Hydroxyeicosatetraenoic acid
HF	Heart failure
HF	High frequency (band 0.15-0.5Hz)
HIT	Headache Impact Test
HIV	Human immunodeficiency virus
HOMA-IR	Homestasis Model Assessment Insulin Resistance
HR	Heart rate
HRV	Heart rate variability
hs-CRP	High sensitivity C-reactive protein
HTA	Health technology assessment
HTN	Hypertension
HV	Healthy volunteers
IADL	Instrumental Activities of Daily Living
IAYT	Integrated approach of yoga therapy
IBD	Inflammatory bowel disease
IBDQ	Inflammatory Bowel Disease Questionnaire
IBS	Inflammatory bowel syndrome
IBS-SSS	IBS-Symptom Severity Scale
ICU	Intensive care unit
ICWP	Integrative cardiac wellness program
IFG	Impaired fasting glucose
IGT	Impaired glucose tolerance
IHGT	Isometric Hand Grip Test
IHME	Institute for Health Metrics and Evaluation
IHN	Inositol hexaniacinate
IHT	Intermittent hypoxic training
IL	Interleukin
IQ	Intelligence quotient
ISI	Insomnia Severity Index
ISQUA	International Society for Quality in Health Care
IYN	Integrated yoga and naturopathy
IYNT	Integrated yoga and naturopathic therapy
JAMA	Journal of the American Medical Association
K-10	Kessler-10 Scale of Psychological Distress
LA	Lipoic acid
LATR	Leucocyte antigen test results
LBM	Lean body mass
LBP	Lower back pain
LcS	Lactobacillus casei strain
LDL	Low-density lipoprotein
LF	Low frequency band (0.05-0.15 Hz)
LF/HF	Ratio of low frequency to high frequency
LFT	Liver function tests
LGBTQ2SIA	Lesbian, gay, bisexual, transgender, transsexual, queer and questioning, two-spirit, intersex, asexual plus people
LH	Luteinizing hormone
LHBT	Lactulose hydrogen breath test
LMT	Lactulose mannitol test
LSEQ	Leeds Sleep Evaluation Questionnaire
M-SACRAH	Modified Score for the Assessment and Quantification of Chronic Rheumatoid Affections of the Hands
MAAS	Mindful Attention Awareness Scale
MADRS	Montgomery-Asberg Depression Rating Scale
MANE	Morrow Assessment of Nausea and Emesis
MANSA	Manchester Quality of Life Scale
MAP	Mean Arterial Pressure (DBP + 1/3 PP)
MARM	Manual Assessment of Respiratory Motion
MASC	Multidimensional Anxiety Scale for Children
MBSR	Mindfulness-based Stress Reduction
MCID	Minimal Clinically Important Difference
MCT	Medium chain triglyceride
MDA	Malondialdehyde
MDD	Major depressive disorder
MDT	Mechanical detection threshold
MENQoL	Menopause Specific Quality of Life Questionnaire
MFI	Multidimensional Fatigue Inventory
Mg	Magnesium
MINI	ICD-DSM Mini International Neuropsychiatric Interview
MMP-9	Matrix metalioproteinase-9
MMSE	Mini-Mental State Exam
MoH	Ministry of Health
MOSES	Monitoring of Side Effects System
MPS	Mental, Physical and Spiritual Wellbeing Scale
MS	Multiple sclerosis
MSAS	Memorial Symptom Assessment Scale
MSK	Musculoskeletal
MSM	Methylsulfonylmethane
Mth	Month
MYMOP	Measure Yourself Medical Outcome Profile
MUFA	Mono-unsaturated fatty acids
n	Number
n3PUFA	Omega 3 polyunsaturated fatty acids
n6PUFA	Omega 6 polyunsaturated fatty acids
n9MUFA	Omega 9 monounsaturated fatty acids
NA	North America
NABH	National Accreditation Board for Hospitals and Healthcare Providers
NABNE	North American Board of Naturopathic Examiners
NAC	N-acetyl cysteine
NAFLD	Non-alcoholic fatty liver disease
NC	Naturopathic care
NCC	Naturopathic community care
NCD	Non-communicable disease
ND	Naturopathic doctor
NDI	Neck Disability Index
NICHE	Novel Interactive Cell-phone technology for Health Enhancement
NIH	National Institute of Health
NMD	Naturopathic Medical Doctor
NN50	The number of interval difference of successive NN intervals greater than 50 ms
np	Neck pain
NP	Naturopathic practitioner

NPI	Neuropsychiatric Inventory
NPQ	Neck Pain Questionnaire
NPS	Neuropathic Pain Scale
NPT	Naturopathic physical therapy
NQ	Nijmegen Questionnaire
NS	Not statistically significant
NSAIDs	Non-steroidal anti-inflammatory drugs
NT proBNP	B-type natriuretic peptide
OCD	Obsessive compulsive disorder
ODI	Oswestry Disability Scale
OGTT	Two-hour post-oral glucose tolerance test
OR	Odds ratio
ORAC	Oxygen radical absorbance capacity
OQ45	Outcome Questionnaire 45
PAID	Problem Areas in Diabetes
PANAS	Positive and Negative Affect Schedule
PASAT	Paced Auditory Serial Addiction Test
PBRN	Practice-Based Research Networks
PCAQ	Perceived Control of Asthma Questionnaire
PCORI	Patient-Centered Research Outcomes
PCOS	Poly-cystic ovary syndrome
PD	Parkinson's disease
PDD-BI	Pervasive Developmental Disorder Behaviour Inventory
PDQ-39	Parkinson Disease Questionnaire 39 Items
PEFR	Peak expiratory flow rate
PG2hr	Plasma glucose two hours
PGI	Patient Global Impression Scale
PGI-I	Patient Global Impression of Improvement
PHQ-9	Patient Health Questionnaire Depression Screener
pNN50	Proportion derived by dividing NN50 by the total number of NN intervals
PNPIC	National Policy on Complementary and Integrative Practices
PNQ	Patient Neurotoxicity Questionnaire
POM	Pain on movement
POMS	Profile of Mood States
PP	Pulse pressure
PPPG	Postprandial plasma glucose
PPT	Pressure pain threshold
PR	Pain at rest
PR	Pulse rate
PRECIS-2	Pragmatic Explanatory Continuum Indicator Analysis
prn	Pro re nata (as needed)
PROMIS	Patient Reported Outcomes Measure Information System
PRT	Progressive resistance training
PSA	Professional Standards Authority
PSQ	Perceived Stress Questionnaire
PSQI	Pittsburg Sleep Quality Index
PSWQ	Penn State Worry Questionnaire
PT	Psychotherapy
PTE	Potentially toxic element
PTQ	Perseverative Thinking Questionnaire
PUCAI	Pediatric Ulcerative Colitis Activity Index
PUFA	Poly-unsaturated fatty acids
QALY	Quality-adjusted life year
QD	Per day
QLI	Quality of Life Index
QODD	Quality of Dying and Death Instrument
QoL	Quality of Life
QSANS	Quick Scale for the Assessment of Negative Symptoms
QSAPS	Quick Scale for the Assessment of Positive Symptoms
RBC	Red blood cell
RBG	Random blood glucose
RCT	Randomized Control Trial
RDA	Recommended daily allowance
RFT	Renal function test
RMDQ	Roland Morris Disability Questionnaire
RMSSD	The square root of the mean of the sum of the squares of differences between adjacent NN intervals
ROM	Range of motion
RPP	Rate pressure product
RRI	Instantaneous Heart Rate, the mean of the intervals between adjacent QRS complexes
RRMS	Relapsing-remitting multiple sclerosis
RTA	Revised Test Anxiety Scale
sAA	Salivary alpha-amylase
SAFTEE	Systematic Assessment for Treatment Emergent Effects
SAMe	S-adenosylmethionine
SANS	Scale for Assessment of Negative Symptoms
SAPS	Scale for Assessment of Positive Symptoms
SAS	Severity of Autism Scale
Sb	Single blind
SBC	Scale of Body Connection
SBL	Pain Perception Scale from the German Pain Questionnaire
SBP	Systolic blood pressure
SC	Standard care
SCB	Substantial clinical benefit
SCCS	Social Cognitive Composite Scale
SCID	Structure Clinical Interview for DSM
SDQ	Strength and Difficulties Questionnaire
SDSCA	Summary of Diabetes Self-Care Activities
SEAR	South East Asian Region
SEBQ	Self-Evaluation of Breathing Questionnaire
SF-12	Short-Form Health Survey – 12 item
SF-36	Short Form Health Survey – 36 item
SFA	Saturated fatty acids
SFVAS	Sexual Function Visual Analogue Scale
SGOT	Serum glutamic-oxaloacetic transaminase
SGPT	Serum glutamic-pyruvic transaminase
SI	Symptomatic interventions
SIBO	Small intestine bacterial overgrowth
sig	Significant
sigA	salivary Immunoglobulin A
SLE	Systemic lupus erythematosus
SNOT	SinuNasal Outcome Test

SoP	Scope of Practice
SPADI	Shoulder Pain and Disability Index
SPN	Sensory peripheral neuropathy
SRNI	Serotonin reuptake inhibitor
SSNT	Southern School of Natural Therapies
SSRI	Selective serotonin reuptake inhibitor
SST	Symptom Severity Scale
STAI	State Trait Anxiety Inventory
STAI-S	State Trait Anxiety Inventory – State
STBI	Severe traumatic brain injury
SUS	Integrated National Health System of Brazil
T&CM	Traditional and complementary medicine
TA	Transaminases
TAS	Test Anxiety Scale
TBI	Traumatic brain injury
TC	Total cholesterol
TCM	Traditional Chinese medicine
TG	Triglycerides
TIBC	Total iron binding capacity
TID	Three times a day
TIDR	Template for Intervention Description and Replication
TNF	Tumor necrosis factor
TNS	Total Neuropathy Score
TOI	Taxane Trial Outcome Index
TOVA	Test of Variables of Attention
TS	Transferrin saturation
TSH	Thyroid stimulating hormone
Tx	Treatment
UC	Usual care
UC	Ulcerative colitis
UCT	Uncontrolled trial
UPDRS	United Parkinson's Disease Rating Scale
USA	United States of America
VAS	Visual Analog Scale
VDT	Vibration Detection Threshold
VSL	Brand of probiotic supplement
WAZ	Weight-for-age Z-score
WBS	Warwick-Edinburgh Mental Well-being Scale
WISC-R	Weschler Intelligence Scale for Children-Revised
WHO	World Health Organization
WHOQoL-BREF	World Health Organization Quality of Life – BREF Questionnaire
Wk	Week
WNF	World Naturopathic Federation
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index
WPR	Western Pacific Region
WSAS	Work and Social Adjustment Scale
YBOCS	Yale-Brown Obsessive Compulsive Scale
YLSP	Yoga-based Lifestyle Modification Program
YRMQ	Yi Ren Medical QiGong
Zn	Zinc
↑	Increase in symptoms
↓	Decrease in symptoms

Appendix IV: Contributors

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Appendix VI: World Naturopathic Federation Publications and Policy Statements

Since its inception, the World Naturopathic Federation (WNF) has produced several publications and policy statements to guide and support the global naturopathic profession. Publications, as of 2021, are listed below with the full documents accessible via the WNF website (www.worldnaturopathicfederation.org/wnf-publications).

Publication title	Year published	Language/s
WNF Report: Impact of Our Rapid Reviews	2021	English Spanish
WNF Naturopathic Educational Program Report	2021	English
WNF Technology Enhanced Education	2021	English
WNF White Paper: Role of Naturopathic Practice within a global Pandemic	2020	English French German Italian Norwegian Portuguese Slovenian Spanish
WNF Naturopathic Journal Report	2020	English
WNF Naturopathic Book Report: A Comprehensive List of Books Written by Naturopaths/Naturopathic Doctors	2020 (v.1 published 2019)	English
WNF Update: Novel Coronavirus disease 2019 – CoV	2020 (v.1 published 2020)	English Spanish
Global Naturopathic Regulation	2019	English
WNF Terminology Document: Defining Naturopathic Terms	2019	English Norwegian
Research Written by Naturopaths/Naturopathic Doctors	2019	English
WNF Response to the Astana Declaration	2019	English
WNF Education and Credentials	2018	English
Naturopathic Books on Philosophy, Principles & Theories	2018 (v.1 published 2016)	English
WNF White Paper: Naturopathic Philosophies, Principles and Theories	2017	English Portuguese Slovenian Spanish
Defining the Global Naturopathic Profession	2017	English Spanish
WNF Strategic Plan 2019 & 2022	2017	English
2016 Naturopathic Numbers Report	2016	English
WNF Naturopathic Roots Report: Findings from the Naturopathic Roots Committee Survey	2016	English
WNF Report: Findings from the 1st World Naturopathic Federation survey	2015	English

Policy statement title	Year published	Language/s
WNF Natural Medicine Policy Statement	2019 (v.1 published 2016)	English Spanish
WNF Guidelines for Professional Naturopathic Organizations	2018	English Spanish
WNF Self-Governance Guidelines for Naturopathic Organizations	2018	English Spanish
WNF Terminology for Professional Formation	2017	English Spanish
WNF Policy on Regulation	2017	English Spanish
WNF Policy Statement on Federations	2016	English Spanish
Naturopath/Naturopathic Doctor Q&A	2016	English

Dr. Iva Lloyd, ND is the current (and first) president of the World Naturopathic Federation and is the international representative of the Canadian Association of Naturopathic Doctors.

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www.worldnaturopathicfederation.org

Naturopathy is a traditional system of medicine originating in Europe and it is part of Traditional and Complementary Medicine (T&CM) in over 108 countries spanning all WHO Regions. Naturopathy/naturopathic medicine is defined by two core philosophies and seven principles and is guided by distinct naturopathic theories. Naturopaths/naturopathic doctors treat patients throughout the span of their life. Naturopathic care focuses on prevention and chronic conditions, but also in the treatment of patients with acute conditions and those in palliative care. Naturopathic practice is complex and multi-modal and incorporates core naturopathic therapies, modalities and practices including applied nutrition, clinical nutrition, herbal medicine, lifestyle modification, mind-body medicine counselling, naturopathic physical medicine, hydrotherapy, and other therapies based on jurisdictional regulations and naturopathic education.

This Health Technology Assessment (HTA) report on naturopathy was compiled to provide an evidence-based summary of naturopathic practice and the safety, economics and effectiveness of naturopathic care. The scope of the HTA was informed by research conducted by the international naturopathic community over the last thirty years encompassing over 2000 peer-reviewed scientific articles of which more than 300 clinical studies involving over 100 different health populations are outlined in this report.

WORLD NATUROPATHIC FEDERATION

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