Original Article

Integrative physiology and traditional naturopathic practice: Results of an international observational study

Amie Steel [a,*], Joshua Z. Goldenberg [a,b], Jason A. Hawrelak [a,c], Hope Foley [a,e], Sophia Gerontakos [a], Joanna E. Harnett [a,d], Janet Schloss [a,e], Rebecca Reid [e]

[a] Australian Research Centre for Complementary and Integrative Medicine, University of Technology Sydney, Sydney, Australia
[b] Helfgott Research Institute, National University of Natural Medicine, Portland, USA
[c] School of Pharmacy and Pharmacology, University of Tasmania, Hobart, Australia
[d] The University of Sydney School of Pharmacy, Faculty of Medicine and Health, Sydney, Australia
[e] Office of Research, Endeavour College of Natural Health, Brisbane, Australia

ARTICLE INFO

ABSTRACT

Background: Naturopathy is one of seven distinct traditional medical systems acknowledged by the World Health Organization. Naturopathic principles and philosophies encourage a focus on multiple body systems during case-taking and the design of treatments. Little is known about whether such teaching translates into practice. This study aimed to characterise naturopathic practice as it relates to the identification of multiple physiological systems in the diagnosis and treatment of patients.

Methods: A cross sectional study was conducted in collaboration with the World Naturopathic Federation. A survey capturing clinical diagnostic and treatment considerations for up to 20 consecutive patients was administered to naturopaths in 14 countries.

Results: Naturopaths ($n = 56$) were mostly female (62.5%), aged between 36 and 45 years (37.5%), in practice for 5–10 years (44.6%), and consulting between 11 and 20 patients per week (35.7%). Participants completed the survey for 851 patient cases. Naturopaths reported a greater number of physiological systems relevant to clinical cases where the patients were working age (18–65 years) (IRR 1.3, $p = .042$), elderly (65 years and over) (IRR 1.4, $p = .046$), or considered by the naturopath to have a chronic health condition (IRR 1.2, $p = .003$). The digestive system was weakly associated with patients based on chronicity of the health complaint ($V = .1149$, $p = .004$), or having a musculoskeletal complaint ($V = .1067$, $p = .002$) autoimmune pathophysiology ($V = .1681$, $p < .001$), and considered relevant in respiratory ($V = .1042$, $p = .002$), endocrine ($V = .1023$, $p = .003$), female reproductive ($V = .1009$, $p = .003$), and integumentary ($V = .1382$, $p < .001$) systems.

Conclusion: Naturopaths across the world adopt an integrative physiological approach to the diagnosis and treatment of chronic and complex health care complaints.

1. Introduction

Naturopathy is a traditional healthcare system based on philosophical principles codified during the 19th and 20th centuries.[1] These principles were drawn from the philosophy and practice of ancient Grecian medicine, European traditional medicine (including both European herbal medicine and Germany's Nature Cure movement) and the Eclectic physicians of the late 19th and early 20th centuries.[1] Naturopathy is a distinct profession that is recognised as one of the major global traditional medical systems by the World Health Organization.[2] Naturopaths are widely consulted by patients in Australia,[3] Europe, and North America.[4]

Two of the key philosophical tenets of naturopathy are an emphasis on *Tolle Causam* (treat the cause) and *Tolle Totum* (treat the whole person).[5] These core concepts have been repeatedly emphasised by both traditional[6] and contemporary[1,5] naturopathic texts. Research exploring naturopathic clinical care often reflects these points of focus. For example, naturopaths often address the gastrointestinal system (specifically intestinal hyperpermeability) in their approach to rheumatoid arthritis.[7] As another example, a randomised, controlled trial of naturopathic care in anxiety utilised

* Corresponding author at: Faculty of Health, University of Technology Sydney, Level 8, Building 10, 235-253 Jones St, Ultimo, NSW, Australia.
  E-mail address: amie.steel@uts.edu.au (A. Steel).

an intervention composed of a multivitamin, breathing exercises, and lifestyle and nutrition counselling, in addition to a herbal medicine that specifically targeted the anxiety.[8]

Health and medical researchers have recently begun to delve more deeply into the interrelationships between physiological systems, such as the gastrointestinal and endocrine systems, within the context of disease occurring in other systems. For instance, research has now found the composition of the gastrointestinal microbiota to influence mood and behaviour,[9] as well as a potential role for gut microbiota-derived bacterial endotoxins and intestinal hyperpermeability in the pathophysiology of depression.[10] Other research has found a putative role of gut microbiota-derived endotoxins in the pathophysiology of endometriosis,[11] type 2 diabetes,[12] and cardiovascular disease.[13] Such studies, and the results of interventional trials,[14,15] suggest that treatments aimed at altering the functionality of one body system, such as the gastrointestinal tract, can have substantial impacts upon other body systems.

Naturopathic texts suggest that clinicians should focus on a number of body systems both when case-taking and when designing treatment.[16] However, there is no known research that has explored how naturopathic practitioners are applying their philosophical tenets and principles within routine clinical care. With this in mind, this study aimed to characterise naturopathic practice as it relates to the identification of multiple physiological systems in the diagnosis and treatment of patients.

2. Methods

2.1. Study design

This study was conducted as a cross sectional study involving a survey design of an international sample.

2.2. Setting

This survey involved naturopathic clinics in 14 countries across the European (Portugal, United Kingdom, Switzerland, Spain), Americas (Canada, United States, Chile, Brazil), Western Pacific (Hong Kong, Australia, New Zealand) and African (South Africa) world regions. The survey was administered through the online software program Survey Gizmo during the period November 2018 to February 2019. In collaboration with the World Naturopathic Federation (WNF), an invitation from the research team was emailed to naturopathic professional associations in each country to forward to their association members for recruitment.

2.3. Participants

Participants were included into the study if they were a member of one of the recognised WNF associations and working in clinical practice as a naturopathic practitioner. Additionally, participants were included if they have been in clinical practice for a minimum five years and have access to a computer and internet in their clinic. Where possible, participants were preferred if they reported an average of 10 or more consultations per week however this was not possible in all countries. Participants were excluded if they identified as naturopath practising within a specialised field of health care (e.g., women's health). Interested participants were provided with a participant information sheet and were required to complete an online consent form and screening instrument to assess their inclusion into the study. A maximum of 20 clinicians were recruited from each country. In countries where less than 20 clinicians agreed to participate, all eligible respondents were included. In countries where more than 20 clinicians expressed

interest, participants were purposively sampled to reflect diversity of characteristics (e.g. clinic location, years in practice). Upon successful inclusion into the study, the research team received an automated email directing them to send the included participant the primary survey link for data collection. Included participants were required to complete the survey for up to 20 consecutive patients with whom they consulted in their clinical practice.

2.4. Data instrument

The survey was designed by the research team in partnership with the WNF to ensure it complied with rigorous survey methods and was applicable to practice in all countries included in this study. The list of treatments and conditions used as a basis for survey items were informed by research reported by the WNF[17–19] and a naturopathic clinical texts used in curriculum internationally.[20] The instrument was tested for face and content validity by representatives of the World Naturopathic Federation (see Supplement 1).

Data was collected directly from the consulting naturopathic practices via the online survey platform Survey Gizmo. Due to the multilingual nature of the study, the participant information sheet, consent form, screening instrument and survey were drafted in English and translated to French, Spanish, and Portuguese by native language individuals. All translated documents were then cross referenced and translated back to English by a different group of bilingual individuals to ensure there was no discrepancies in the study's documents and data collection instruments. The survey items recorded patient demographics, the patient's reason for consultation, interprofessional care, and naturopathic approach and interpretation on the presenting health concern.

2.5. Patient demographics

Participants were required to state the patient's age and sex (i.e., male, female, or other).

2.6. Patient's reason for consultation

This domain requested data collection on the reason for the patient's visit, the type of consultation (initial or follow up), the primary presenting health concern as reported by the patient and the chronicity of the patient's primary health concern (as perceived by the practitioner). Participants were required to report on the patient's primary health concern by selecting one out of 17 health categories (e.g., autoimmune disease, reproductive, cardiovascular) and then select or state the patient's primary health concern or diagnosed condition.

2.7. Naturopathic interpretation of the health concern

Participants were asked to provide their interpretation on the primary health concern and if they considered any of the other body systems to be important in the case management of the presenting concern. This list was replicated from the reasons for the patient's visit domain, however, participants were able to provide data on multiple areas as relevant to the patient health complaint.

Additionally, the survey also requested clarification if a previous patient was missed out of the 20 consecutive patients. If the participants confirmed a missed patient, the participant was requested to state the rationale for not obtaining data collection for that patient.

2.8. Variables

Raw data were exported from Survey Gizmo into Microsoft Excel (2003)[21] for data cleaning. Prior to merging, all non-English

collected data was translated including all open text responses. All reported data was cross checked for consistent and accurate reporting. The research team classified all reported conditions by predetermined categories (e.g., gastrointestinal) to ensure consistency due to varied participant classification. All cleaned raw data was numerically coded and imported into Stata 14.2 (StataCorp LLC)[22] for analysis.

2.9. Statistical analysis

Bivariate analysis was conducted to examine the relationship between the reported patient characteristics and the health systems reported by the naturopathic participants. Additional bivariate analysis was then conducted to identify the relationship between the patients' characteristics and the two most reported health systems as identified by the consulting naturopathic practitioner. The findings of the bivariate analysis were further tested utilising a chi square test with effect size as determined by Cramer's *V*. The effect size was classified as negligible association (.00 and under .10); weak association (.10 and under .20); moderate association (.20 and under .40); relatively strong association (.40 and under .60); strong association (.60 and under .80) and very strong association (.80 and under 1.00), as reported by Rea and Parker (1992).[2]

A backwards stepwise *Poisson* regression model was used to identify patient characteristics most likely associated with the health systems as reported by the naturopath. Additional backwards stepwise regression models were employed to identify the patient's characteristics associated with the two most common specific health systems identified as relevant to the management of the patient's reported primary health concern, the digestive and endocrine systems. Independent variables identified as potential confounders (defined as a *p* value <0.25) as determined by the bivariate analyses conducted were entered into the backwards stepwise regression models, as relevant.

2.10. Ethics approval

Ethics approval for this study was granted by the Human Research Ethics Committee of the Endeavour College of Natural Health (#20181017).

3. Results

Participants (*n* = 56) were based in 14 countries and were more often female (62.5%), aged between 36 and 45 years (37.5%), in practice for 5–10 years (44.6%), and, on average, providing care to between 11 and 20 patients per week (35.7%) (see Table 1). The mean number of reported cases (representing individual patients) per participants was 15.1, equating to 854 patient cases in total.

The majority of the patients described by participants were female (72.6%), working age (81.2%), and visiting the naturopath for a follow up consultation (67.0%) with a chronic health complaint (75.0%) (see Table 2). The chi square test identified a negligible association between the number of systems identified as important in the management of the patient's health and the patient's sex (*V* = 0.1058, *p* = 0.049), age (*V* = 0.1009, *p* = 0.005), and chronicity of the condition (*V* = .1512, *p* < .001). Negligible associations were also identified for presenting musculoskeletal (*V* = .1170, *p* = .019), endocrine (*V* = .1293, *p* = .006), and cancer-related (.1214, *p* = .013) complaints. The association between cotreatment by general practitioner (*V* = .1372, *p* = .003) and specialist doctor (*V* = .1538, *p* < .001), as known by the participant, or by no other health professional (*V* = .1294, *p* = .006) was also negligible. Table 2 also reports the outcomes of the backwards stepwise logistic regression of patient characteristics based on the number of systems identified

Table 1
Participant Characteristics (*n* = 56)

Characteristic	*n* (%)
Country	
Australia	6 (10.7)
Brazil	4 (7.1)
Canada	6 (10.7)
Chile	4 (7.1)
Hong Kong	3 (5.4)
India	7 (12.5)
Nepal	2 (3.6)
New Zealand	3 (5.4)
Portugal	4 (7.1)
South Africa	2 (3.6)
Spain	4 (7.1)
Switzerland	2 (3.6)
United Kingdom	3 (5.4)
United States	6 (10.7)
Gender	
Female	35 (62.5)
Male	21 (37.5)
Age	
26–35 years	11 (19.6)
36–45 years	21 (37.5)
46–55 years	11 (19.6)
56–65 years	11 (19.6)
66 years or more	2 (3.6)
Years in clinical practice	
5–10 years	25 (44.6)
11–15 years	14 (25.0)
16–20 years	5 (8.9)
21–25 years	6 (10.7)
26 years	6 (10.7)
Average number of patients per week	
Less than 10	9 (16.1)
11–20	20 (35.7)
21–30	12 (21.4)
31–40	8 (14.3)
41–50	4 (7.1)
51 or more	3 (5.4)
	Mean (SD; Min, Max)
Average number of responses per participant	15.1 (7.6; 1, 20)

by participants to be relevant to patients. The incidence of a greater number of physiological systems being identified by participants was higher among patients of working age (18–65 years) (IRR 1.3, *p* = .042) or elderly (65 years and over) (IRR 1.4, *p* = .046). Patients also had a higher incidence of a greater number of physiological systems important to their health if participants considered the patient to have a chronic health condition (IRR 1.2, *p* = .003).

Table 3 presents the analysis of patient characteristics based on whether the participant considered the gastrointestinal system or endocrine system to be an important consideration in the management of the patient's health. These two physiological systems were selected as they were identified most frequently by participants. Based on bivariate analysis, the digestive system was weakly associated with patients based on chronicity of their health complaint (*V* = .1149, *p* = .004), or having a musculoskeletal complaint (*V* = .1067, *p* = .002) and was found to have negligible association with the patient presenting with an endocrine complaint (*V* = .0981, *p* = .004). The analysis also indicated a weak association between the participant considering the digestive system important for the patient's case and other systems also being viewed as relevant, including respiratory (*V* = .1042, *p* = .002), endocrine (*V* = .1023, *p* = .003), female reproductive (*V* = .1009, *p* = .003), and integumentary (*V* = .1382, *p* < .001) systems. Autoimmune pathophysiology was also found to have a weak association (*V* = .1681, *p* < .001) with the digestive system in the context of the factors considered important by participants for an individual patient's health

Table 2
Characteristics of Patients Compared with Number of Physiological Systems Considered by the Participants to be Important in Management of the Patient's Health (n = 854)

	All patients (n = 852)	None (n = 36)	One (n = 292)	Two (n = 174)	Three (n = 162)	Four or more (n = 186)	Cramer's V	p	IRR	95% CI	p
Sex (n = 851)											
Female	618 (72.6)	26 (70.3)	198 (67.8)	136 (78.2)	113 (69.8)	145 (78.0)	.1058	.049	–		
Male	233 (27.4)	11 (29.7)	94 (32.2)	38 (21.8)	49 (30.3)	41 (22.0)					
Age category (n = 835)											
Young child (0–4 years)	21 (2.5)	3 (8.3)	10 (3.5)	4 (2.3)	3 (1.9)	1 (0.6)	.1009	.005	Ref	–	–
Child (5–11 years)	21 (2.5)	1 (2.8)	16 (5.6)	2 (1.2)	1 (0.6)	1 (0.6)			.95	.65–1.40	.794
Adolescent (12-17 years)	10 (1.2)	0 (0.0)	6 (2.1)	1 (0.6)	2 (1.3)	1 (0.6)			1.2	.8–2.0	.455
Working age (18–65 years)	678 (81.2)	31 (86.1)	218 (76.0)	143 (83.6)	132 (83.0)	154 (84.6)			1.3	1.0–1.8	.042
Elderly (65 years and older)	105 (12.6)	1 (2.8)	21 (12.3)	21 (12.3)	21 (13.2)	25 (13.7)			1.4	1.0–1.8	.046
Visit (n = 852)											
First	281 (33.0)	11 (29.7)	110 (37.4)	52 (30.2)	44 (27.5)	64 (33.9)	.0812	.229	–		
Follow up	571 (67.0)	26 (70.3)	184 (62.6)	120 (70.0)	116 (72.5)	125 (66.1)					
Chronicity (n = 844)											
Acute	165 (19.5)	8 (22.9)	82 (28.4)	36 (20.7)	21 (13.2)	18 (9.6)	.1512	<.001	Ref	–	–
Chronic	633 (75.0)	26 (74.3)	186 (64.4)	128 (73.6)	129 (81.1)	164 (87.7)			1.2	1.1–1.3	.003
Unsure	46 (5.5)	1 (2.9)	21 (7.3)	10 (5.8)	9 (5.7)	5 (2.7)			1.0	.8–1.3	.767
Primary reason for visit (n = 854)											
Musculoskeletal condition	158 (18.4)	13 (33.3)	56 (19.0)	37 (21.3)	29 (17.8)	23 (12.2)	.1170	.019	.90	.8–1.0	.051
Gastrointestinal condition	104 (12.1)	6 (15.4)	37 (12.6)	23 (13.2)	15 (9.2)	23 (12.2)	.0477	.745	–	–	–
Mental health condition	93 (10.8)	3 (7.7)	38 (12.9)	23 (13.2)	18 (11.0)	11 (5.8)	.0946	.104	–	–	–
Wellness and condition	57 (6.6)	1 (2.6)	27 (9.2)	7 (4.0)	12 (7.4)	10 (5.3)	.0885	.151	–	–	–
Female reproductive condition	51 (5.9)	1 (2.6)	17 (5.8)	6 (3.5)	12 (7.4)	15 (7.9)	.0738	.321	–	–	–
Skin condition	44 (5.1)	3 (7.7)	9 (3.1)	13 (7.5)	9 (5.5)	10 (5.3)	.0774	.273	–	–	–
Respiratory condition	43 (5.0)	0 (0.0)	22 (7.5)	8 (4.6)	5 (3.1)	8 (4.2)	.0930	.115	–	–	–
Fertility condition	43 (5.0)	0 (0.0)	11 (3.7)	12 (6.9)	9 (5.5)	11 (5.8)	.074	.319	–	–	–
Neurological condition	43 (5.0)	1 (2.6)	16 (5.5)	10 (5.8)	5 (3.1)	11 (5.8)	.5024	.670	–	–	–
Endocrine condition	40 (4.7)	0 (0.0)	6 (2.0)	7 (4.0)	14 (8.6)	13 (6.9)	.1293	.006	–	–	–
Cancer-related condition	39 (4.5)	1 (2.6)	13 (4.4)	4 (2.3)	4 (2.5)	17 (9.0)	.1214	.013	–	–	–
Cardiovascular condition	36 (4.2)	2 (5.1)	11 (3.7)	5 (2.9)	4 (2.5)	14 (7.4)	.0908	.132	–	–	–
Weight management	34 (4.0)	2 (5.1)	11 (3.7)	6 (3.5)	6 (3.7)	9 (4.8)	.0275	.957	–	–	–
Autoimmune condition	31 (3.6)	2 (5.1)	7 (2.4)	7 (4.0)	9 (5.5)	6 (3.2)	.0632	.488	–	–	–
Urogenital condition	21 (2.4)	0 (0.0)	7 (2.4)	4 (2.3)	6 (3.7)	4 (2.1)	.0498	.712	–	–	–
Ageing or cognition condition	10 (1.2)	0 (0.0)	3 (1.0)	1 (0.6)	4 (2.5)	2 (1.0)	.0630	.491	–	–	–
Infectious condition	7 (0.8)	0 (0.0)	2 (0.7)	1 (0.6)	2 (1.2)	2 (1.0)	.034	.911	–	–	–
Health care team (n = 854)											
General practitioner	369 (43.2)	14 (40.0)	101 (34.5)	78 (44.8)	81 (47.0)	95 (50.3)	.1372	.003	1.1	1.0–1.2	.020
Specialist doctor	237 (27.8)	9 (25.7)	55 (18.8)	52 (29.9)	54 (33.1)	67 (35.5)	.1538	<.001	1.1	1.0–1.2	.034
Allied health practitioner	106 (12.7)	2 (5.7)	31 (10.6)	26 (14.9)	23 (14.1)	24 (12.7)	.0669	.431	–	–	–
Other complementary medicine practitioner	93 (10.9)	3 (8.6)	23 (7.9)	20 (11.5)	23 (14.1)	24 (12.7)	.0797	.246	–	–	–
No other health practitioner	282 (33.0)	14 (40.0)	119 (40.6)	53 (30.5)	43 (26.4)	53 (28.0)	.1294	.006	–	–	–
Specific systems considered											
Gastrointestinal system	348 (40.8)	0 (0.0)	48 (16.4)	63 (36.2)	99 (60.7)	138 (73.0)	.4912	<.001			
Endocrine system	203 (23.8)	0 (0.0)	21 (7.2)	41 (23.6)	46 (28.2)	95 (50.3)	.3909	<.001			
Musculoskeletal system	151 (17.7)	0 (0.0)	21 (7.2)	26 (14.9)	36 (22.1)	68 (36.0)	.2989	<.001			
Female reproductive system	134 (15.7)	0 (0.0)	11 (3.8)	30 (17.2)	29 (17.8)	64 (33.9)	.3175	<.001			
Mental health	132 (15.5)	0 (0.0)	29 (9.9)	30 (17.2)	27 (16.6)	46 (24.3)	.1722	<.001			
Cardiovascular system	108 (12.7)	0 (0.0)	12 (4.1)	11 (6.3)	27 (16.6)	58 (30.7)	.3223	<.001			
Integumentary system	79 (9.3)	0 (0.0)	9 (3.1)	6 (3.5)	15 (9.2)	49 (25.9)	.3182	<.001			
Autoimmune condition	74 (8.7)	0 (0.0)	3 (1.0)	5 (2.9)	18 (11.0)	48 (25.4)	.3428	<.001			
Respiratory system	71 (7.3)	0 (0.0)	7 (2.4)	5 (2.9)	15 (9.2)	44 (23.3)	.3044	<.001			
Ageing and cognition	69 (8.1)	0 (0.0)	9 (3.1)	10 (5.8)	13 (8.0)	37 (19.6)	.2368	<.001			
Neurological system	67 (14.3)	0 (0.0)	13 (4.4)	12 (6.9)	15 (9.2)	27 (14.3)	.1498	.001			
Urogenital system	41 (4.8)	0 (0.0)	4 (1.4)	1 (0.6)	12 (7.4)	24 (12.7)	.2277	<.001			
Cancer	29 (3.4)	0 (0.0)	7 (2.4)	3 (1.7)	0 (0.0)	19 (10.1)	.2021	<.001			

Table 3

Characteristics of Patients that Participants have Considered the Digestive System (n = 348) or Endocrine System (n = 204) as an Additional Factor to Consider in Management of the Patient's Health

	All participants (n = 854)	Digestive system (n = 348)	V	p	IRR[a]	95%CI	p	Endocrine system (n = 203)	V	p	IRR	95%CI	p
Sex													
Female	618 (72.6)	145 (28.7)	.0401	.243	–	–	–	160 (80.0)	.0904	.009	–	–	–
Male	233 (27.4)	86 (25.1)			–	–	–	40 (20.0)			–	–	–
Age category													
Young child (0–4 years)	21 (2.5)	10 (3.0)	.0531	.673	–	–	–	2 (1.0)	.1022	.069	–	–	–
Child (5–11 years)	21 (2.5)	8 (2.4)			–	–	–	1 (0.5)			–	–	–
Adolescent (12-17 years)	10 (1.2)	2 (0.6)			–	–	–	2 (1.0)			–	–	–
Working age (18–65 years)	678 (81.2)	275 (81.9)			–	–	–	170 (87.2)			–	–	–
Elderly (65 years and older)	1 (2.8)	41 (12.2)			–	–	–	20 (10.3)			–	–	–
Visit													
First	281 (33.0)	104 (33.1)	.0519	.130	–	–	–	70 (34.7)	.0185	.590	–	–	–
Follow up	571 (67.0)	241 (66.9)			–	–	–	132 (65.4)			–	–	–
Chronicity					–	–	–				–	–	–
Acute	165 (19.5)	50 (14.5)	.1149	.004	–	–	–	26 (13.1)	.0900	.033	–	–	–
Chronic	633 (75.0)	279 (80.9)			–	–	–	160 (80.8)			–	–	–
Unsure	46 (5.5)	16 (4.6)			–	–	–	12 (6.1)			–	–	–
Primary reason for visit													
Gastrointestinal condition	104 (12.1)	35 (10.1)	.0538	.116	–	–	–	21 (10.3)	.0313	.360	–	–	–
Respiratory condition	43 (5.0)	18 (5.2)	.0052	.879	–	–	–	3 (1.5)	.0908	.008	0.3	0.1–0.9	.035
Cardiovascular condition	36 (4.2)	14 (4.0)	.0079	.816	–	–	–	15 (7.4)	.0882	.010	4.0	2.0–8.3	<.001
Endocrine condition	40 (4.7)	25 (7.2)	.0981	.004	2.3	1.1–4.5	.020	16 (7.9)	.0845	.014	–	–	–
Female reproductive condition	51 (5.9)	20 (5.8)	.0079	.818	–	–	–	25 (12.3)	.1495	<.001	3.7	2.0–6.9	<.001
Musculoskeletal condition	158 (18.4)	47 (13.5)	.1067	.002	–	–	–	21 (10.3)	.1173	.001	–	–	–
Skin condition	44 (5.1)	26 (7.5)	.0870	.011	2.1	1.1–5.0	.022	8 (3.9)	.0306	.371	–	–	–
Urogenital condition	21 (2.4)	6 (1.7)	.0394	.250	–	–	–	2 (1.0)	.0531	.120	–	–	–
Autoimmune condition	31 (3.6)	19 (5.5)	.0811	.018	2.3	1.0–5.0	.035	9 (4.4)	.0240	.483	–	–	–
Cancer-related condition	39 (4.5)	21 (6.0)	.0583	.088	–	–	–	11 (5.4)	.0228	.505	–	–	–
Fertility condition	43 (5.0)	13 (3.7)	.0493	.150	–	–	–	21 (10.3)	.1356	<.001	3.3	1.7–6.5	.001
Ageing or cognition condition	10 (1.2)	5 (1.5)	.0205	.549	–	–	–	0 (0.0)	.0608	.076	–	–	–
Infectious condition	7 (0.8)	3 (0.9)	.0039	.909	–	–	–	2 (1.0)	.0103	.764	–	–	–
Wellness and prevention	57 (6.6)	25 (7.2)	.0169	.621	–	–	–	9 (4.4)	.0501	.143	–	–	
Weight management	34 (4.0)	16 (4.6)	.0261	.445	–	–	–	12 (5.9)	.0551	.107	–	–	–
Mental health condition	93 (10.8)	41 (11.8)	.0237	.488	–	–	–	15 (7.4)	.0628	.067	–	–	–
Neurological condition	43 (5.0)	14 (4.0)	.0384	.262	–	–	–	13 (6.4)	.0350	.307	–	–	–
Health care team													
General practitioner	369 (43.2)	167 (48.0)	.0800	.019	–	–	–	88 (43.4)	.0016	.963	–	–	–
Specialist doctor	237 (27.8)	118 (33.9)	.1140	.001	1.5	1.1–2.1	.016	65 (32.0)	.0532	.120	–	–	–
Allied health practitioner	106 (12.7)	50 (14.4)	.0492	.151	–	–	–	26 (12.8)	.0067	.845	–	–	–
Other complementary medicine practitioner	93 (10.9)	40 (11.5)	.0161	.638	–	–	–	26 (12.8)	.0344	.315	–	–	–
No other health practitioner	282 (33.0)	104 (29.9)	.0553	.106	–	–	–	60 (29.6)	.0411	.229	–	–	–
Specific additional systems considered													
Gastrointestinal system	348 (40.8)							101 (49.8)	.1023	.003	1.5	1.1–2.2	.019
Respiratory system	71 (7.3)	41 (11.8)	.1042	.002	–	–	–	18 (8.9)	.0112	.744	–	–	–
Cardiovascular system	108 (12.7)	57 (16.4)	.0931	.006	1.7	1.1–2.6	.015	31 (15.3)	.0441	.198	–	–	–
Endocrine system	203 (23.8)	101 (29.0)	.1023	.003	–	–	–						
Female reproductive system	134 (15.7)	70 (20.1)	.1009	.003	1.6	1.1–2.4	.020	60 (29.6)	.2129	<.001	2.9	1.9–4.4	<.001
Musculoskeletal system	151 (17.7)	67 (19.3)	.0342	.318	–	–	–	34 (16.8)	.0137	.690	–	–	–
Integumentary system	79 (9.3)	49 (14.1)	.1382	<.001	2.0	1.2–3.3	.008	28 (13.8)	.0875	.011	–	–	–
Urogenital system	41 (4.8)	22 (6.3)	.0590	.085	–	–	–	14 (6.9)	.0547	.110	–	–	–
Autoimmune condition	74 (8.7)	50 (14.4)	.1681	<.001	2.7	1.6–4.6	<.001	29 (14.3)	.1116	.001	2.4	1.4–4.2	.002
Cancer	29 (3.4)	15 (4.3)	.0419	.221	–	–	–	9 (4.4)	.0320	.350	–	–	–
Ageing and cognition	69 (8.1)	30 (8.6)	.0165	.630	–	–	–	16 (7.9)	.0041	.906	–	–	–
Wellness and prevention	245 (28.7)	115 (33.0)	.0799	.020	1.5	1.1–2.0	.016	48 (23.7)	.0623	.069	0.7	0.5–1.0	.042
Mental health	132 (15.5)	51 (14.7)	.0184	.591	–	–	–	19 (9.4)	.0942	.006	0.4	0.3–0.7	.002
Neurological system	67 (14.3)	25 (7.2)	.204	.551	–	–	–	17 (8.4)	.0110	.748	–	–	–

[a] IRR – Incident Rate Ratio.

management. Consideration of both the cardiovascular system (V = .0931, p = .006) and general wellness and prevention (V = .0799, p = .020) were identified through the analysis as having a negligible association with practitioners considering the digestive system as an important factor in the management of the patient's health. Co-treatment by a specialist doctor (V = .1140, p = .001) or a general practitioner (V = .0800, p = .019) had a weak and negligible association respectively.

Regression analysis found a greater incidence of the digestive system being identified as important for an individual patient's health if the patient visited the participant for management of an endocrine (Incident Rate Ratio [IRR] 2.3, p = .020), skin (IRR 2.1, p = .022) or autoimmune (IRR 2.3, p = .035) condition. Patients for whom participants considered the digestive system important also had a higher incidence of co-treatment by a specialist doctor (IRR 1.5, p = .016). A greater incidence of participants listing the cardiovascular (IRR 1.7, p = .015), female reproductive (IRR 1.6, p = .020), and integumentary (IRR 2.0, p = .008) systems were also seen among patients for whom the digestive system was considered to be relevant to an individual patient's care. Participant consideration of an autoimmune condition (IRR 2.7, p < .001) or wellness and prevention (IRR 1.5, p = .016) as additional factors relevant to a patient's health were also seen more often among patients for whom participants reported the digestive system as important.

The analysis related to the endocrine system as a factor considered important in individual patient care plans is also presented in Table 3. The chi square test found negligible associations between the identification of the endocrine system as relevant and the patient's sex (V = .0904, p = .009) and chronicity of the patient's complaint (V = .0900, p = .033). The bivariate analysis indicated weak associations between the endocrine system being identified as important and the patient's type of presenting complaint, such as female reproductive (V = .1495, p < .001), musculoskeletal (V = .1173, p < .001) and fertility-related conditions (V = .1356, p < .001). Negligible associations were found with other types of presenting complaints including respiratory (V = .908, p = .008), cardiovascular (V = .0882, p = .010), and endocrine (V = .0845, p = .014) conditions. Alongside the endocrine system, associations with other systems considered by participants to be important in the management of their patient's health were identified. A moderate association was found for the female reproductive system (V = .2129, p < .001), a weak association was reported for the gastrointestinal (V = .1023, p = .003) system and autoimmune conditions (V = .1116, p = .001) and the association with the integumentary system (V = .0875, p = .011) and mental health (V = .0942, p = .006) was negligible.

Backwards stepwise regression analysis indicated an increased incidence of cardiovascular (IRR 4.0, p < .001), female reproductive (IRR 3.7, p < .001) and fertility-related conditions (IRR 3.3, p = .001) and a reduced incidence of respiratory conditions (IRR 0.3, p = .035) as primary reasons for the visit, among patient for whom participants identified the endocrine system as important to the management of the patient's health. Participants also indicated the female reproductive system (IRR 2.9, p < .001), autoimmune conditions (IRR 2.4, p = .002) and the gastrointestinal system (IRR 1.5, p = .019) with greater incidence among patients for whom the endocrine system was described as an important additional consideration. In these patients, there was a lower incidence of wellness and prevention (IRR 0.7, p = .042) and mental health (IRR 0.4, p = .002) being listed as relevant to the patient's condition.

4. Discussion

This paper presents the first international examination of the characteristics of patients accessing non-specialised naturopathic care. Our analysis identifies a number of key findings that warrant careful consideration. Firstly, more than one physiological system was considered in patient management regardless of the primary reason for the visit in many cases, a pattern that aligns with both traditional and contemporary naturopathic teachings and philosophies.[16] The multisystem approach of naturopaths indicates a holistic approach is referring not only to mind-body-spirit but also suggests the application of an integrated approach to physiology and pathophysiology informs clinical management of patients. This has been documented in contemporary naturopathic texts which highlight the importance of considering multiple organ systems and key systems such as the digestive and nervous systems, regardless of the disease presentation.[16] Furthermore, naturopathic medicine emphasises holism - defined as recognising all aspects of the human that are influenced by internal, external and social factors including psychological, spiritual, functional (physiology) and structural components of the individual in clinical care.[19] Evidence of the multi-system approach of naturopaths can be found in the writings of many 19th and 20th century naturopaths such as Lorenz Gleich (1850), J.E. Cummins (1920), Edward Earle Purinton (1920s) and Benedict Lust (1905).[18] Holistic assessment is considered part of the naturopathic case-taking model where the inherent strengths and weaknesses of physiological systems are assessed on a case-by-case basis alongside mental, social and spiritual factors.[16] The multi-system naturopathic approach reflects the core naturopathic principle–treat the cause (*Tolle Causam*) rather than treating the disease.[23] Holism is the foundation of a core principle of naturopathic philosophy—treat the whole person (*Tolle Totum*).[17]

Endocrine and digestive function – or dysfunction – were commonly reported by this cohort of naturopaths as an important underlying factor to be considered in the treatment of their patients' primary complaint. Nutrition and digestion are essential components of naturopathic clinical practice. Traditional naturopathic texts describe "nutrition as a fundamental core of wellness and naturopathic philosophy"[24] and this continues into the present day with modern textbooks noting the common naturopathic view that many diseases "colloquially all come down to the gut".[20] Interestingly, emerging contemporary research appears to support this view, specifically as it relates to the association between many of the conditions linked to the digestive system in our study (e.g. autoimmune, skin, and endocrine conditions). For example, it is presumed that in genetically susceptible individuals, there may be a strong gastrointestinal microbiome association with autoimmune conditions such as primary sclerosing cholangitis, primary biliary cirrhosis, and autoimmune hepatitis.[25] Regarding skin conditions, a growing body of evidence is now supporting clinical improvement in dermatological illness by using gastrointestinally modifying interventions such as prebiotics, probiotics, and synbiotics.[26] Pertaining to endocrine disorders, autoimmune linked gastroenterological and endocrine conditions have long been known to be associated (e.g., coeliac disease and autoimmune thyroiditis).[27] In addition, a collection of research is building using diverse study designs that suggest an association between environmental toxicants, specifically endocrine disruptors, and various endocrine disorders including diabetes.[28] The gastrointestinal system plays an important role in such toxin degradation and excretion, primarily via the liver and microbiome-based degradation enzymes,[28] further supporting the rationale of considering the gastrointestinal system in one's clinical approach to some endocrine disorders.

The endocrine system was also associated with some specific conditions in our analysis. Particularly noteworthy is the link between the female reproductive system and the endocrine system. One striking example of this link is that of polycystic ovarian syndrome (PCOS), one of the most common endocrine disorders in

women.[29] Naturopathic intervention has been found to improve PCOS outcomes via a combination of regulating sex hormones (evidenced in a reduction in androgens), a decrease in body weight and a regulation of cortisol via the hypothalamic-pituitary-adrenal (HPA) axis[29] an example of the integrative physiology approach of naturopathic intervention. Endometriosis, affecting an estimated 10–15% of women of reproductive age,[30] is another common female reproductive condition where naturopathic intervention focuses on hormone regulation (as opposed to conventional treatments which have a predominant focus on hormone replacement).[31] Endometriosis is said to be an oestrogen-dependent disease and is a good example of an 'inter-systems' condition where multiple body systems are involved in the pathophysiology including the HPA and hypothalamic-pituitary-ovarian (HPO) axes, inflammatory pathways and the immune system.[30] While hormone levels may be modified with herbal medicine or other naturopathic interventions,[32] these treatments may also upregulate metabolic pathways involved in hormone clearance, such as with oestrogen which is predominantly metabolised by the liver and eventually eliminated through bile and faeces.[33] Therefore, a naturopathic approach to treating female reproductive disorders would include restoring or facilitating gastrointestinal and digestive function, with an emphasis on dietary intake. The trends in association between endocrine, female reproductive and digestive systems in our analysis reflect naturopathic philosophies and approach including naturopathic biological and physiological understanding of the body. Interestingly, mental health conditions only showed a trending association in our analysis, despite women with PCOS reported to be over three and five times more likely to experience depression and anxiety respectively.[34]

This study is not without limitations. While this is the only study to date positing naturopathic clinical practice within an integrative physiology paradigm, the findings may not be generalisable to the aggregate international naturopathic profession. However, this study does provide preliminary findings that require larger and more focused studies. The diversity of naturopathic practice in specific geographical areas is likely to be impacted by cultural, social and regulatory influences and this requires consideration within the context of these national and regional settings. The target population was limited to members of professional associations and therefore biases may have been introduced by excluding naturopaths who possibly have lower standards of professional practice, particularly in countries were regulatory mechanisms ensuring consistency in training and practice are absent. As such the generalisability of this data to the overall international naturopathic profession is not clear. Due to the pilot nature of this study, it was decided to have a smaller representation of naturopathic practitioners from a greater number of countries. However, as the Agency for Health Research and Quality describes, a level of representativeness can be afforded by practice-based research conducted in a minimum of five locations and with at least 15 participating clinicians.[35] Additional bias may have been introduced by the self-reported nature of the survey data that required naturopaths to report on patient characteristics. The accuracy of this data was not independently confirmed by the researchers. Regardless of these limitations, this study provides an important contribution to the understanding of naturopathic practice at an international level.

In conclusion, naturopaths across the world adopt an integrative physiological approach to the diagnosis and treatment strategies of chronic and complex health care complaints. Among multiple body systems reported to be implicated, the digestive system is the most common. This approach of naturopaths is supported by the growing body of scientific literature implicating aberrations in gastrointestinal health and its microbial composition with extraintestinal conditions.

Appendix A. Supplementary data

The survey questionnaire can be found in the online version, at http://dx.doi.org/10.1016/j.imr.2020.100424.

References

1. Zeff J, Snider P, Myers S, DeGrandpre Z. A hierarchy of healing: the therapeutic order, a unifying theory of Naturopathic medicine. In: *Textbook of natural medicine*. 4th ed. St Louis: Elsevier; 2012:18–33.
2. WH Organization. *Benchmarks for training in traditional*; 2010.
3. McIntyre E, Adams J, Foley H, Harnett J, Leach MJ, Reid R, et al. Consultations with naturopaths and Western herbalists: prevalence of use and characteristics of users in Australia. *J Altern Complement Med* 2019;25:181–8.
4. Litchy AP. Naturopathic physicians: holistic primary care and integrative medicine specialists. *J Diet Suppl* 2011;8:369–77.
5. Broderick K. Naturopathic philosophy. In: L H, editor. *Naturopathic medicine vol.*. 2nd ed. Chatswood: Elsevier; 2019:3–16.
6. Benjamin H. *Everybody's guide to nature cure*. Read Books Ltd; 2013.
7. Dunn JM, Wilkinson JM. Naturopathic management of rheumatoid arthritis. *Mod Rheumatol* 2005;15:87–90.
8. Cooley K, Szczurko O, Perri D, Mills EJ, Bernhardt B, Zhou Q, et al. Naturopathic care for anxiety: a randomized controlled trial ISRCTN78958974. *PLoS One* 2009;4:e6628.
9. Kelly JR, Borre Y, O'Brien C, Patterson E, El Aidy S, Dean J, et al. Transferring the blues: depression-associated gut microbiota induces neurobehavioural changes in the rat. *J Psychiatr Res* 2016;82:109–18.
10. Stevens BR, Goel R, Seungbum K, Richards EM, Holbert RC, Pepine CJ, et al. Increased human intestinal barrier permeability plasma biomarkers zonulin and FABP2 correlated with plasma LPS and altered gut microbiome in anxiety or depression. *Gut* 2018;67:1555–7.
11. Khan KN, Fujishita A, Hiraki K, Kitajima M, Nakashima M, Fushiki S, et al. Bacterial contamination hypothesis: a new concept in endometriosis. *Reprod Med Biol* 2018;17:125–33.
12. Cani PD, Amar J, Iglesias MA, Poggi M, Knauf C, Bastelica D, et al. Metabolic endotoxemia initiates obesity and insulin resistance. *Diabetes* 2007;56:1761–72.
13. Horseman A, Surani MS, Bowman D, Endotoxin J. Toll-like receptor-4, and atherosclerotic heart disease. *Curr Cardiol Rev* 2017;13:86–93.
14. Schmidt K, Cowen PJ, Harmer CJ, Tzortzis G, Errington S, Burnet PW. Prebiotic intake reduces the waking cortisol response and alters emotional bias in healthy volunteers. *Psychopharmacology* 2015;232:1793–801.
15. Lohner S, Jakobik V, Mihályi K, Soldi S, Vasileidas S, Theis S, et al. Inulin-type fructan supplementation of 3-to 6-year-old children is associated with higher fecal bifidobacterium concentrations and fewer febrile episodes requiring medical attention. *J Nutr* 2018;148:1300–8.
16. Connolly G. Naturopathic case taking. In: Sarris JaW J, editor. *Clinical naturopathy*. 2nd ed. Sydney: Churchill Livingston Elsevier; 2014:6–12.
17. World Naturopathic Federation. *The World Naturopathic Federation Roots Report – findings from the naturopathic roots committee survey*. World Naturopathic Federation; 2016. http://worldnaturopathicfederation.org/wnf-publications/. Accessed 7th January 2020.

18. World Naturopathic Federation. *White paper on naturopathic philosophies, principles and theories*. World Naturopathic Federation; 2017. http://worldnaturopathicfederation.org/wnf-publications/. Accessed 7th January 2020.

19. World Naturopathic Federation. *Defining naturopathic terms*; 2019. http://worldnaturopathicfederation.org/wp-content/uploads/2019/08/WNF_Terminology_Document_final-Aug-2019.pdf. Accessed 7th January 2020.

20. Wardle J, Sarris J. *Clinical naturopathy: an evidence-based guide to practice*. Sydney, Australia: Elsevier Health Sciences; 2014.

21. *Excel for Office 365 [computer program]*; 2003.

22. *Stata Statistical Software: Release 14.2 [computer program]*. College Station, TX: StataCorp LLC; 2015.

23. Seaton K. Naturopathic philosophy. In: Hechtman L, ed. *Clinical naturopathic medicine*. vol. 1. Sydney: Churchill Livingston; 2012:2–13.

24. Cayleff SE. *Nature's path: a history of naturopathic healing in America*. JHU Press; 2016.

25. Marchesi JR, Adams DH, Fava F, Hermes GD, Hirschfield GM, Hold G, et al. The gut microbiota and host health: a new clinical frontier. *Gut* 2016;65:330–9.

26. Notay M, Foolad N, Vaughn AR, Sivamani RK. Probiotics, prebiotics, and synbiotics for the treatment and prevention of adult dermatological diseases. *Am J Clin Dermatol* 2017;18:721–32.

27. Freeman HJ. Endocrine manifestations in celiac disease. *World J Gastroenterol* 2016;22:8472.

28. Velmurugan G, Ramprasath T, Gilles M, Swaminathan K, Ramasamy S. Gut microbiota, endocrine-disrupting chemicals, and the diabetes epidemic. *Trends Endocrinol Metabol* 2017;28:612–25.

29. Ratnakumari ME, Manavalan N, Sathyanath D, Ayda YR, Reka K. Study to evaluate the changes in polycystic ovarian morphology after naturopathic and yogic interventions. *Int J Yoga* 2018;11:139.

30. Hartmann G, McEwen B. The potential of herbal medicine'in the management of endometriosis. *J Aust Tradition-Med Soc* 2018;24:146.

31. Peiris AN, Chaljub E, Medlock D. Endometriosis. *J Am Med Assoc* 2018;320.

32. Bina F, Soleymani S, Toliat T, Hajimahmoodi M, Tabarrai M, Abdollahi M, et al. Plant-derived medicines for treatment of endometriosis: a comprehensive review of molecular mechanisms. *Pharmacol Res* 2019;139:76–90.

33. Tortora GJ, Derrickson BH. *Principles of anatomy and physiology*. John Wiley & Sons; 2018.

34. Cooney LG, Dokras A. Depression and anxiety in polycystic ovary syndrome: etiology and treatment. *Curr Psychiatr Rep* 2017;19:83.

35. Agency for Health Care Research and Quality. *Practice-based research networks: research in everyday practice*. U.S. Department of Health & Human Services; 2017. https://pbrn.ahrq.gov/. Accessed December 22, 2017.