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Prevalence and profile of New Zealand osteopaths treating people experiencing headaches and migraines

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Abstract

Objectives: To describe the prevalence and profile of NZ osteopaths treating people experiencing headaches and migraines. This study is the first to describe this practice.

Background: Manual and manipulative therapy interventions are commonly sought by individuals experiencing headaches or migraines. Evidence supports the use of manual therapy as part of the management of headache and migraine

disorders. Osteopaths are health professionals who provide care for individuals experiencing headaches and migraines. However, there is a lack of data concerning the profile of osteopaths treating these conditions, in addition to their diagnostic and management strategies.

Methods: The Osteopathy Research Connect-New Zealand (ORC-NZ), a practice-based research network for the New Zealand osteopathy profession, was established, and recruitment occurred between August to December 2018.

Results: Two hundred and seventy-seven respondents provided responses to the headache and migraine items on the ORC-NZ practice questionnaire. Of these respondents, 235 (84.8 %) indicated treating headaches often, and 107 (38.6 %) indicated treating migraines often. Osteopaths who reported often treating patients with migraines and headaches were more likely to report clinically supervising associates and be co-located with a general practitioner. In terms of management, they tend to use HVLA, are likely to treat TMJ in the case of migraines, and the thoracic spine for patients with headaches. Further, NZ osteopaths frequently refer patients with migraines and/or headaches to other practitioners.

Conclusions: NZ osteopaths treat patients with migraines and/or headaches and frequently refer them to other practitioners. NZ osteopaths are aware of the inter-professional approach required for this patient population.

Keywords: allied health; health workforce; musculoskeletal; public health

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Introduction

Headache disorders, including migraines, tension-type headaches (TTH) and cluster headaches are collectively categorised as primary headaches according to the *International Classification of Headache Disorders* (ICHD-3) [1]. This classification represents 98 % of all reported headaches globally [2]. The Global Burden of Disease Risk Factor Study [3] emphasises the significant impact of migraine and headache disorders, ranking them second and third respectively of 369 conditions, in terms of years lived with disability (YLD). Primary headaches have most impact between the ages of 35–45 years, with

migraine affecting approximately 1.04 billion individuals, making it the leading cause of disability in people under 50 years of age [4]. TTH also contributes to the global burden, affecting around 1.89 billion people [5]. Various comorbidities encompassing neurological, cardiovascular, and metabolic disorders, as well as chronic pain disorders like fibromyalgia, low back or neck pain, and other musculoskeletal disorders, are commonly associated with primary headaches [6, 7].

Migraine constitutes a neurological disorder, representing a frequently debilitating primary headache condition [8] and, with respect to sex, there is more than double female-to-male prevalence, suggestive of hormonal influences [8] amongst other causative factors. There are two classifications of migraine disorders: migraine with aura which presents with transient focal neurological symptoms usually preceded or accompanied by headache; and, migraine without aura characterised by headache symptoms including, but not limited to, vomiting and photophobia [1]. Several features of migraine indicate altered autonomic function in the central nervous system [9], and pathways posited to be involved, include the trigeminovascular pathway conveying nociceptive information to the meninges, central brain and cortex during the headache phase [10], and the possible role of the cervical nerves [6].

TTH can be episodic or chronic in nature, and commonly lacks any underlying medical cause [1, 7]. Although the exact mechanisms of TTH are not known, it is suggested central pain mechanisms play a key role in chronic TTH, whereas peripheral pain mechanisms are active in episodic TTH [1]. People with TTH can present with pressure pain hyperalgesia [11, 12], which may be explained by the activation of peripheral and central nociceptive pathways [12]. Peri-cranial tenderness is usually present and often detected during manual palpation assessment of TTH and migraine patients [11, 13].

Cervicogenic headaches are categorised as the less common secondary headache type with a prevalence of 1–4 % among those who experience headaches [1]. Cervicogenic headaches are thought to be related to the anatomical structures of the upper cervical spine supplied by C1-C3 spinal nerves causing neck pain and accompanying occipital, frontal and temporal referral [14]. It is common for patients to present with cervical symptoms and TTH concurrently [7], and migraine also commonly presents with neck pain [13]. Patients with TTH may also exhibit associated neck pain, limited cervical range of motion, cervical motor control disturbances and cervical spine sensitivity [15, 16]. There is evidence suggesting manipulative treatment to the cervical and thoracic spine can reduce headache pain [17, 18].

The temporomandibular joint (TMJ) is another area of anatomical significance with temporomandibular disorder

(TMD) a common occurrence in primary headache patients, the prevalence of which increases if both migraine and TTH are concurrent [19, 20]. The greater the number of TMD symptoms the more likely the occurrence of a headache [21], although it is debated whether headaches occur secondary to TMD [22]. Studies suggest treatment of TMD and headache simultaneously has more significant clinical effect [23].

Due to common under- and mis-diagnosis, headache sufferers habitually access solutions external to the medical profession [24, 25]. Approximately half of individuals with headaches or migraine are recommended to self-manage their condition despite having access to high-quality resources [25]. According to Ahmed [24], approximately 45 % of those with headache/migraine should be managed by primary care, 3–4 % in primary care with additional training, and 1 % by consultants. A comprehensive case history and physical examination support effective management of primary headache presentations with non-pharmacological modalities [26]. Manual therapy, exercise and lifestyle advice for example, all of which are used by osteopaths, can constitute integral components in the management of migraine [27], TTH [28] and cervicogenic headache [17, 18]. Research suggests people with headaches commonly present to osteopaths, and osteopathic manipulative treatment (OMT) and manual therapy may be effective in their management [29, 30]. As primary healthcare professionals employing multimodal management and referral strategies [31], osteopaths are well-placed to contribute to enhancing patient outcomes and overall patient well-being. The aim of the study is to explore the characteristics of osteopaths who report often treating patients experiencing headache and migraine disorders, using data from a nationally representative osteopathy workforce survey conducted in New Zealand (NZ).

Materials and methods

This study is a secondary analysis of data obtained from a practice-based research network (PBRN) established for the NZ osteopathy profession [32]. Ethical approval for this study (#ETH19-3,435) was granted by the University of Technology Sydney. All osteopaths involved in the PBRN consented to participate.

Participants

The Osteopathy Research Connect-New Zealand (ORC-NZ), a PBRN for the NZ osteopathy profession, was established in 2018. Recruitment for the PBRN occurred between August to

December 2018. A total of 277 osteopaths completed the PBRN baseline questionnaire, representing 48.7 % of the profession at the time of data collection.

Questionnaire

The practice questionnaire consisted of items that were specifically designed for the ORC-NZ project. Participants were asked to provide information on various practitioner, practice, and clinical management characteristics. In terms of practitioner characteristics, participants identified their gender, age, qualifications, and years of experience in practice. Regarding practice characteristics, participants reported the number of patient care hours, the average number of patients seen in a week, the presence of other healthcare professionals at their workplace, and referrals to/from other healthcare professionals. The questionnaire also delved into patient management, with participants indicating the frequency of treating different regions of the body, the frequency of using specific manual therapy techniques and adjunctive therapies, and the management of particular patient groups.

Outcome variable and exposure variables

The outcome variable for this study was the frequency of treating patients with migraines or headaches. Participants indicated the frequency of treating these complaints on a 4-point scale: never, rarely, sometimes, and often. The first three options were grouped as ‘not often’ while ‘often’ was retained as the other binary outcome. The exposure variables in this study encompassed information related to the previously described practice characteristics, utilising either continuous or binary (yes/no) responses.

Statistical analyses

Relationships between individual practice characteristics and the treating patients with migraines or headaches were evaluated using inferential statistics. Independent measures t-tests were used for continuous variables, and chi-square tests with a continuity correction were used for analysing binary responses. For the multivariate binary logistic regression model, variables with a significance level of $p < 0.20$ were selected. Backward elimination was utilised to identify the key predictors of osteopaths who ‘often’ treating patients with migraines or headaches. Adjusted odds ratios (OR) with 95 % confidence intervals

(CI) and p-values were computed from this regression modelling. Statistical significance was set at $p < 0.05$, and inferential statistical analyses were carried out using JASP (version 0.18), while regression modelling was performed using SPSS (version 24 for Mac).

Results

Two hundred and seventy-seven ($n=277$) respondents provided responses to the headache and migraine items on the ORC-NZ practice questionnaire. Of these respondents, 235 (84.8 %) indicated treating headaches *often*, and 107 (38.6 %) indicated treating migraines *often*. The descriptive statistics for the participants are described by group in Table 1. New Zealand osteopaths who report *often* treating patients with migraines (OR 2.41) and headaches (OR 8.66) were more likely to report clinically supervising associates compared to colleagues who do *not often* treat patients with migraines and headaches.

New Zealand osteopaths who report *often* treating patients with migraines were more likely to be co-located with a general practitioner (OR 3.22) than osteopaths who *not often* treat this complaint. With respect to sending referrals to other health professionals, NZ osteopaths who report *often* treating patients with migraines were more likely to send referrals to specialist medical practitioners (OR 1.81),

Table 1: Demographic characteristics of New Zealand osteopaths who report ‘often’ treating migraines and headaches.

	Migraine (n=107)	p-Value	Headache (n=235)	p-Value
Gender				
Male	55 (51.4 %)		105 (44.7 %)	
Female	52 (48.5 %)		129 (54.9 %)	
Other	0		1 (0.4 %)	
Age, years				
Mean ($\pm$ SD)	45.4 ($\pm$ 11.7)	0.98	45.6 ($\pm$ 11.8)	0.54
Years in clinical practice				
Mean ($\pm$ SD)	14.9 ($\pm$ 9.6)	0.75	15.5 ($\pm$ 10.4)	0.29
Patient care hours per week				
Mean ($\pm$ SD)	28.7 ($\pm$ 11.5)	0.14	27.9 ($\pm$ 10.8)	0.77
Patient visits per week				
Mean ($\pm$ SD)	34.1 ($\pm$ 22.6)	0.37	37.9 ($\pm$ 21.0)	0.13
Professional roles				
Clinical supervision (students)	10 (9.3 %)	0.75	20 (8.5 %)	0.83
Clinical supervision (associates)	23 (21.5 %)	0.02 ^a	41 (17.5 %)	0.01 ^b
Volunteer	19 (17.7 %)	0.92	43 (18.3 %)	0.80

^aunadjusted odds ratio 2.41, 95 %CI[1.03, 5.64]; ^b unadjusted odds ratio 8.66, 95 %CI[1.16–64.81].

exercise physiologists (OR 2.80), naturopaths (OR 1.64) and nutritionists (OR 2.05) compared with osteopaths who do *not* often treat patients with migraines ($p < 0.05$) (Table 2). New Zealand osteopaths who report *often* treating patients with migraines were more likely to receive referrals from exercise physiologists (OR 5.24), psychologists (OR 2.05) and

Table 2: Practice characteristics of New Zealand osteopaths who report ‘often’ treating patients with migraines or headaches.

	Migraine (n=107)			Headache (n=235)		
	‘Often’	p-Value	Or [95 % CI]	‘Often’	p-Value	Or [95 % CI]
Location						
More than one practice location	35 (32.7 %)	0.81	–	77 (32.7 %)	0.50	–
Urban practice	99 (92.5 %)	0.05	–	207 (88.1 %)	0.66	–
Co-located with other health professionals (‘yes’)						
Osteopath	65 (60.7 %)	0.09	–	130 (55.3 %)	0.52	–
General practitioner	13 (12.1 %)	0.01	3.22 [1.24, 8.35]	15 (6.4 %)	0.20	–
Specialist medical practitioner	3 (2.8 %)	0.32	–	4 (1.7 %)	0.76	–
Podiatrist	9 (8.4 %)	0.30	–	15 (6.4 %)	0.85	–
Physiotherapist	16 (14.9 %)	0.63	–	32 (13.6 %)	0.91	–
Exercise physiologist	4 (3.7 %)	0.01	14.8 [0.79, 278.1]	4 (1.7 %)	0.39	–
Occupational therapist	1 (0.9 %)	0.57	–	4 (1.7 %)	0.39	–
Psychologist	17 (15.8 %)	0.32	–	33 (14.0 %)	0.43	–
Massage therapist	36 (33.6 %)	0.90	–	77 (32.8 %)	0.71	–
Acupuncturist	26 (24.2 %)	0.61	–	61 (26.0 %)	0.97	–
Naturopath	12 (11.2 %)	0.67	–	26 (11.1 %)	0.15	–
Dietician	5 (4.67 %)	0.02	8.28 [0.95, 71.9]	6 (2.6 %)	0.30	–
Nutritionist	8 (7.4 %)	0.89	–	16 (6.8 %)	0.53	–
Chiropractor	5 (4.7 %)	0.63	–	9 (3.8 %)	0.77	–
Send referrals to other health professionals (‘yes’)						
Osteopath	64 (59.8 %)	0.60	–	147 (62.3 %)	0.51	–
General practitioner	93 (86.9 %)	0.52	–	208 (88.5 %)	0.94	–
Specialist medical practitioner	87 (81.3 %)	0.04	1.81 [1.00, 3.26]	177 (75.3 %)	0.59	–
Podiatrist	44 (41.1 %)	0.63	–	90 (38.3 %)	0.40	–
Physiotherapist	45 (42.0 %)	0.41	–	104 (44.3 %)	0.49	–
Exercise physiologist	13 (12.1 %)	0.02	2.80 [1.12, 7.00]	20 (8.5 %)	0.17	–
Occupational therapist	13 (12.1 %)	0.21	–	22 (9.4 %)	0.97	–
Psychologist	34 (31.7 %)	0.91	–	77 (32.8 %)	0.25	–
Massage therapist	71 (66.3 %)	0.44	–	149 (63.4 %)	0.91	–
Acupuncturist	79 (73.8 %)	0.16	–	161 (68.5 %)	0.71	–
Naturopath	52 (48.5 %)	0.04	1.64 [1.00, 2.69]	96 (40.9 %)	0.80	–
Dietician	7 (6.54 %)	0.60	–	19 (8.1 %)	0.45	–
Nutritionist	29 (27.1 %)	0.01	2.05 [1.23, 3.74]	48 (20.4 %)	0.57	–
Chiropractor	6 (5.6 %)	0.25	–	15 (6.3 %)	0.02	0.34 [0.13–0.89]
Receive referrals to other health professionals (‘yes’)						
Osteopath	82 (76.6 %)	0.42	–	176 (74.9 %)	0.43	–
General practitioner	94 (91.3 %)	0.84	–	210 (89.4 %)	0.02	2.63 [1.15, 5.97]
Specialist medical practitioner	39 (36.4 %)	0.22	–	76 (32.3 %)	0.86	–
Podiatrist	21 (19.6 %)	0.86	–	45 (19.1 %)	0.99	–
Physiotherapist	48 (44.8 %)	0.82	–	105 (44.7 %)	0.74	–
Exercise physiologist	12 (11.2 %)	<0.01	5.24 [1.64, 16.71]	15 (6.4 %)	0.31	–
Occupational therapist	14 (13.0 %)	0.06	–	23 (9.8 %)	0.39	–
Psychologist	23 (21.4 %)	0.02	2.05 [1.06, 3.95]	40 (17.0 %)	0.10	–
Massage therapist	88 (82.2 %)	<0.01	2.39 [1.33, 4.32]	177 (75.3 %)	<0.01	2.52 [1.28, 4.96]
Acupuncturist	62 (57.9 %)	0.05	1.62 [0.99, 2.64]	121 (51.5 %)	0.50	–
Naturopath	46 (42.9 %)	0.07	–	88 (37.4 %)	0.42	–
Dietician	4 (3.7 %)	0.50	–	7 (3.0 %)	0.83	–
Nutritionist	12 (11.2 %)	0.07	–	19 (8.1 %)	0.45	–
Chiropractor	10 (9.3 %)	0.38	–	18 (7.7 %)	0.90	–
Diagnostic imaging						

Table 2: (continued)

	Migraine (n=107)			Headache (n=235)		
	'Often'	p-Value	Or [95 % CI]	'Often'	p-Value	Or [95 % CI]
Referral for imaging ('often')	31 (28.9 %)	0.11	–	56 (23.8 %)	0.10	–
Investigation of unknown pathologies	75 (70.0 %)	0.12	–	178 (75.7 %)	0.55	–
Investigation of suspected diagnosis	95 (88.7 %)	0.87	–	211 (89.8 %)	0.43	–
Investigation of potential fractures	92 (85.9 %)	0.35	–	195 (83.0 %)	0.66	–
Rule out risk factors prior to treatment	52 (48.5 %)	0.01	1.82 [1.11, 2.99]	91 (38.7 %)	0.42	–
General screening of the spine	8 (7.4 %)	0.82	–	19 (8.0 %)	0.84	–
Patient assessment ('yes')						
Orthopaedic testing	104 (97.1 %)	0.74	–	227 (96.6 %)	0.73	–
Clinical assessment algorithm	30 (28.0 %)	0.51	–	69 (29.4 %)	0.41	–
Neurological testing	105 (98.1 %)	0.05	–	223 (94.9 %)	0.93	–
Screening questionnaire	97 (90.6 %)	0.52	–	207 (88.1 %)	0.28	–
Cranial nerve testing	78 (72.8 %)	0.12	–	156 (66.4 %)	0.34	–

massage therapists (OR 2.39) compared with osteopaths who do *not often* treat patients with migraines ($p < 0.05$) (Table 2). For headaches, NZ osteopaths who report *often* treating patients with this complaint were more likely to report receiving referrals from general practitioners (OR 2.63) and massage therapists (OR 2.52), compared with osteopaths who treat this complaint on a *not often* basis (Table 2). With respect to the use of diagnostic imaging, NZ osteopaths who report *often* treating patients with migraines were more likely to refer for diagnostic imaging to rule out risk factors prior to treatment compared with osteopaths who do *not often* treat patients with migraines (OR 1.82) (Table 2).

New Zealand osteopaths who report *often* treating patients with migraines were more likely to report *often* discussing occupational health and safety with patients, compared with osteopaths who do *not often* treat patients with migraines (OR 1.64) (Table 3). For patients with headaches, New Zealand osteopaths who report *often* treating patients with this condition were more likely to discuss stress (OR 2.39), medication and nutrition (OR 2.89) with patients, compared with osteopaths who treat headache patients on a *not often* basis (Table 3). New Zealand osteopaths who report *often* treating patients with migraines and headaches were more like to report *often* treating a wide range of conditions compared with osteopaths who do *not often* treat migraines and headaches (Table 3). A similar finding was also observed for New Zealand osteopaths who report *often* treating patients with migraines and headaches with respect to *often* treating a range of patient groups (Table 3).

New Zealand osteopaths who report *often* treating patients with migraines were less likely to send referrals to a specialist medical practitioner (aOR 0.02) or naturopath (aOR 0.04) compared with osteopaths who do *not often* treat patients with migraines (Table 4). From a clinical examination perspective,

New Zealand osteopaths who report *often* treating patients with migraines were less likely to use neurological testing (aOR 0.06) compared with osteopaths who do *not often* treat patients with migraines. With respect to patient care, New Zealand osteopaths who report *often* treating patients with migraines were more likely to treat temporomandibular complaints (aOR 6.40) and use high-velocity low amplitude manipulation techniques, (aOR 3.33), compared with osteopaths who do *not often* treat patients with migraines (Table 4).

New Zealand osteopaths who report *often* treating patients with headaches were more likely to treat thoracic spine complaints (aOR 5.31) and use high-velocity low amplitude manipulation techniques (aOR 3.33), compared with osteopaths who do *not often* treat patients with headaches (Table 5). With respect to specific patient groups, NZ osteopaths who report *often* treating patients with headaches were more likely to report *often* treating patients up to 3 years of age (aOR 10.38) and patients experiencing chronic pain (aOR 3.20), compared with osteopaths who do *not often* treat patients with headaches (Table 5).

With respect to sending referrals to other health professionals, New Zealand osteopaths who report *often* treating patients with migraines were more likely to send referrals to specialist medical practitioners (OR 1.81), exercise physiologists (OR 2.80), naturopaths (OR 1.64) and nutritionists (OR 2.05) compared with osteopaths who do *not often* treat patients with migraines ($p < 0.05$) (Table 2). New Zealand osteopaths who report *often* treating patients with migraines were more likely to receive referrals from exercise physiologists (OR 5.24), psychologists (OR 2.05) and massage therapists (OR 2.39) compared with osteopaths who do *not often* treat patients with migraines ($p < 0.05$) (Table 2). For headaches, New Zealand osteopaths who report *often* treating patients with this complaint were more likely to

Table 3: Clinical management characteristics of New Zealand osteopaths who report ‘often’ treating patients with migraines and headaches.

	Migraine (n=107)			Headache (n=235)		
	‘Often’	p-Value	Or [95 % CI]	‘Often’	p-Value	Or [95 % CI]
Discuss with patients (‘often’)						
Diet	46 (42.9 %)	0.55	–	99 (42.1 %)	0.29	–
Smoking, alcohol and drug use	17 (15.8 %)	0.32	–	32 (13.6 %)	0.76	–
Physical activity	93 (86.9 %)	0.44	–	200 (85.1 %)	0.77	–
Occupational health & safety	52 (48.5 %)	0.04	1.64 [1.00, 2.69]	101 (43.0 %)	0.15	–
Pain counselling	26 (24.2 %)	0.22	–	48 (20.4 %)	0.88	–
Stress	65 (60.7 %)	0.06	–	134 (57.0 %)	0.01	2.39 [1.21, 4.72]
Nutritional supplements	29 (27.1 %)	0.65	–	66 (28.1 %)	0.03	2.89 [1.09, 7.67]
Medication	45 (42.0 %)	0.08	–	90 (38.3 %)	0.04	2.28 [1.04, 4.98]
Patient presentations (‘often’)						
Neck pain	107 (100.0 %)	0.07	–	235 (100 %)	<0.001	69.08 [3.74, 1,275.08]
Thoracic pain	100 (93.4 %)	0.05	2.34 [0.97, 5.65]	218 (92.8 %)	<0.001	6.41 [2.85, 14.41]
Low back pain	106 (99.0 %)	0.18	–	231 (98.3 %)	0.04	4.44 [0.96, 20.61]
Hip musculoskeletal pain	92 (85.9 %)	<0.01	4.84 [2.59, 9.03]	169 (71.9 %)	<0.001	3.41 [1.74, 6.70]
Knee musculoskeletal pain	68 (63.5 %)	<0.01	2.55 [1.55, 4.20]	117 (49.8 %)	0.80	–
Ankle musculoskeletal pain	58 (54.2 %)	<0.01	3.19 [1.91, 5.30]	91 (38.7 %)	0.34	–
Foot musculoskeletal pain	44 (41.1 %)	<0.01	2.79 [1.63, 4.78]	72 (30.6 %)	0.03	2.65 [1.07, 6.57]
Shoulder musculoskeletal pain	97 (90.6 %)	0.01	3.28 [1.57, 6.86]	196 (83.4 %)	0.01	2.51 [1.21, 5.20]
Elbow musculoskeletal pain	39 (36.4 %)	<0.01	3.32 [1.86, 5.93]	60 (25.3 %)	0.02	3.26 [1.12, 9.51]
Wrist musculoskeletal pain	33 (30.8 %)	<0.01	4.01 [2.10, 7.67]	47 (20.0 %)	0.05	3.25 [0.96, 10.98]
Hand musculoskeletal pain	26 (24.2 %)	<0.01	5.74 [2.57, 12.82]	33 (14.0 %)	0.01	3.27 [0.75, 14.17]
Postural disorders	71 (66.3 %)	<0.01	2.62 [1.58, 4.33]	132 (56.2 %)	<0.001	3.20 [1.56, 6.57]
Degenerative spine conditions	64 (59.8 %)	<0.01	2.40 [1.46, 3.94]	120 (51.1 %)	<0.001	3.82 [1.75, 8.35]
Headache disorders	106 (99.0 %)	<0.01	33.69 [4.55, 249.10]	106 (45.1 %)	<0.001	33.7 [4.56, 240.01]
Spine health maintenance	74 (69.1 %)	<0.01	4.81 [2.85, 8.11]	120 (51.1 %)	<0.001	4.44 [1.97, 9.98]
Chronic or persistent pain	69 (64.4 %)	<0.01	2.65 [1.61, 4.38]	130 (55.3 %)	<0.001	5.26 [2.34, 11.85]
Tendinopathies	52 (48.5 %)	<0.01	4.41 [2.55, 7.62]	76 (32.3 %)	0.02	2.87 [1.16, 7.10]
Temporomandibular joint disorders	27 (25.2 %)	<0.01	6.03 [2.71, 14.44]	36 (15.3 %)	0.00	15.55 [0.94, 258.39]
Non-musculoskeletal disorders	27 (25.2 %)	<0.01	3.03 [1.56, 5.90]	43 (18.3 %)	0.00	9.18 [1.23, 68.61]
Patient subgroups (treat ‘often’)						
Up to 3 years of age	41 (38.3 %)	<0.01	2.48 [1.44, 4.27]	73 (31.1 %)	<0.001	9.01 [2.12, 38.3]
4 to 18 years of age	52 (48.5 %)	<0.01	2.97 [1.77, 5.15]	85 (36.2 %)	0.03	2.41 [1.07, 5.44]
Over 65 years of age	80 (74.7 %)	0.05	1.70 [0.99, 2.90]	167 (71.1 %)	0.00	2.46 [1.26, 4.79]
Maori people	22 (20.5 %)	0.03	2.05 [1.05, 4.01]	38 (16.2 %)	0.13	–
Pregnancy	46 (42.9 %)	<0.01	3.01 [1.76, 5.15]	76 (32.3 %)	0.00	4.54 [1.56, 13.18]
Non-English speaking	9 (8.4 %)	0.02	3.81 [1.14, 12.70]	13 (5.5 %)	0.12	–
Sport injuries	72 (67.2 %)	<0.01	3.01 [1.81, 4.99]	125 (53.2 %)	0.07	–
Worker injury	82 (76.6 %)	<0.01	2.35 [1.36, 4.04]	160 (68.1 %)	0.02	2.13 [1.10, 4.15]
Traffic injury	37 (34.5 %)	0.01	2.03 [1.18, 3.51]	69 (29.4 %)	0.00	5.40 [1.61, 18.07]
Post-surgery	21 (19.6 %)	0.02	2.19 [1.10, 4.39]	36 (15.3 %)	0.06	–
Accident compensation commission	96 (89.7 %)	0.35	–	209 (88.4 %)	0.06	–
Manual therapy (use ‘often’)						
Counterstrain	32 (29.9 %)	0.15	–	62 (26.4 %)	0.31	–
Muscle energy technique	68 (63.5 %)	0.37	–	146 (62.1 %)	0.14	–
High-velocity, low-amplitude manipulation	75 (70.0 %)	0.01	1.94 [1.16, 3.23]	145 (61.7 %)	0.40	–
Joint manipulation	67 (62.6 %)	0.01	1.79 [1.09, 2.94]	130 (55.3 %)	0.23	–
Soft tissue technique	94 (87.8 %)	0.63	–	205 (87.2 %)	0.49	–
Myofascial release	71 (66.3 %)	0.08	–	145 (61.7 %)	0.15	–
Visceral techniques	34 (31.7 %)	0.01	2.08 [1.18, 3.66]	56 (23.8 %)	0.74	–
Lymphatic pump	15 (14.0 %)	0.03	2.35 [1.03, 5.34]	26 (11.1 %)	0.02	10.8 [0.64, 179.9]
Autonomic balancing	24 (22.4 %)	0.39	–	50 (21.3 %)	0.16	–
Biodynamics	23 (21.4 %)	0.20	–	47 (20 %)	0.04	3.25 [0.96, 10.98]
Functional technique	56 (52.3 %)	0.04	1.64 [1.01, 2.68]	106 (45.1 %)	0.79	–
Balanced ligamentous tension	53 (49.5 %)	0.60	–	113 (48.1 %)	0.96	–
Chapman’s reflexes	6 (5.6 %)	0.20	–	9 (3.8 %)	0.78	–

Table 3: (continued)

	Migraine (n=107)			Headache (n=235)		
	'Often'	p-Value	Or [95 % CI]	'Often'	p-Value	Or [95 % CI]
Trigger point therapy	36 (33.6 %)	0.20	–	76 (32.3 %)	0.02	2.87 [1.16, 7.10]
Osteopathy in the cranial field	59 (55.1 %)	0.16	–	124 (52.8 %)	0.02	2.23 [1.12, 4.46]
Facilitated positional release	28 (26.1 %)	0.70	–	62 (26.4 %)	0.18	–
Dry needling	8 (7.4 %)	0.14	–	13 (5.5 %)	0.39	–
Exercise prescription	87 (81.3 %)	0.40	–	189 (80.4 %)	0.09	–
Shockwave therapy	21 (1.8 %)	0.07	–	2 (0.9 %)	0.55	–
Ultrasound	1 (0.9 %)	0.20	–	1 (0.4 %)	0.67	–
TENS	5 (4.6 %)	0.07	–	7 (3.0 %)	0.26	–
Instrument soft-tissue	1 (0.9 %)	0.70	–	1 (0.4 %)	0.17	–
Sport taping	12 (11.2 %)	0.60	–	22 (9.4 %)	0.33	–
Breathing	28 (26.2 %)	0.40	–	60 (25.5 %)	0.04	2.54 [0.05, 6.75]

Table 4: Statistically significant variables and their associated odds ratios for New Zealand osteopaths who *often* treat patients with headaches.

	95 % confidence interval			
	Odds ratio (ORa)	Lower	Upper	p-Value
Treat patients with thoracic spine complaints (often)	5.31	1.89	14.89	0.002
Treat patients for spine health maintenance (often)	3.42	1.38	8.45	0.008
Treat patients with chronic pain (often)	3.20	1.28	7.98	0.013
Treat patients with migraines (often)	22.58	2.92	174.42	0.003
Treat patients up to 3 years of age (often)	10.38	2.20	53.40	0.008
Use trigger point therapy (often)	3.72	1.26	11.03	0.017

report receiving referrals from general practitioners (OR 2.63) and massage therapists (OR 2.52), compared with osteopaths who treat this complaint on a *not often* basis (Table 2). With respect to the use of diagnostic imaging, New Zealand osteopaths who report *often* treating patients with migraines were more likely to refer for diagnostic imaging to rule out risk factors prior to treatment compared with osteopaths who do *not often* treat patients with migraines.

Discussion

This study is the first to describe the practice characteristics of NZ osteopaths who report *often* treating patients presenting with migraines and headaches. The data suggests that headaches are *often* treated by NZ osteopaths with a small percentage of practitioners treating migraines *often*.

Table 5: Statistically significant variables and their associated odds ratios for New Zealand osteopaths who *often* treat patients with migraines.

	95 % confidence interval			
	Odds ratio (ORa)	Lower	Upper	p-Value
Work with general practitioners (yes)	0.07	0.012	0.38	0.002
Work with dietitians (yes)	0.02	0.001	0.62	0.025
Send referrals to specialist medical practitioners (yes)	0.35	0.15	0.82	0.015
Send referrals to naturopaths (yes)	0.04	0.50	0.25	0.038
Use neurological testing (yes)	0.06	0.01	0.35	0.002
Use diagnostic imaging for investigation of unknown pathologies (yes)	5.95	2.57	13.76	<0.001
Treat hip complaints (often)	3.74	1.67	8.38	0.001
Treat headaches (often)	43.34	4.20	447.02	0.001
Treat spinal health maintenance or prevention (often)	3.42	1.74	6.70	<0.01
Treat temporomandibular joint complaints (often)	6.40	2.13	19.25	0.001
Treat sports-related injuries (often)	2.08	1.04	4.17	0.040
Use high velocity, low amplitude manipulation (often)	3.33	1.55	7.14	0.002

Through a nationally representative sample of the NZ osteopathy profession, the current work identified several characteristics associated with *often* treating patients experiencing these two complaints.

Headache disorders

With respect to specific patient groups our findings suggest osteopaths who report *often* treating patients with headaches

are significantly more likely to *often* treat patients with chronic pain and younger patients up to three years of age, compared with osteopaths who *not often* treat these patient groups. The association between treating patients with headache and increased likelihood of treating patients with chronic pain may be explained by the potential chronicity for both tension and cervicogenic headaches [11, 33]. *Often* treating patients under three years of age was also a significant predictor of *often* treating headaches. Cervicogenic or TTH have been reported in older paediatric and adolescent populations [34], but have not been reported in the under three years of age population, so it is likely the association observed in the current work reflects the manual therapy treatment approach used for these patient populations. Descriptions of osteopathy practice suggest osteopaths who treat patients under the age of three years will use manual therapy approaches such as Osteopathy in the Cranial Field (OCF) [35], for example. The use of OCF by osteopaths for the management of headaches has been described [36], albeit there is limited evidence as to its effectiveness [37]. Future research could explore the treatment approaches used by NZ osteopaths, particularly those osteopaths who manage patients under three, to ascertain whether their treatment approach is relatively consistent regardless of the population being treated.

Regarding other complaints and treatment techniques of choice, NZ osteopaths who report *often* treating patients with headaches were more likely to report *often* treating thoracic spine musculoskeletal complaints and *often* use trigger point therapy. The use of manual therapy applied to the thoracic spine (particularly HVLA manipulation) is supported by clinical practice guidelines for people with chronic neck pain and headache [38]. The application of manual therapy to other biomechanically-related areas of the body is an approach commonly used by osteopaths and it may be NZ osteopaths who report *often* treating headache disorders are also treating the thoracic spine as part of their management. Another significant predictor of NZ osteopaths *often* treating headache disorders was often using trigger point therapy. Patients with headaches, especially TTH, present with both active and latent myofascial trigger points [39, 40]. The use of manual therapy applied to trigger points is consistent with the literature. Further, manual therapy targeting myofascial trigger points is suggested as a non-pharmacologic strategy for the treatment of headache [26]. It would be of value to explore the technique approaches NZ osteopaths use to treat trigger points and their clinical decision-making for patients with headaches when choosing techniques and their application.

Migraine disorders

New Zealand osteopaths who report *often* treating patients with migraines, from a clinical examination and diagnostic perspective, were less likely to use neurological testing and more likely to refer for diagnostic imaging to rule out risk factors prior to treatment, compared with osteopaths who do *not often* treat patients with migraines. Migraine assessment guidelines suggest the case history and physical examination (especially neurological examination) are adequate for the diagnosis of migraines, with neuroimaging only considered to exclude red flags [26]. It may be NZ osteopaths are managing migraine disorders where there is already a diagnosis made by another health professional, and/or migraine disorder patients are not presenting with symptoms necessitating a neurological examination. Participants in the ORC-NZ survey were also asked to identify if they used cranial nerve testing in practice, an examination more likely to be used for migraine disorders compared with other neurological system examinations. No significant association between using cranial nerve examination and *often* treating migraines was observed in the current work. This outcome suggests that regardless of the frequency with which NZ osteopaths are treating migraine disorders, they are using cranial nerve testing. However, such an assertion requires additional research to understand how osteopaths approach the examination of patients presenting with migraine disorders. Routine neuroimaging as a diagnostic tool for migraine and/or headache is not necessary [41] and recommended only when a secondary headache disorder is suspected [42]. Secondary headaches are more likely to occur in migraine particular populations such as older adults [26, 42]. How NZ osteopaths are using diagnostic imaging in their clinical reasoning and management of migraines requires further exploration to understand if their approach is consistent with best practice migraine care. Future qualitative research may help unpick the knowledge of NZ osteopaths about the role of imaging and diagnosis of migraines more broadly.

New Zealand osteopaths who report *often* treating patients with migraine disorders are more likely to treat TMJ disorders and use HVLA spinal manipulation techniques. Potential relationships between TMJ disorders and migraine have been described in the literature at the anatomic, neurologic and emotional levels [19–22]. Additionally, patients with TMJ disorders are reported as a higher risk of developing migraines [23]. The association of TMJ symptoms and migraine can also be explained by the concept of nociceptive pain, where the augmented central nervous system pain and sensory processing and altered pain modulation play prominent roles in producing multifocal pain,

predominantly in chronic conditions [43]. As part of the management of migraine disorders, NZ osteopaths may be working to influence the anatomic and neurologic relationship between the TMJ and migraine through manual therapy applied to the TMJ [44, 45]. Evidence for osteopathy care for TMJ disorders is limited but positive with respect to reductions in TMJ pain and disability [44, 45]. However, there is no research addressing osteopathy care of the TMJ and its influence on migraine outcomes could present an avenue for future research. With regard to spinal manipulation, evidence suggests using this therapeutic approach may reduce migraine days and pain intensity [46]. It is not clear from the data in the current work whether the cervical, thoracic and/or lumbar spine are being addressed by NZ osteopaths when managing migraine disorders. However, as discussed above, it may be that the cervical and thoracic spine are areas where spinal manipulation is most commonly applied in order to influence the reported anatomic and neurologic relationships [47]. Again, how NZ osteopaths are using spinal manipulation in migraine care would be of value to understand whether this is a key manual therapy intervention or used as part of a multimodal care approach as described in the work by Cerritelli, Ginevri [27].

Limitations and future research

Cross-sectional surveys are susceptible to recall [48] and social desirability [49] biases and these may impact on the results. Further, the strong association observed between often treating migraine disorders and often treating headache disorders suggests either these conditions are common presentations in NZ osteopathy practices, or respondents did not differentiate between these complaints. Large 95 % confidence intervals were also observed for several of the significant predictor variables likely due to the sample size. Although these confidence intervals were large, they do provide an indication as to how NZ osteopaths may approach the management of migraine and headache disorders.

Conclusions

This work is the first to describe the characteristics of NZ osteopaths who offer care for people with headaches and migraines. Data from the PBRN suggests headaches are a relatively common presentation to NZ osteopaths, with migraines being less so. The current work suggests manual therapy approaches are being utilised in the management of these conditions. Manual therapy approaches include the use of spinal manipulation to the thoracic spine, as well as

treating other body areas such as the TMJ. Although there is some literature supporting the effectiveness of osteopathy care for headaches and migraines, the current research points to other areas that would be of value to explore, the role osteopaths play in managing these conditions, their clinical reasoning for examination, technique selection, and use of diagnostic imaging. This additional data would further inform the role of osteopaths in multidisciplinary care of headaches and migraines to reduce or alleviate the burden of these conditions.

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