Editorial: Spring 2023: Canadian NDs and Environmental Leadership

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As I write this letter on a late February afternoon in Ottawa, we've just been told that the Rideau canal skateway, the world's largest outdoor skating rink, will not open this year at all, the first time since 1970. As one of the coldest national capitals anywhere in the world, this has been a wake-up call for people of the city and our various levels of government. In a very odd moment of dissonance, however, I noticed that our annual Winterlude festival was sponsored by a natural gas producer, with the argument that its product does not actually contribute to climate change.

While the non-opening of an open-air skating rink (no matter how large) during a winter festival may seem like a minor event in our warming global environment, there is no doubt that our winters across Canada are becoming shorter, wetter, and with more severe storms of various kinds. Coming on the heels of 3 years of the COVID-19 pandemic, it's also clear that these extreme weather events have hit our vulnerable populations much harder and are having long-lasting health effects on people who have challenges accessing safe housing, clean air and water, and adequate food.

As mentioned in my letter last spring, I've just completed a 9-month healthcare leadership mobilization course with the Canadian Association of Physicians for the Environment (CAPE). During our monthly training sessions, I've heard many compelling stories from healthcare providers about how weather events brought on by climate change are affecting our patients and communities and how we can mobilize for effective lobbying in areas such as clean electricity standards, pollution protection, and universal rights to healthy air and water. We also discussed the increases we are all seeing of pollen- and vector-borne diseases (such as Lyme disease) and respiratory issues caused by wildfires and deteriorating air quality in cities post-pandemic. Our group then reflected on the importance of building teams to help mobilize for change on these issues, then strategizing and acting to share the message of why targeted changes in policy are necessary and how this can come about through political engagement.[1]

With the first cohort of this project recently wrapped up, I would encourage members to have a look at some of CAPE's current initiatives and consider getting involved with one of the regional committees or applying for the next Advocacy and Mobilization Program (AMP) cohort, which will be starting later this year. Like the Park Rx program, these projects are entirely congruent with our philosophy of the link between the individual and the planetary, and they are another way we can show up for our communities and, with like-minded healthcare colleagues, offer a trusted voice. It's also a way to not feel isolated, wondering what to do or where to start, a common feeling articulated by many of the participants.

This edition leads off with a cross-sectional analysis of Canadian College of Naturopathic Medicine (CCNM) graduate retention, the first to consider this question in the Canadian environment. After surveying targeted cohorts from both Toronto and Vancouver campuses between 1997 and 2020, they found retention rates closely correlate with other regulated health professions 2 to 3 years post-graduation. They also found that most graduates held registration in the province of their program, and that where prescriptive authority was available as an optional certification, a large majority of graduates held that certification. It will be interesting to see what conversations their findings elicit on this topic in ND leadership and at the association level and whether this will encourage more studies about long-term professional development and retention.

Our other published study for this edition is a World Naturopathic Federation (WNF) sponsored interim report on a living systematic review of natural health products (NHPs) for the prevention and/or treatment of COVID-19. As the authors point out, there is increasing interest in research in this area, particularly in NHP therapeutics for prevention and adjunctive COVID-19 treatment. However, there is a need for more consistent outcome reporting before findings can be reported with reasonable evidence quality.

With this edition, we say goodbye to several editorial board members, who have moved onto other professional roles, and I want to thank them for their contributions to our continual improvement here at *CANDJ*. In particular, I want to recognize the

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efforts of our retiring board member Jacob Schorr, ND FABNO, who was one of the original members of the *Vital Link* review board, along with myself, Iva Lloyd (then EIC), and Paul Saunders, back in 2009. At the time, Jacob was also an editor at the *Natural Medicine Journal* and *Naturopathic Doctor News and Review*, and I remember many spirited conversations over the years about the state of naturopathic medical publications and what could be done to create stronger and more science-based standards, while maintaining our respect for traditional and complementary medicines (T&CM) in their cultural contexts. Now 14 years later, I would argue that we are well along with seeing those ideas come to fruition in this publication, which itself continues to grow and evolve.

We wish Jacob a happy and healthy retirement; and hope everyone enjoys this current edition.

AUTHOR AFFILIATIONS
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1. Howard C. Targeted change making for a healthy recovery. *Lancet Planetary Health*. 2020;4(9):e372-e374. https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30200-X/fulltext

Interim Report on a Live Review of Systematic Reviews of Natural Health Products and Natural Therapies in the Prevention and/or Treatment of COVID-19

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ABSTRACT

Objective: This living review of systematic reviews investigates the types and volume of research pertaining to natural health products and therapies as they relate to the prevention and/or treatment of COVID-19 and post-COVID syndrome.

Methods: A monthly search for published peer-reviewed systematic reviews of the topic was initiated May 2022 and is ongoing. Using a systematic keyword search strategy with clear inclusion and exclusion criteria, a summary of the types of studies included, the overall outcome and treatment focus were assessed.

Results: A total of 225 systematic reviews encompassing 5,636 studies of randomized controlled trials (49.8%, *n*=112), observational studies (21.3%, *n*=48), clinical studies (20.4%, *n*=46), and other studies (12%, *n*=27) were included. Of those, 28.9% (*n*=65) of the systematic reviews focused on prevention, 67.6% (*n*=152) on treatment, and 3.1% (*n*=8) on post-COVID. The natural health products reviewed included herbal medicine, vitamins, minerals, other natural health products, and other therapies, with 83.5% (*n*=188) of all systematic reviews stating a positive outcome and beneficial potential of the natural treatment or therapy investigated.

Conclusion: This living systematic review concludes that there is a growing interest in research pertaining to natural health products and therapies with respect to the prevention of COVID-19 infections and addressing disease severity and mortality, especially in adjunct to conventional medical intervention. Nonetheless, there is a lack of high-quality evidence and consistency in outcome reporting across the large breadth of natural treatment and management options.

Key Words Living systematic review, post-COVID, natural therapies, vitamins, minerals, herbal medicine.

INTRODUCTION

The World Health Organization announced the presence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in March of 2020.[1] SARS-CoV-2 was believed to be a novel virus with no known treatment to the array of symptoms generally referred to as COVID-19.[1] As the ensuing pandemic spread globally, the search for treatments and preventive strategies, both within conventional medicine and within the realm of traditional and complementary medicine (T&CM), became a focus internationally.

In March 2020, the World Health Organization (WHO) brought together ten T&CM non-governmental organizations, including the World Naturopathic Federation (WNF), to discuss the role of T&CM in addressing SARS-CoV-2.[2] In follow-up to that meeting, the WNF worked with naturopathic researchers globally to compile and publish ten rapid reviews on the role that specific natural health products (NHPs) might play in the prevention and/or treatment of COVID-19.[3] As outlined in this paper, T&CM researchers and organizations have contributed a tremendous body of research outlining the role of specific NHPs in the prevention and/or treatment of COVID-19 or the management and treatment of post-COVID syndrome.

In May of 2022, the WNF, in collaboration with the Canadian College of Naturopathic Medicine (CCNM), initiated a living review highlighting systematic reviews that had been published with respect to the role of NHPs and/or therapies in the prevention and/or treatment of COVID-19 or the management and treatment of post-COVID syndrome.[4] This interim report provides a summary of the data collected between May and December 2022. Updated information on this Living Review can be found on the WNF website[4]: https://worldnaturopathicfederation.org/live-review-of-natural-health-products-nhps-researched-with-respect-to-the-covid-pandemic/.

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Aim

This report is an interim narrative review of the systematic reviews that have been conducted with respect to NHPs and natural therapies in the prevention and/or treatment of COVID-19 and/or the management/treatment of post-COVID syndrome. The aim is to highlight the growing interest in NHPs in this area and to list the research on specific types of treatments and therapies that have been investigated within the realm of T&CM.

METHODS

Design

This study is a continual and active high-level monitoring of all systematic reviews on NHPs and natural treatments for the prevention and management of COVID-19 and post-COVID. With the aim of including any new important evidence on a condition that it is new to the world, monthly searches were conducted and up-to-date communication about research status was provided via the WNF website to answer the question: what T&CM products and therapies are being researched with respect to the treatment and/or management of COVID-19 and post-COVID syndrome.

Search Strategy

Starting in May 2022, the researchers performed monthly literature searches. As per Cochrane Guidelines,[5] monthly meetings were held to review the research design and search terms used in all databases and make modifications as needed to ensure all new evidence was included for an accurate and complete collection of relevant evidence without any change to the aim or scope of the living review. These monthly meetings also were used to review the articles collected each month to determine whether they met the inclusion and exclusion criteria. This was a necessary part of the process to make sure the collection of articles was continually updated, and that the search incorporated all relevant new evidence on the natural prevention and/or treatment of COVID-19 and post-COVID syndrome available at that time, following the Cochrane guidelines for living systematic reviews.[5] Because it was a living review, other researchers in this field were asked to submit papers they may have come across, ensuring any articles not published in PubMed or Google Scholar would be included.

PubMed and Google Scholar databases were used, with search terms such as "natur*," "herb*," "nutraceutical," "botanical," "medicinal plant," "Ayurvedic," "Chinese medicine," "herbal patent formula," "vitamin," "mineral," combined with "prevention," "prophylaxis," "deficiency," "treatment," "management," and "*COVID*," "Coronavirus," "SARS-CoV-2." Additionally, individual herb names, compounds, vitamins, and minerals cited in the literature were searched. Though this report has drawn a line in the sand in December 2022 to publish the results thus far, monthly updates on published systematic reviews on the topic will continue.

The current absence of statistical analysis is deliberate and reflective of the abundance of new systematic reviews. Once the number of published articles declines significantly, this living review will likely be transitioned into a systematic review including an analysis of the quality of evidence available.

Inclusion and Exclusion Criteria

Only systematic reviews were included, with no restrictions regarding publication language. Articles were therefore included if the researchers used a structured search of databases, were transparent about their methodological criteria for their study inclusion/exclusion criteria, and presented a summary of conclusions about cumulative outcomes.

Excluded were narrative reviews, secondary analyses, literature reviews, editorial discussions, best practice guidelines, and book chapters. On occasion, a title or abstract stated the paper was a systematic review, but it did not provide the details of databases searched, inclusion/exclusion criteria, or other methodological rigour, so was ultimately excluded.

Table 1 summarizes the PICO eligibility criteria requirements for study inclusion of systematic reviews.

Data Mining

An online spreadsheet was used to collate included studies and extract relevant data. For each paper, the full reference, abstract link, full text link, year of publication, country of the primary author, WHO Region of the primary author, number of studies included in the systematic review, type of studies included, number of participants, short summary of findings, conclusion of the findings, treatment focus, and details of treatment focus were extracted. Keywords were used to itemize included topics relevant to NHPs and approaches (see Table 2).

Data Management

The data collected from each study was based on the information outlined by the authors in each systematic review for each analytic analyzed. The types of studies were grouped into randomized controlled trials (RCTs), clinical trials, observational studies, and other (which included other qualitative and quantitative studies on humans or animals, case reports, guidelines and other reviews, *in vitro*, and *in silico* studies). Studies were categorized as having a positive, neutral, or negative outcome. The outcome recorded was based on the authors' interpretation of their study. There were three options for the treatment category—prevention, treatment, or post-COVID—as outlined in the abstract. The categories for treatment focus included herbal medicine, vitamins, minerals, other NHPs (e.g., quercetin, probiotics, fish oils), and other therapies (e.g., Ayurveda, Qi Gong, nutrition, exercise). Details of the treatment focus included a listing of each specific herb, nutrient, or treatment provided. As outlined in

Table 1 PICO inclusion criteria

Population	Clinical or observational (humans of any age or gender, and in any setting), *in vivo* (including animal studies), *in vitro,* or *in silico* (including molecular docking)
Intervention	Any natural health product or approach
Comparison	No limitation for comparator studies
Outcome	Any symptom, biological marker, diagnostic criteria, or viral traits related to severe acute respiratory syndrome or viral respiratory tract infections of the coronavirus or COVID-19.

Table 2, if a paper included multiple terms for the same nutrient (e.g., Vitamin C, Ascorbic acid, ascorbate) only the main term was included in the list.

Data Analysis

Using standard Excel counting formulas, the number of occurrences for each defined word was counted and summary data tables were compiled. Descriptive statistics were prepared for each analytic (i.e., frequency). It was possible for systematic reviews to include more than one treatment focus or individual treatment, hence the totals included in those categories is greater than the total number of systematic reviews for that category.

Limitations

The data collected from each systematic review was not assessed for a risk of bias nor quality grading. The aim of this study was to highlight the amount of new evidence emerging on a monthly basis to create awareness of options health practitioners could investigate for patient care. Articles labelled as finding positive, negative, or neutral results were based on the author's findings and conclusions. Some studies outlined that the NHPs and/or treatments studied were an adjunctive approach as opposed to independent interventions and hence direct conclusions about the NHPs and/or treatments are difficult to isolate.

Table 2 Keywords and their definitions, as used in the collection and analysis of the data

Keywords	Terms Included in the Keywords
Vitamins	
Vitamin A	Vitamin A, Retinol, Retinoid
Vitamin C	Vitamin C, Ascorbic acid, Ascorbate
Vitamin D	Vitamin D, Cholecalciferol, Hydroxycalciferol
Vitamin B	Vitamin B1, Thiamine, Vitamin B2, Riboflavin, Vitamin B3, Niacin, Vitamin B5, Pantothenic acid, Vitamin B6, Pyridoxine, Vitamin B7, Biotin, Vitamin B9, Folate, Folic acid, Vitamin B12, Cobalamin
Vitamin E	Vitamin E, Tocopherol
Carotene	Alpha Carotene, Beta Carotene, Carotenoid
Minerals	Listed individually by mineral name
Herbal Medicine	
Quinones	Quinone, Hydroxymethyl anthraquinone, Anthraquinone
Saponins	Saponin, Shikonin, Glycyrrhizic acid, Glycyrrhizin, Ruscogenin, Senegenin
Phenolic acids	Phenolic acids, Gallic acid, Vanillic acid, Syringic acids, Cinnaminic acid, Caffeic acid, Ferulic acid, Sinapic acid
Coumarin	Coumarin, Coumaric acid
Tannins	Tannin, Proanthocyanidin, Gallotannins, Ellagitannins
Turmeric	Curcuma longa, Curcumin, Turmeric
Patent Herbal Formula	Includes any herbal formula used in traditional Chinese, Korean, Ayurvedic or other medicine.
Note: Herbs are referred to by their first Latin name (e.g.: *Allium* = Garlic)	
Other NHPs	
Omega3	Omega3, EPA, DHA, Cod liver oil, Fish oil
Quercetin	Quercetin, Flavone
Probiotics	Probiotics, Symbiotics, Lactobacillus (coryniformis, paracasei, fermentum, casei, acidophilus, brevis, plantarum, reuteri, rhamnoses, and lactis), Bifidobacterium (lactis, bifidum, longum, short, animalis subsp. Lactis), Saccharomyces boulardii, Streptococcus thermophilus, Bacillus subtilis, Pediococcus pentosaceus
Polyphenols	Polyphenol, Resveratrol, Bergenin, Rosmarinic acid, Dicaffeoylquinic acid
Polysaccharides	Polysaccharide, Lectin, Glycoprotein, Glycans, Concanavalin A, Agglutinin, Fructo-oligosaccharides, Galacto-oligosaccharides
Terpenes	Terpene, Lactone, Euphorbia, Bisabolol, Picfeltarraenin, Jolkinolide, Anthocyanin
Glucosides	Glucoside, Glycoside, Salidroside, Ulinastatin, Forsythoside, Polydatin, Ginsenoside, Fraxin
Flavonoids	Flavonoid, Isoflavones, Hesperetin, Silymarin, Silibinin, Astilbin, Acacetin, Puerarin, Apigenin, Nobiletin, Tangeretin, Chalcone, Artemetin
Catechins	Catechin, Epigallocatechin gallate, EGCG
Steroids	Steroid, Steroidal compounds, Diosgenin
Other Therapies	
Nutrition	Nutritional interventions, Nutritional inadequacies, Diet, Fruit and vegetable intake, identification of specific diets, spices
TCM	TCM, Chinese herbal medicine, Korean herbal medicine, Oriental medicine, Chinese patent medicine
Acupuncture	Acupuncture, Electro-acupuncture

NHP = natural health product; TCM = traditional and complementary medicine.

This live review focused solely on systematic reviews, which means some NHPs and therapies may not have been included if they have not yet been studied at the level of systematic review. This applies especially to novel approaches for which primary research studies are being conducted. Similarly, reviews on post-COVID are limited, as this is a phenomenon still being unraveled and treatments for post-COVID are still being explored.

Though some studies included the word "systematic review" in their title, they may have been excluded from the review because of their lack of transparency to the methodology and data analysis. It is recommended that researchers adhere to reporting guidelines for systematic reviews, such as the Cochrane or PRISMA Guidelines, to provide quality evaluations and summaries of all the available primary research. Nonetheless, our study did not assess the quality of the studies included, and publication bias was not assessed.

RESULTS

Study Selection

Between May and December 2022, a total of 225 systematic reviews focused on the role of NHPs or natural therapies with respect to the prevention and/or treatment of COVID-19, or post-COVID systems.[6-211] Of those, 28.9% focused on prevention, 67.6% on treatment, and 3.6% on post-COVID. In sum, 5,636 studies were reported as part of the systematic reviews, involving over 4 million participants and a reference list of 8,870 citations. With regard to the publication dates, 9.8% of the papers were published in 2020, 33.3% in 2021, and 56.9% in 2022.

Geographical Representation

With respect to geographical representation, 36.9% of the systematic reviews originated in the Western Pacific region, 18.2% in the European region, 15.6% in South-East Asia, 12.0% in the Eastern Mediterranean, 11.6% in the region of the Americas, and 5.8% in the African region. Our analysis indicated that systematic reviews on the prevention and/or treatment of COVID-19 have originated in 25 countries, with 21% (*n*=12) of those focused on prevention of COVID-19 originating in Iran, 11% (*n*=6) in the United Kingdom, and 9% (*n*=5) in both China and India. Of those focused on treatment of COVID-19, 33.6% (*n*=48) originated in China, 12.6% (*n*=18) in India, 8.4% (*n*=12) in Iran, and 7.0% (*n*=10) in Brazil.

Types of Studies

As outlined in Table 3, 49.8% of all systematic reviews were based on RCTs, 21.3% on observational studies, 20.4% on clinical or pre-clinical trials, and 12.0% included mixed designs and other types of studies. Of the systematic reviews focused on treatments, 59.2% (*n*=90) were based on RCTs, compared with 24.6% (*n*=16) focused on prevention. Among the pre-clinical trials, a total of 15 articles included *in vitro* or *in silico* studies to examine the effects a particular compound could have on SARS-CoV-2, while all animal and human studies were more focused on specific markers of disease (e.g., inflammatory markers, such as IL-6, TNF-alpha, etc.), clinical indicators of disease (e.g., blood oxygen levels, viral shedding, etc.), or symptoms of disease (e.g., fever, coughing, etc.).

Study Outcomes

The outcomes of the systematic reviews were recorded as positive, negative or neutral, or mixed based on the stated outcome of the authors. As such, 83.5% of all systematic reviews stated a positive outcome, 7.6% indicated a mixed response, and 6.8% a negative or neutral response. The percentage of positive outcomes between prevention and treatment reviews were 81.5% (*n*=53) and 84.9% (*n*=129), respectively. Of the prevention studies, 13.8% (*n*=9) stated a mixed outcome response, and 9.2% (*n*=14) of the treatment studies indicated a negative or neutral response.

Research Focus

As per Table 3, 41.8% of all systematic reviews researched herbal medicines, with 54.6% (*n*=83) focusing on herbal medicines as a treatment, versus 6% (*n*=4) as prevention. In comparison, 27% of reviews focused on vitamins as a form of treatment, but that percentage increased to 67.7% (n-44) in the systematic reviews focused on prevention. A total of 13.3% researched other therapies (including nutrition, breathing, exercise, etc.), 13.8% other NHPs, and 12.0% researched minerals.

As outlined in Table 4, the systematic reviews focused on prevention most researched Vitamin A (*n*=42), Vitamin D (*n*=42), Zinc (*n*=11), and Selenium (*n*=10). In the treatment studies, patent herbal formulas were the most common (*n*=50), followed by Vitamin D (*n*=32), Vitamin C (*n*=23), Turmeric (*Curcuma longa*) (*n*=11), and Zinc (*n*=11). The number of systematic reviews focusing on post-COVID is currently not sufficient to identify specific research focuses.

Nearly all (91%) of the publications focused on the benefit of natural treatments and therapies as adjunctive approaches to COVID-19. Research on natural treatments or therapies as independent interventions were limited to non-clinical studies to assess individual compounds and their specific molecular effects.

DISCUSSION

The growing number of systematic reviews and the wide range of NHPs and natural therapies researched with respect to the prevention and treatment of COVID-19 indicate a strong interest in the role of T&CM.

Growing Interest in the Role of NHPs and Natural Therapies in the Prevention and Treatment of COVID-19

The interest in the role of NHPs in the prevention and treatment of COVID-19 appears to be gaining momentum, with 17 systematic reviews being published in 2020, 75 in 2021, and at least 134 in 2022. The focus of the systematic reviews is broad and includes most vitamins, 6 minerals, a wide range of herbal medicines both as individual herbs and as patent herbal formulae, over 12 other individual NHPs (e.g., probiotics, flavonoids, quercetin, melatonin, etc.), and other therapies (i.e., Ayurveda, lifestyle, diet and nutrition, exercise, breathing, yoga, etc.). Studies on prevention

Table 3 Summary of the number of systematic reviews included, the geographical region, year of publication, type of studies included outcomes and area of study focus

WHO Region	Prevention	Treatment	Post-COVID	Totals
Number of papers	28.9% (*n*=65)	67.6% (*n*=152)	3.6% (*n*=8)	225
Number of studies	1983	3494	120	5,636
WHO Region				
African region	4.6% (*n*=3)	5.3% (*n*=8)	25% (*n*=2)	5.8% (*n*=13)
Americas	9.2% (*n*=6)	11.8% (*n*=18)	25% (*n*=2)	11.6% (*n*=26)
Eastern Mediterranean	20% (*n*=13)	9.2% (*n*=14)	0	12.0% (*n*=27)
European	32.3% (*n*=21)	11.8% (*n*=18)	25% (*n*=2)	18.2% (*n*=41)
South-East Asia	12.3% (*n*=8)	17.8% (*n*=27)	0	15.6% (*n*=35)
Western Pacific	21.5% (*n*=14)	44.1% (*n*=67)	25% (*n*=2)	36.9% (*n*=83)
Year of Publication				
2020	6.2% (*n*=4)	11.9% (*n*=18)	0	9.8% (*n*=22)
2021	41.5% (*n*=27)	30.9% (*n*=47)	12.5% (*n*=1)	33.3% (*n*=75)
2022	52.3% (*n*=34)	57.2% (*n*=87)	87.5% (*n*=7)	56.9% (*n*=128)
Type of Study				
RCT	24.6% (*n*=16)	59.2% (*n*=90)	75% (*n*=6)	49.8% (*n*=112)
Observational	40.0% (*n*=26)	13.8% (*n*=21)	12.5% (*n*=1)	21.3% (*n*=48)
Clinical	16.9% (*n*=11)	20.4% (*n*=31)	50% (*n*=4)	20.4% (*n*=46)
Other/mixed	24.6% (*n*=16)	6.6% (*n*=10)	12.5% (*n*=1)	12.0% (*n*=27)
Unspecified	7.7% (*n*=5)	4.6% (*n*=7)	0	5.3% (*n*=12)
Outcome				
Positive	81.5% (*n*=53)	84.9% (*n*=129)	75.0% (*n*=6)	83.5% (*n*=188)
Mixed	13.8% (*n*=9)	3.9% (*n*=6)	25.0% (*n*=2)	7.6% (*n*=17)
Negative/neutral	1.5% (*n*=1)	9.2% (*n*=14)	0	6.8% (*n*=15)
Treatment Focus				
Vitamins	67.7% (*n*=44)	27.0% (*n*=41)	37.5% (*n*=3)	39.1% (*n*=88)
Minerals	21.5% (*n*=14)	7.9% (*n*=12)	12.5% (*n*=1)	12.0% (*n*=27)
Herbal medicine	6.0% (*n*=4)	54.6% (*n*=83)	75.0% (*n*=6)	41.8% (*n*=94)
Other natural health products	6.1% (*n*=4)	1701% (*n*=26)	12.5% (*n*=1)	13.8% (*n*=31)
Other therapies	15.4% (*n*=10)	11.2% (*n*=17)	37.5% (*n*=3)	13.3% (*n*=30)

WHO = World Health Organization; RCT = randomized controlled trial.

tend to focus more on nutritional status and the use of vitamins and minerals, as well as lifestyle and diet. Studies focused on treatment most commonly focus on individual or patent herbal formulae. Both prevention and treatment studies focus on vitamins and minerals, but the prevention studies put a greater emphasis on Vitamin A, whereas the treatment studies focus on Vitamin C. Vitamin D is the most common vitamin researched. Treatment studies research a range of other NHPs, whereas the same trend is not found in the prevention studies.

The focus of the systematic reviews is common to what T&CM practitioners have historically used in the treatment of upper respiratory tract infections. The therapies highlighted in the rapid reviews conducted by the WNF in May 2020 supported the findings of the systematic reviews as of the end of 2022. That is, the most common natural therapies to consider in the prevention and treatment of COVID-19 and post-COVID include Vitamin C,[212] Vitamin D,[213] multivitamins,[214] Zinc,[215] Quercetin,[216] N-Acetyl-cysteine (NAC),[217] essential oils,[218] and the herbs *Echinacea,*[219] *Hedera helix,*[220] and *Sambucus nigra.*[221]

Despite the mounting volume of research on natural approaches for the prevention and treatment of COVID-19, there has been limited acknowledgement by or interest from governments with respect to the role of T&CM either adjunctively or individually with respect to the prevention and/or treatment of COVID-19 and/or post-COVID.

Global Contribution

The contribution of systematic reviews focused on the role of NHPs and treatments in the prevention and management of COVID-19 has been global, with 25 countries spanning all WHO regions contributing to the body of knowledge. Researchers from China have contributed the highest number of systematic reviews, with a primary focus being on the use of traditional Chinese herbal patents in the treatment of COVID-19. The high number

Table 4 Details of natural health products and natural therapies that were researched in the systematic reviews

Natural health product or natural therapy	Prevention	Treatment	Post-COVID	Total
Herbal Medicines				
TCM herbal patents*		32.9% (*n*=50)		22.2% (*n*=50)
Turmeric (*Curcuma longa*)		7.2% (*n*=11)		4.9% (*n*=11)
Licorice (*Glycyrrhiza glabra*)		4.6% (*n*=7)	25.0% (*n*=2)	4.0% (*n*=9)
Ginger (*Zingiber officinale*)		3.3% (*n*=5)		2.2% (*n*=5)
Andrographis (*Andrographis paniculate*)		2.6% (*n*=4)		1.8% (*n*=4)
Echinacea (*Echinacea angustifolia*)	1.5% (*n*=1)	2.0% (*n*=3)		1.8% (*n*=4)
Garlic (*Allium sativum*)		2.0% (*n*=3)		1.3% (*n*=3)
Ginseng (*Panax ginseng*)		2.0% (*n*=3)		1.3% (*n*=3)
Ashwagandha (*Withania somnifera*)		1.3% (*n*=2)		0.9% (*n*=2)
Essential oils		0.6% (*n*=1)	12.5% (*n*=1)	0.9% (*n*=2)
Individual herbs*	4.5% (*n*=3)	2.6% (*n*=4)	25.0% (*n*=2)	4.0% (*n*=9)
Vitamins				
Vitamin A	64.6% (*n*=42)	2.6% (*n*=4)	12.5% (*n*=1)	20.9% (*n*=47)
B Vitamins	6.1% (*n*=4)	3.3% (*n*=5)		4.0% (*n*=9)
Vitamin C	9.2% (*n*=6)	15.1% (*n*=23)		12.9% (*n*=29)
Vitamin D	64.6% (*n*=42)	21.0% (*n*=32)		20.9% (*n*=47)
Vitamin E		3.9% (*n*=6)		2.7% (*n*=6)
Minerals				
Zinc	16.9% (*n*=11)	7.2% (*n*=11)	12.5% (*n*=1)	10.2% (*n*=23)
Selenium	15.4% (*n*=10)	3.9% (*n*=6)		7.1% (*n*=16)
Iron	9.2% (*n*=6)			2.7% (*n*=6)
Calcium	4.6% (*n*=3)	0.6% (*n*=1)		1.8% (*n*=4)
Magnesium	4.6% (*n*=3)			1.3% (*n*=3)
Phosphorus	3.1% (*n*=2)			0.9% (*n*=2)
Other NHPs				
Probiotics		5.9% (*n*=9)		4.0% (*n*=9)
Flavonoids		5.9% (*n*=9)		4.0% (*n*=9)
Polyphenols		4.6% (*n*=7)		3.1% (*n*=7)
Quercetin		3.9% (*n*=6)		2.7% (*n*=6)
Melatonin		3.9% (*n*=6)		2.7% (*n*=6)
Propolis		3.9% (*n*=6)		2.7% (*n*=6)
Polysaccharides		1.3% (*n*=2)		0.9% (*n*=2)
Omega 3	.5% (*n*=3)	1.3% (*n*=2)		2.2% (*n*=5)
N-acetylcysteine (NAC)		1.3% (*n*=2)		0.9% (*n*=2)
Other NHPs**	1.5% (*n*=1)		37.5% (*n*=3)	1.8% (*n*=4)
Other Therapies				
Ayurveda		5.9% (*n*=9)		4.0% (*n*=9)
Lifestyle	6.1% (*n*=4)			1.8% (*n*=4)
Diet	6.1% (*n*=4)			1.8% (*n*=4)
Homeopathy		1.3% (*n*=2)		0.9% (*n*=2)
Pulmonary rehabilitation/ breathing			12.5%(*n*=1)	0.4% (*n*=1)
Acupuncture		0.6% (*n*=1)	12.5%(*n*=1)	0.9% (*n*=2
Exercise/physical therapy		0.6% (*n*=1)	12.5%(*n*=1)	0.9% (*n*=2)
Ozone		0.6% (*n*=1)		0.4% (*n*=1)

TCM = traditional and complementary medicine; NHP = natural health product.
*Indicates the number of individual herbs that appeared in only one systematic review.
**Indicates the number of other natural health products that appeared in only one systematic review.

of studies originating from China may reflect the recognition of the Chinese government that both Traditional Chinese medicine and Western (or conventional) medicine can be used in combination to prevent and treat COVID-19.[222] With NHPs and natural therapies commonly used in North America, it is surprising to see the lack of research originating in this region. This may be due to the restrictions placed on T&CM healthcare workers with respect to the management of patients with COVID-19.

Positive Outcomes

Randomized control trials are recognized as the gold standard for evaluating the effectiveness of an intervention.[223] Over half of all the systematic reviews were based on RCTs and the systematic reviews focused on both prevention and treatment indicated positive outcomes, above 84% in the NHP and/or natural therapy that was being researched. More of the prevention studies (13.8%) indicated a mixed outcome, whereas 9.2% of the systematic reviews focused on treatment indicated a neutral or negative outcome. The high percentage of RCTs and the high rate of positive outcomes support further investigation of the role of natural therapies in the prevention and treatment of COVID-19.

None of the studies suggested that natural therapies or treatments should be used in isolation. Rather, they indicated use as a complement to conventional medicine. Integrative approaches to treatment or prevention included addressing nutrient deficiencies, combining medical care (e.g., adding an herbal or natural health product to pharmaceutical treatment), or managing symptoms (e.g., reducing inflammation or respiratory burden). Based on the abundance of research supporting the benefit of natural medicine as an adjunctive approach to COVID-19 treatment and prevention, the researchers see no grounds for inhibiting the use of T&CM as a general practice.

CONCLUSION

This live systematic review concludes that there is growing interest in research to support consideration of NHPs and therapies in the prevention and the treatment of COVID-19 in order to decrease disease severity and mortality, as an adjunctive therapy to conventional medical intervention, and that the range of NHPs and therapies studied is broad. Further research that follows consistent standard reporting is warranted.

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CONFLICTS OF INTEREST DISCLOSURE

We have read and understood the *CAND Journal*'s policy on conflicts of interest and declare that we have none.

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Retention and Registration Status of Naturopathic Doctors from Accredited Naturopathic Educational Programs in Canada – A Cross-Sectional Analysis

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ABSTRACT

Objective: This cross-sectional analysis describes the entry to practice and continuing registration of cohorts from the two accredited naturopathic medical educational programs in Canada.

Methods: Cohorts from the Canadian College of Naturopathic Medicine (CCNM)-Toronto and CCNM-Boucher were included and analyzed based on jurisdiction of registration, time between graduation and registration, current registration status, and the percentage achieving advanced training and certification.

Results: A total of 565 graduates from CCNM-Toronto and 296 graduates from CCNM-Boucher were analyzed. 53.3% (n=459) were registered with the naturopathic regulator in Ontario, 34.0% (n=293) with the naturopathic regulator in British Columbia, 9.1% (n=78) with other regulators or professional associations in Canada and 3.6% (n=31) internationally. 47.3% (n=360) acquired registration within 5 to 7 months of graduation and 23.1% (n=176) within 8 to 11 months. The registration status of 74.8% (n=644) was listed as active. Of the naturopathic doctors (NDs) working in jurisdictions where these certifications are optional, 69.0% (n=392) had their prescribing certification and 49.8% (n=302) had their Intravenous and Injection Therapies (IVIT) certification.

Conclusion: This cross-sectional analysis indicated that 2 to 3 years following graduation, the NDs sampled have a similar or higher retention rate as other healthcare professionals. The majority of graduates are registered to practice in the same province as the naturopathic program they attended. A higher percentage of NDs practicing in British Columbia than in Ontario have additional training and certification in prescribing and intravenous therapies, which may be a reflection of the broader scope of practice in that province.

Key Words Naturopathy, naturopathic education, naturopathic medicine, naturopathic workforce, accredited naturopathic educational programs.

INTRODUCTION

Naturopathic medicine has been practiced in Canada since the end of the 19th century and is currently practiced in every province and territory other than Nunavut.[1] The first province to regulate the naturopathic workforce was British Columbia in 1923, followed by Ontario in 1925, Manitoba (1946), Alberta (1948), Saskatchewan (1954), Nova Scotia with title protection (2008), and Northwest Territories (2022).[2] The therapies and practices commonly practiced by the naturopathic workforce globally include clinical nutrition, applied nutrition, herbal medicine, homeopathy, lifestyle counseling, and hydrotherapy.[2] Naturopathic training in Canada includes naturopathic manipulation and acupuncture.[3] In addition, naturopathic doctors (NDs) in Canada are eligible to take advanced training in areas such as intravenous therapy and injection therapies (IVIT) (mesotherapy, prolotherapy, etc.) and have prescribing authority based on the regulations in their jurisdiction.[4,5] Prior to registration with a naturopathic regulator in Canada, a candidate must graduate from an accredited naturopathic medical education program, pass standard entry-to-practice examinations, and acquire malpractice insurance.[4,5]

The Canadian College of Naturopathic Medicine (CCNM), which first opened as the Ontario College of Naturopathic Medicine (OCNM) in 1978, was the first dedicated naturopathic medical educational program in Canada.[1] Throughout the late 1990s, CCNM tripled its enrollment, and today, CCNM offers the

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largest accredited naturopathic medical educational program in North America.[1] In 2001, a second naturopathic medical educational program, the Boucher Institute of Naturopathic Medicine (BINM), opened in British Columbia.[1] CCNM and BINM amalgamated in 2021 and are now referred to as CCNM-Toronto and CCNM-Boucher.[3] The vision of CCNM is to make naturopathic medicine an integral part of health care through pre-eminent education, research, and clinical services and for CCNM to be a leading voice in naturopathic medicine.[3]

Medical school accreditation in North America began with the Flexner Reports for the United States and Canada in 1910.[1] Accreditation, defined as "the formal process of evaluation of an educational program, institution, or system against defined standards by an external body for purposes of quality assurance and enhancement,"[6] is ongoing for conventional medical programs, naturopathic medical programs, chiropractic, nursing, and other medical education programs. Accreditation seeks to implement, strengthen, and support quality medical education.[6,7] Accreditation of the 4-year naturopathic medical educational programs in North America began in 1978 through the Council on Naturopathic Medical Education (CNME).[8] CCNM-Toronto acquired CNME accreditation in 2000 and BINM was accredited in 2008.[1]

Between 2005 and 2020, CCNM and BINM reported a total of 2,198 graduates.[9] During that same time frame, the Canadian Association of Naturopathic Doctors (CAND) recorded growth of the naturopathic workforce in Canada, which increased by 1,700 members (from 1,300 to over 3,000)[10]. In a 2018 CAND survey of its members, 91% of respondents indicated that they had graduated from Canadian naturopathic educational programs.[11] Hence, overall, between 2005 and 2020 the cumulative retention rate of NDs in Canada between 2005 and 2020 appeared to be over 80%.

The status of graduates from naturopathic medical educational programs in Canada has not previously been explored. This cross-sectional analysis describes entry-to-practice and continuing registration status of naturopathic graduates by analyzing cohorts from the 2 CNME-accredited naturopathic medical educational programs offered by CCNM and BINM with respect to registration status, jurisdiction of practice after registration, months to registration, and advanced certification status for IVIT and/or prescribing authority.

METHODS

Design

A cross-sectional analysis of available administrative data from Canadian naturopathic medical educational programs and regulatory authorities.

Aim

The aim of the study was to describe entry-to-practice and continuing registration status of ND graduates, from the 2 CNME accredited naturopathic medical educational programs offered in Canada. The study analyzes the length of time between graduation and registration, the jurisdiction of registration, current registration status and the percentage of graduates that undertook additional training in order to receive pharmaceutical and/or IVIT certification.

Graduating Cohorts

Since the inception of CCNM-Toronto in 1978, there have been over 3,600 graduates.[1,9] For the purpose of this study 6 graduating cohorts (1997, 2002, 2007, 2012, 2017, 2020) from CCNM-Toronto were selected. Due to the large number of graduates, the selection of the CCNM-Toronto cohorts was based on 5-year intervals limited to the last 25 years of graduates. The cohort selection was made *a priori*, purposely by the primary author and approved through discussion and consensus of all authors to minimize cohort effects that could not be overcome with study design or statistical analyses such as small sample sizes or confounding variables.[12] As such, we avoided graduating years with significant confounding external factors that might have affected the results, including: periods of substantive changes in enrollment (1999), or disruption to the educational institutions (e.g., the move of the CCNM educational institution to its current location in August of 1999 and the accreditation of the CCNM naturopathic medical educational program in 2000 by CNME).[1] None of these potential confounding factors were experienced by the CCNM-Boucher cohorts. The last cohort was chosen as 2020 versus 2022 to ensure sufficient time after graduation to allow for accrual of registration and registration status outcomes, hence minimizing the influence of time-based opportunity on our findings. Based on the significant difference in class size between CCNM-Toronto and CCNM-Boucher, and the desire of the authors to have a sizable, comparable number of graduates from each educational institution, all CCNM-Boucher cohorts were included (from 2004 until 2020). The cohorts from CCNM-Boucher were grouped to allow for comparison with the cohorts from CCNM-Toronto. A listing of graduates prior to 2008 was contained in the book *The History of Naturopathic Medicine, a Canadian perspective*.[1] The listing of graduates from 2009 to 2020 was verified by CCNM-Toronto and CCNM-Boucher personnel.[9]

Sample Size

The study analyzed available data listed on Canadian regulators' websites. A minimum sample size of 300 is recommended for descriptive survey research.[13] In analyzing the cohorts selected, the inclusion rate was calculated based on the number of individuals for whom practice status could be identified and included for those who were listed with a recognized naturopathic regulator or a national or provincial/territorial association in Canada (see Table 1) or where it was indicated that the ND was in active healthcare practice according to a website analysis as outlined below.

Data Mining

Data from each cohort were listed on an Excel spreadsheet with columns to capture registration jurisdiction months to registration, current registration status, prescribing status, IVIT status and a notes field. The registration jurisdiction column included 4 possible entries: the College of Naturopaths of Ontario (CONO), the College of Naturopathic Physicians of British Columbia

(CNPBC), Canada (which included all other Canadian regulators and naturopathic professional associations (see Table 1), and International (for graduates who were determined to be practicing outside of Canada). To determine last known status, the websites for each of the above were searched during November 2022 by one member of the study team, and a random selection including roughly 10% of the data was verified by a second author. Jurisdiction of registration was determined by searching the published list of registrants of the regulator in the province of the graduating cohort (e.g., CCNM-Toronto graduates were first searched under CONO), then other naturopathic regulators in Canada, then provincial associations and then a Google search, when needed. The study only recorded one jurisdiction for each active graduate and did not account for graduates who may have been registered in more than one jurisdiction.

Based on the month and year of graduation (e.g., May according to the CCNM-Toronto calendar), the timespan (in months) from graduation to registration was calculated.[3] Hence, due to entrance-to-practice exams being offered in August or September with results one month or so later, 5 months was generally the minimum timeframe between graduation and possible registration.[4,23] For those NDs associated with a naturopathic professional association, as opposed to a regulatory authority, or those working internationally, the number of months to registration was recorded as not applicable (N/A). The current registration status was based on the data found on the regulators' websites and included active, revoked, resigned, inactive, and/or cancelled. Due to the variability in the terms used by the different naturopathic regulators, the terms revoked, resigned, and cancelled were categorized as "cancelled" for the purposes of this analysis.

For those NDs practicing in a non-regulated jurisdiction in Canada or practicing internationally, the status entry was recorded as active if they were listed as a current member of a professional naturopathic association or if their professional website, LinkedIn or Facebook profile indicated that they were currently practicing as a naturopathic doctor and that they had graduated from CCNM. Given the nature of private practices of most naturopathic doctors, these public-facing sources for practice status were deemed to be reasonable information sources. Internet queries used the Google search engine and employed an iterative search strategy beginning with name and using the terms "naturopath*" and the name or initials of the graduating institution.

If an active ND was working in a regulated jurisdiction where prescribing and/or intravenous therapy was part of the scope of practice, their prescribing and/or IVIT certification status was recorded. If prescribing and/or IVIT was not permitted or the ND was working in a non-regulated jurisdiction, the status was recorded as not applicable as their status could not be verified. The registration status "unregistered" was used to indicate a graduate who was working in the healthcare industry as a non-naturopathic practitioner, such as a health coach or personal trainer, but was not registered with a healthcare regulator. The notes field was used to record the location of NDs practicing outside of Ontario or British Columbia or to record other comments such as the type of practice that unregistered graduates were engaged in.

Each ND in the cohorts selected was analyzed using the search function of the naturopathic regulators in Canada (starting with the regulator in the same province as their naturopathic educational program) and the listing of naturopathic doctors on the naturopathic national or provincial/territorial association websites. If required, a search for the graduate on public websites using their name was conducted, as outlined above, in an attempt to capture last-known status.

Data Management and Analysis

Using standard Excel counting formulas, the number of occurrences for each defined word was counted and summary data tables were compiled. Missing data for each variable and non-applicable data were excluded from the analysis for that category. Not all regulators and none of the provincial associations, for example, included the date of first registration. Descriptive statistics were prepared for each variable (i.e., place of registration or practice, months to registration, prescribing and IV status, registration status) using the Excel function. The graduates from CCNM-Boucher were grouped for ease of comparison with the years sampled from CCNM-Toronto. That is, the groupings were 2004–2007, 2008–2012, 2013–2017 and 2018–2020.

TABLE 1 Naturopathic regulator or naturopathic professional association used to verify practice status and the estimate of number of NDs by province[9]

Province	Estimated # of NDs	Naturopathic Regulator or Naturopathic Professional Association Used to Verify Practice Status
British Columbia	718	College of Naturopathic Physicians of British Columbia (CNPBC)[5]
Ontario	1,740	College of Naturopaths of Ontario (CONO)[4]
Other Canadian Naturopathic Regulators and Professional Associations	551	College of Naturopathic Doctors of Alberta (CNDA)[23] Saskatchewan Association of Naturopathic Practitioners (SANP)[25] Manitoba Naturopathic Association (MNA)[26] Quebec Association of Naturopathic Medicine (QANM)[27] New Brunswick Association of Naturopathic Doctors (NBAND)[28] Newfoundland and Labrador Association of Naturopathic Doctors (NLAND) Northwest Territories Association of Naturopathic Doctors (NTAND)[29] Nova Scotia Association of Naturopathic Doctors (NSAND)[30] Prince Edward Island Association of Naturopathic Doctors (PEIAND)[31] Yukon Association of Naturopathic Doctors (YAND)[32]
Total estimate of NDs in Canada	~3,009	

RESULTS

Number of Graduates and Registration Jurisdiction

This cross-sectional analysis reviewed 592 graduates from CCNM-Toronto and 304 graduates from CCNM-Boucher. As outlined in Table 2, practice status data on 95.4% of CCNM-Toronto graduates and 97.4% of CCNM-Boucher graduates was acquired. Of CCNM-Toronto graduates included in the final analysis, 79.8% were listed on CONO's public register, 7.1% with CNPBC, 9% with other naturopathic regulators or professional associations in Canada and 4.1% internationally. Of CCNM-Boucher graduates, 85.5% were listed on CNPBC public register, 2.7% with CONO, 9.1% with other regulators or professional associations in Canada and 2.7% internationally.

Registration Status of NDs

In addition, Table 2 outlines the registration status of NDs and indicates that 74.8% of all NDs included in the final analysis were active in practice, and 6.0% were listed as inactive at the time of the analysis.

Table 3 further outlines that 97.6% of NDs who graduated from CCNM-Toronto in 2020 and 94.1% of those from CCNM-Boucher who graduated from 2018–2020 were in active practice as an ND as of November 2022. For all cohorts analyzed from CCNM-Toronto, 71.2% were in active practice, 6.9% were listed as inactive, and 19.3% have had their registration cancelled either due to its being revoked or the ND resigning (Table 2). The analysis of graduates from CCNM-Boucher spans graduating years since its inception in 2004 until 2020 and indicated that 81.8% were active in practice, 4.4% were inactive, and 10.8% have had their registration cancelled (Table 2). 2.5% of graduates from the CCNM-Toronto and 1.4% of graduates from CCNM-Boucher were listed as unregistered, that is, practicing as a healthcare provider, but not as an ND (Table 2). As expected, the percentage of active graduates was highest for the most recent graduates, with 97.6% of CCNM-Toronto graduates from 2020 listed as active, while 54.1% of those from 2002 (20 years ago) were active (Table 3). Likewise, the percentage of active graduates from the 2018–2020 CCNM-Boucher was 94.1%, while 76.7% of the 2004–2007 cohort were still active (Table 3).

Table 2 Comparison of jurisdiction of registration, registration status and additional certifications of graduates from the two CCNM campuses

	CCNM-Toronto	CCNM-Boucher	Total
Sample			
# of graduates in sample	592	304	896
Percentage with practice status identified	95.4% (*n*=565)	97.4% (*n*=296)	96.1% (*n*=861)
Jurisdiction of registration			
Ontario (CONO)	79.8% (*n*=451)	2.7% (*n*=8)	53.3% (*n*=459)
British Columbia (CNPBC)	7.1% (*n*=40)	85.5% (*n*=253)	34.0% (*n*=293)
Rest of Canada	9.0% (*n*=51) CNDA (*n*=24) MNA (*n*=9) SANP (*n*=4) QANM (n-1) NSAND (*n*=1) NBAND (*n*=1) PEIAND (*n*=1) unregistered (*n*=10)	9.1% (*n*=27) CNDA (*n*=17) SANP (*n*=3) MNA (*n*=1) NBAND (*n*=1) unregistered (n-4) deceased (*n*=1)	9.1% (*n*=78)
International	4.1% (*n*=23)	2.7% (*n*=8)	3.6% (*n*=31)
Registration Status			
Active	71.2% (*n*=402)	81.8% (*n*=242)	74.8% (*n*=644)
Inactive	6.9% (*n*=39)	4.4% (*n*=13)	6.0% (*n*=52)
Cancelled	19.3% (*n*=109)	10.8% (*n*=32)	16.4% (*n*=141)
Unregistered	2.5% (*n*=14)	1.4% (*n*=4)	2.1% (*n*=18)
Deceased	0.2% (*n*=1)	0.7% (*n*=2)	0.3% (*n*=3)
Months to registration	*n*=495	*n*=266	*n*=761
5–7 months	47.1% (*n*=233)	47.7% (*n*=127)	47.3% (*n*=360)
8–11 months	23.2% (*n*=115)	22.9% (*n*=61)	23.1% (*n*=176)
12–23 months	25.5% (*n*=126)	22.9% (*n*=61)	24.6% (*n*=187)
24+ months	4.2% (*n*=21)	6.4% (*n*=17)	5.0% (*n*=38)
Prescribing and/or IV Certification			
Eligible for Prescribing	*n*=360	*n*=208	*n*=568
% with prescribing	54.7% (*n*=197)	93.8% (*n*=195)	69.0% (*n*=392)
Eligible for IVIT	383	224	607
% with IVIT	30% (*n*=115)	83.4% (*n*=187)	49.8% (302)

The percentages of inactive graduates were fairly consistent across the 2002, 2007, and 2012 cohorts from CCNM-Toronto and were recorded as 9.2%, 11.2%, and 8.7%, respectively. The percentage of unregistered graduates was highest in the CCNM-Toronto 2017 cohort at 5.8% (Table 3). The percentage of inactive graduates from CCNM-Boucher ranged from 3.3% to 10%. None of the graduates in the 2018–2021 cohort were listed as inactive (Table 3).

Months to Registration

As outlined in Table 2, 47.1% (n=233) of graduates from CCNM-Toronto acquired registration within 7 months of graduation, 23.2% took between 8 and 11 months and 25.5% took 12 to 23 months, with 4.2% taking more than 2 years following graduation to acquire registration. Of the CCNM-Boucher graduates, 47.7% acquired registration within 7 months of graduation, 22.9% within 8 to 11 months, 22.9% within 12 to 23 months, and 6.4% took 24 months or longer. As outlined in Table 4, in 2012, 61.4% of CCNM-Toronto graduates acquired registration within 7 months compared with only 31.9% in 2020. The percentage of CCNM-Boucher graduates acquiring registration within 7 months has remained fairly consistent over the cohorts ranging from 40.0% to 54.0%.

Percentage of NDs with Prescribing and IVIT Certification

Table 2 lists the percentage of regulated, eligible, active NDs that have undertaken the additional requirements for prescribing and/or IVIT certification. Of the 360 eligible NDs who graduated from CCNM-Toronto, 54.7% have their prescribing certification and 30% have their IVIT certification, compared with CCNM-Boucher graduates, 93.8% of whom have their prescribing certification and 83.4% their IVIT certification.

DISCUSSION

This study presents an overview of the registration status of NDs graduating from the two accredited naturopathic medical educational programs offered in Canada and provides insight into their retention and additional certifications. This study provides

Table 3 Comparison of CCNM-Toronto and CCNM-Boucher with respect to registration status

CCNM-Toronto	1997 (n=29)	2002 (n=120)	2007 (n=89)	2012 (n=104)	2017 (n=138)	2020 (n=85)
Active	62.1% (n=18)	54.1% (n=65)	67.4% (n=60)	64.4% (n=67)	79.0% (n=109)	97.6% (n=83)
Inactive	0% (n=0)	9.2% (n=11)	11.2% (n=10)	8.7% (n=9)	5.8% (n=8)	1.2% (n=1)
Cancelled	31.0% (n=9)	34.2% (n=41)	19.1% (n=17)	26.9% (n=28)	9.4% (n=13)	1.2% (n=1)
Unregistered	3.4% (n=1)	2.5% (n=3)	2.2% (n=2)	0% (n=0)	5.8% (n=8)	0% (n=0)
Deceased	3.4% (n=1)	0% (n=0)	0% (n=0)	0% (n=0)	0% (n=0)	0% (n=0)
CCNM-Boucher	**N/A**	**N/A**	**2004-2007 (n=60)**	**2008-2012 (n=70)**	**2013-2017 (n=64)**	**2018-2020 (n=102)**
Active			76.7% (n=46)	67.1% (n=47)	84.4% (n=54)	94.1% (n=96)
Inactive			3.3% (n=2)	10.0% (n=7)	6.3% (n=4)	0% (n=0)
Cancelled			8.4% (n=5)	20.0% (n=14)	9.4% (n=6)	6.9% (n=7)
Unregistered			6.7% (n=4)	0% (n=0)	0% (n=0)	0% (n=0)
Deceased			1.7% (n=1)	0% (n=0)	1.6% (n=1)	0% (n=0)

Table 4 Comparison of CCNM-Toronto and CCNM-Boucher campuses with respect to months to registration

CCNM-Toronto (graduates with available information)	1997 (n=23)	2002 (n=99)	2007 (n=81)	2012 (n=101)	2017 (n=122)	2020 (n=69)
5–7 months	39.1% (n=9)	46.5% (n=46)	42.0% (n=34)	61.4% (n=62)	49.2% (n=60)	31.9% (n=22)
8–11 months	34.8% (n=8)	29.3% (n=29)	18.5% (n=15)	12.9% (n=13)	22.1% (n=27)	33.3% (n=23)
12–23 months	17.4% (n=4)	18.2% (n=18)	28.4% (n=23)	23.8% (n=24)	27.0% (n=33)	34.8% (n=24)
24+ months	8.7% (n=2)	6.1% (n=6)	11.1% (n=9)	2.0% (n=2)	1.6% (n=2)	0 (n=0)
CCNM–Boucher (graduates with available information)	**N/A**	**N/A**	**2004–2007 (n=50)**	**2008–2012 (n=63)**	**2013–2017 (n=60)**	**2018–2020 (n=93)**
5–7 months			54.0% (n=27)	52.4% (n=33)	40.0% (n=24)	46.2% (n=43)
8–11 months			4.0% (n=2)	19.0% (n=12)	35.0% (n=21)	28.0% (n=26)
12–23 months			30.0% (n=15)	20.6% (n=13)	16.7% (n=10)	24.7% (n=23)
24+ months			12.0% (n=6)	7.9% (n=5)	8.3% (n=5)	1.1% (n=1)

naturopathic graduates, potential naturopathic students, and other healthcare professionals a glimpse into the retention and registration status of NDs in Canada.

Registration Status of NDs

A survey by Statistics Canada in 2000 showed a high retention rate in conventional health occupations among health graduates, with about 93% still employed in a health occupation after 3 years.[24] The lowest retention rate (88.2%–90%) was reported in nurses.[24,25] The naturopathic graduates sampled have a similar or higher retention rate 2 to 3 years into practice, with 97.6% of the 2020 CCNM-Toronto graduates and 94.1% of the 2018–2021 CCNM-Boucher graduates listed as active. There is a lack of current research identifying the long-term retention of healthcare workers, especially those in the fields of traditional, complementary and integrative healthcare (TCIH), yet a 2010 study of chiropractors in California found that the 10-year attrition rate was between 20% and 25% for chiropractors registered between 1992 and 1998.[26] The results of our analysis indicate a similar trend, with 79% of CCNM-Toronto and 84.4% of CCNM-Boucher still active 5 years after graduation and 67.4% of CCNM-Toronto and 76.7% of CCNM-Boucher graduates still active as NDs 15 years after graduation. Although comparative statistical analysis was not performed, this data suggests that the active rate between the two CCNM campuses is fairly consistent over the last 10 years.

Inactive status is recorded by regulators when registered NDs request time away from practice for a range of reasons including child rearing, sick leave, caring for a sick or elderly relative, or a work sabbatical. The lowest rate of inactive status was seen in the most recent graduates (1.2% in the 2020 CCNM-Toronto cohort and 0% in the 2018–2020 CCNM-Boucher cohort). The highest percentage of inactive was in the 2007 CCNM-Toronto cohort (11.2%) and in the 2018-2012 CCNM-Boucher cohort (10.0%). Although the overall percentage of inactive was only 6.0%, further analysis into the reasons for inactive status and support mechanisms for NDs requiring inactive status should be explored. The scope of the study did not identify or address whether or not inactive status impacted long-term retention in naturopathic practice.

Healthcare educational programs are an integral part of a profession's advancement and stature.[27] They are tasked with ensuring that health professionals who can safely and effectively provide healthcare services within their designated profession are trained, that there is ongoing research to support the advancement of the profession, and that their educational programs stay current. They are a valuable part of civil society and addressing healthcare challenges.[27] To ensure the advancement of the naturopathic profession, it is also necessary that a percentage of graduates use their knowledge and training to support the profession in fields such as education, research, government work, support of the natural health products industry, and other fields. The percentage of graduates listed as cancelled includes those who have chosen to utilize their knowledge and training in other areas. As our analysis was based primarily on the publicly available data reported by regulators in Canada, we are not able to report on the current status of those listed as cancelled, but as of 2022, there are 6 naturopathic graduates working in various directorates and departments of the Canadian federal government, primarily within the Ministry of Health in the Natural and Non-Pharmaceutical Health Products Directorate (NNHPD),[10] and over thirty NDs working in research.[9] CCNM indicates that there are 165 individuals who have graduated from an ND program who are working as supervisors, teaching assistants, and/or staff at CCNM alone.[9] There are also NDs working in non-regulated healthcare educational roles or supporting the natural health product industry in Canada. Many NDs maintain active practices, either full- or part-time. Further analysis of this data would be valuable and would help clarify the distinction between registration being cancelled due to disciplinary actions taken by a naturopathic regulator and a naturopathic doctor cancelling their registration to work in another field. Unregistered practitioners were defined as naturopathic graduates who were deemed to be working as non-naturopathic healthcare practitioners in unregistered fields, such as health coaches and personal trainers. Although the percentage of unregistered graduates from CCNM-Toronto and CCNM-Boucher was low, this is a marker worth tracking.

The Majority of NDs Acquire Registration in the Province of Their Education

The majority of graduates acquire registration in the jurisdiction of their educational program. This likely explains why Ontario (NDs=1,740)[4] and British Columbia (NDs=740)[5] account for over 80% of the total naturopathic workforce in Canada (NDs=3,000) (Table 1) despite there being statutory regulation in 7 jurisdictions. It is important to note that, in order to indicate support for government regulation and/or for insurance purposes, graduates working in unregulated provinces often seek registration with a regulator in a province that regulates their naturopathic workforce. The percentage of graduates listed as registered outside of Ontario and British Columbia is similar between the 2 campuses, yet CCNM-Toronto saw a significant shift in 2017, with 15.9% of all graduates registered in other provinces. Growing the naturopathic profession across Canada is essential, and looking at ways to increase this trend and understand what may be driving it would be beneficial. Over the last decade, CCNM enrollment indicates that roughly 15% of its student population is international,[9] yet the data indicate that the percentage of graduates that acquire registration internationally is significantly lower, at 3.6%. Further exploration of this discrepancy would be beneficial.

Rate of NDs with Prescribing and IVIT Certification Varies Between the Graduates

Naturopathic care in Canada is diverse and includes clinical nutrition, applied nutrition, botanical medicine, lifestyle counselling, homeopathic medicine, hydrotherapy, and naturopathic manipulation and acupuncture.[2] In some jurisdictions in Canada, the scope of practice for the naturopathic workforce also includes intravenous therapy, injection therapies (meso- or prolo-therapy), and prescribing authority based on an exclusionary list or a defined schedule of substances.[4,5] Additional certifications—such as acupuncture, minor surgery, meso- or prolo- therapy—may be part of

the scope of practice dependent on an ND's jurisdiction, but only IVIT and prescribing were analyzed as these were recorded on the regulator's sites and were consistent in the jurisdictions where the two CCNM campuses reside and were analyzed. NDs in British Columbia with prescribing authority have an exclusionary list of drugs for prescription, while in Ontario, NDs are restricted to a narrow schedule of substances that they are permitted to prescribe. The broad scope of practice in British Columbia[28] is likely a strong contributing factor to the high rate of graduates who take the additional training to acquire certification in IVIT and prescribing. 93.8% of CCNM-Boucher graduates, compared with 54.7% of CCNM-Toronto graduates, are listed as having prescribing certification, and 83.4% of CCNM-Boucher graduates, compared with 30% of CCNM-Toronto graduates, have their IVIT certification.

Timing Between Graduation and Registration

Medical licensing examinations are considered an essential part of the process in certifying that a doctor is ready to practice.[29] Recent studies of licensing examinations and candidate performance found a positive correlation between national license examination performance and patient outcomes and a negative correlation with rates of complaints.[29] A separate study found a correlation with honours grades and examination outcomes even after correction for gender, institution, and test-taking ability, and a positive correlation with clinical performance.[30] The Naturopathic Physicians Licensing Examinations (NPLEX) established by the North American Board of Naturopathic Examiners (NABNE) have been available to Canadian CNME-accredited naturopathic graduates since the early 1990s.[1,23] In 2019, the Council of Naturopaths of Ontario (CONO), the regulator of the naturopathic workforce in Ontario, created its own entrance-to-practice examination for those naturopathic doctors seeking registration in Ontario.[31] The CONO entrance-to-practice exam has been accepted by naturopathic regulators in Alberta, Saskatchewan and the Northwest Territories, but not in British Columbia or Manitoba.[5] With the exception of Ontario, the NPLEX exam continues to be accepted in all regulated Canadian jurisdictions.

The NPLEX exams are offered twice a year, in August and February.[23] The CONO entrance-to-practice exams are offered in February and August or September for the clinical science exam and March and September for the biomedical exam.[31] The timing of exams after graduation results in graduates not being eligible for registration for at least 5 months—time to write the exam and for the regulatory authority to mark and to advise the graduates of their results; NPLEX results are released in September and March, respectively. After writing NPLEX, the percentage of graduates from CCNM-Toronto who received registration within 7 months was between 39.1% in 1997 and 61.4% in 2012. After the entrance-to-practice examination was changed to the CONO exam, the rate that received registration within 7 months dropped to 31.9% in 2020. The CCNM-Boucher graduates, who primarily wrote NPLEX, did not see the same drop in registration within the first 7 months of graduation. CONO indicated that the pass rate for the 2020–2021 entrance-to-practice exam was 55% for the biomedical and 74% for the clinical sciences exam.[31] The pass rate for those taking the NPLEX entrance-to-practice exam as graduates from CCNM-Toronto and CCNM-Boucher over the last 5 years has ranged from 76% to 88%.[32] Research into the impact of delayed registration should be explored as it relates to registration status and/or competency and retention of naturopathic graduates. Further research should be conducted to fully understand the entrance-to-practice examination factors and the sociodemographic factors that impact delayed registration.

This is the first study addressing retention rates and registration status of naturopathic doctors from accredited naturopathic educational programs in Canada, and further research is required to understand the factors impacting registration status, such as workload, income, practice location, and/or sociodemographic factors (e.g., gender, race, age, family status, etc.).

Limitations

A limitation of this study is that the data from any of our information sources (regulators, internet searches) do not capture the reasons why NDs chose other professions/careers, are inactive, resigned, or who have had their registration cancelled or revoked, nor their activities. The information and the categorizing of information provided by the various naturopathic regulators is not consistent and limited our ability to make direct comparisons. For example, CONO's categorization includes active, revoked, resigned, and inactive, whereas CNPBC's categorization includes active, inactive, and cancelled. This study did not capture information regarding practitioners who may have been registered in more than one jurisdiction and did not verify the status of those practitioners listed as inactive or cancelled. This study also did not verify that practitioners listed as registered in a jurisdiction were actually practicing in that jurisdiction. The selection of CCNM-Toronto cohorts may not be reflective of all CCNM-Toronto cohorts. The impact of grouping CCNM-Boucher cohorts was not determined. Determining the exact number of months between graduation and registration was challenging as some students attended their convocation in May or June, but did not actually fully complete the requirements for graduation and did not receive their diploma or certificate of graduation until a few months later. Another limitation was that the date of entrance exams varied slightly between the cohort years and between NPLEX and CONO's entrance exams. For the purpose of the study, all graduates were deemed to have graduated in May. The precision and accuracy of the information sources utilized to capture status is unknown. However, our study used all reasonable approaches to capture the last known status of graduates through publicly accessible means.

The annual class size at CCNM-Boucher is generally around 35 students, compared with CCNM-Toronto at around 110 students.[9] The impact of class size on registration status has not been explored. The majority of the graduates where no data were available were part of the graduating classes from 2017 and 2020 for CCNM-Toronto. Based on the relatively low pass rate of the 2021-22 CONO exam, there is a concern that some of the graduates from 2020 where information was missing were impacted by this exam outcome.

Some information, such as total number of graduates from CCNM, the number of faculty or staff holding an ND designation,

the total number of NDs in Canada, the number of NDs working at Health Canada, and NPLEX average pass rates were received based on communication with senior leadership personnel. Every effort was made to verify the data.

CONCLUSION

The naturopathic graduates sampled have a retention rate similar to or higher than that of other healthcare professionals surveyed by Statistics Canada 2 to 3 years into their practice. Based on these findings, it may be argued that a high percentage of NDs remain in practice for a significant number of years. It takes over 50% of the graduates more than 7 months between graduation and the start of practice, the length of time appearing to be correlated with the timing of the entrance-to-practice examinations. Addressing the length of time between graduation and registration and its impact on ongoing registration status requires further evaluation. The majority of graduates appear to practice in the same province as the naturopathic program they attended. Additionally, there appears to be a higher percentage of NDs practicing in British Columbia who have certification in prescribing and intravenous therapies, which may be a reflection of the broader scope of practice in that province.

AUTHOR AFFILIATIONS

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KC and PRS are employees of CCNM. IL teaches part-time at CCNM. PRS is unpaid President of NPLEX.

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