Editorial: Summer of Fires

Marianne Trevorrow,[1] MA, ND

This has been a summer of wildfires and extreme weather events in Canada, playing out in real time with multiple evacuations across the North West Territories and in several of our southern provinces. As we go to press, many people are only now returning to their homes in interior British Columbia, Yellowknife and the Northwest Territories from fires which began in early August.[1]

Beyond the risks of death and injury from proximity to wildfires, there are considerable physical and mental health effects due to wildfire smoke; smoke-related pollution will often travel thousands of kilometres away from active fire sites to create downstream health problems for people with asthma, chronic obstructive pulmonary disease (COPD), and chronic heart disease, as well as for pregnant people.[2] Additionally, we are dealing with disaster-related post-traumatic stress and anxiety from weather-related disasters, as well as other documented psychological threats stemming from the knowledge that these summers are likely to become more frequent, leading to grief, anger, or simply despair that our climate is deteriorating in ways that none of us may be able to do much about.

While understanding the physical and mental health effects of climate change is part of naturopathic medical training, there is still much that we don't know about the long-term health effects of wildfire smoke, and of our changing climate in general. At *CANDJ*, we are promoting educational initiatives and further association-based discussions on these topics, as well as collaboration with many diverse planetary health interest and advocacy groups outside the profession, as we share many of the same concerns and goals.[3]

For this issue of *CANDJ*, our government relations letter addresses a topic of recent concern for many of our members, namely proposed increases to fees by the Natural and Non-Prescription Health Products Directorate (NNHPD) of Health Canada for natural health products (NHPs). Since this issue was first announced by Health Canada in May, CAND leadership and staff have been working overtime on this file, coordinating email and lobbying campaigns with Health Canada, the government and many members of parliament. As the consultation period with Health Canada has now closed, we are hopeful that they have taken account of the concerns expressed by the CAND, our members and the public on these new, unwelcome costs to NHPs, based on a framework more appropriately suited to licensed pharmaceutical drugs and medical devices, where the risks are higher and the profit margins much higher.

Next up is a presentation of a newly developed clinical tool to support dietary intervention in a mental health context. As authors Aucoin and Barbaro point out, many patients are seeking complementary therapies for mental disorders due to inaccessibility within the publicly funded mental health system, or poor tolerability of conventional therapeutics. Naturopathic doctors (NDs) have long been providing complementary supports using a number of different modalities (including diet), but with new emphasis on collaborative and team-based care, questions have arisen regarding what it is that NDs *do* with nutritional counselling (as opposed to simply prescribing a number of natural health products), and whether it reflects current evidence-based best practices. This article represents one component of a multi-year project from Aucoin et al. at the Canadian College of Naturopathic Medicine (CCNM) to study the precise impacts of diet change on mental health symptoms while also developing knowledge translation strategies that facilitate the use of emerging evidence by both naturopathic doctors and other healthcare stakeholders around non-pharmacologic mental health interventions.

Our other Perspective for this edition is a provocative article by Solomonian and Osborne. Using a previously defined critique of conventional psychiatry known as the "attrition model," which argues that many psychiatric diagnoses are adaptations to dis-ease in social and ecological environments, they argue that naturopathic medicine in Canada should be wary of trying to align its values too closely with what they term the "biomedical paradigm" of the Canadian single-payer medical system. This system, they believe, both deprioritizes and stigmatizes "patient-oriented" outcomes central to the naturopathic model of care. Additionally, they argue that naturopathic medicine itself, in making itself more acceptable in this "dominant biomedical model" has co-opted many traditional and Indigenous healing traditions, but because

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of the economics of allied health in Canada, these very practices have become inaccessible to the marginalized communities they have been drawn from. While not every reader will agree with their calls for "resistance" to "biomedical dominance," still they point out an important tension between the ideals of naturopathic care as patient centred, integrative and accessible, and the current reality that determines which demographics are mostly likely to access that care.

Finally, we have a very interesting pilot clinical trial of a cold spinal spray form of hydrotherapy from Boopalan et al. of the Naturopathy Medical College and Hospital in Chennai, India. Although the results of their single treatment trial are preliminary, they did find that this form of hydrotherapy was able to lower systolic blood pressure in a group of male hypertensive patients.

After two years as the new digital *CANDJ*, our journal is definitely growing with each edition and we are excited to see the new studies and passionate perspectives on areas of naturopathic therapeutics and the direction this profession is taking. As editorial staff, we also welcome members' feedback about how we can continue to increase our audience and pursue the conversation about the science and practice of naturopathic primary care in Canada.

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CANDJ

Update from the Chair

Dr. Jatish Kaler, ND

Dear members of the CAND,

I appreciate this opportunity to introduce myself as the incoming Chair of the Canadian Association of Naturopathic Doctors (CAND). Over the past 6 years, I have had the privilege to serve on the CAND board and appreciate the board and the staff's dedication to the profession as well as the crucial role the national association plays in the advancement of our profession.

The CAND's mandate is to build public awareness of naturopathic medicine's value within the Canadian healthcare system, to inform and support our ND membership and to advocate on the profession's behalf with the federal government, health insurance companies, and corporate partners. Through its work, the CAND has launched numerous Naturopathic Medicine Weeks and a National Awareness Campaign, aided in regulatory efforts across the provinces and territories, lobbied for greater coverage of naturopathic services among insurance companies, and lobbied the federal government for greater consultation on public health matters, such as the inclusion of naturopathic benefits for Veterans Affairs and Indigenous Peoples and attending stakeholder consultations on Canadian federal healthcare reform.

With a strong professional association, our members can look forward to continued cultivation of our public image and further consultation with the federal government on how naturopathic medicine can strengthen our Canadian medical system through "Better Health Together."

Finally, I would like to specifically thank Shawn O'Reilly for her mentorship and service as the Executive Director and Director of Government Relations of the CAND for over 20 years and to the outgoing Chair, Dr. Mark Fontes, ND, for his invaluable leadership and guidance as Chair over the last 3 years.

Thank you for your time, and I look forward to serving the strong and growing community of Canadian Naturopathic Doctors.

Sincerely,
Dr. Jatish Kaler, ND

Dr. Jatish Kaler, ND, is Chair of the Canadian Association of Naturopathic Doctors.

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Government Relations Update for CANDJ

Shawn O'Reilly

As a national association, the CAND is mandated to represent and advocate for the naturopathic profession at the federal level with all Ministries, Directorates, and Departments. Over the past year we have made great strides on the profession's behalf getting coverage for naturopathic services for Veterans through Veterans Affairs Canada, continuing our participation on the Public Health Agency of Canada's (PHAC) Health and Allied Health Sector advisory table, and progressing, thanks to the support of the Chiefs of Ontario, towards coverage of naturopathic medicine for Indigenous Peoples under the Non-Insured Health Benefits program (NIHB). In April, the *Hill Times*, the preeminent publication read by all politicos in Ottawa, published our Op Ed on how naturopathic medicine continues to be an emerging answer to Canada's healthcare concerns.

Along with the accomplishments, the profession faced a significant challenge in May, when Health Canada announced its consultation on "Proposed Fees for Natural Health Products." The proposal, in response to a 2021 Auditor General's report on the Natural and Non-prescription Health Products Directorate (NNHPD), set out a number of proposed changes to the Natural Health Product regulations (NHPRs) to address the concerns outlined in the Auditor General's report and a cost recovery structure for NHPs based on the costing method used for drugs and medical devices. If implemented, the amendments and fees will cause significant price increases for NHPs and the loss of products and companies from the Canadian market. All stakeholders involved in the NHP sector, including the CAND, launched coordinated campaigns in opposition to the proposal. Health Canada, the Health Minister's office, and Members of Parliament (MPs) for all parties were inundated with the concerns expressed by NDs, patients, and the public—expressed by letter, by phone call, and in face-to-face meetings. Our campaign garnered support from many MPs, who committed to take our concerns forward to Health Canada, the Health Minister, and their colleagues in Parliament. In a meeting with the CAND, Health Canada acknowledged the significant number of responses it had received. The consultation closed on August 10, 2023, and at time of writing, the CAND awaits Health Canada's report on its review of the input received and how it proposes to move forward.

The House of Commons adjourned in June, slated to return September 18, 2023. However, while MPs went back to their home ridings to spend the summer assisting constituents, the Prime Minister decided to shuffle his cabinet. The shuffle resulted in new Ministers in several key portfolios for the CAND—Health, Veterans and Indigenous Affairs. The process of developing relationships with the new Ministers and their staff has begun and we look forward to working with them in our advocacy efforts for the naturopathic profession.

Shawn O'Reilly is the Executive Director and Director of Government Relations of the Canadian Association of Naturopathic Doctors.

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The Critical Role of Diet in the Prevention and Treatment of Mental Disorders: An Opportunity for the Naturopathic Profession to Positively Impact the Burden of Illness Using a Recently Developed Clinical Tool

Monique Aucoin,[1,2] ND, MSc, and **Domenique Barbaro,**[1] BSc

ABSTRACT

The burden of mental illness is high, and currently available treatments do not meet the needs of all people affected. Conventional treatment options for mental disorders are not always accessible, effective, or well tolerated, and many individuals therefore seek complementary therapies. There is emerging and compelling evidence that diet is an important modifiable risk factor in the development and progression of mental illnesses, and early evidence suggests that diet modification is an effective therapeutic intervention.

However, dietary counselling in the context of mental health care is currently underutilized, including in the delivery of naturopathic care. A recently created clinical tool meant to facilitate dietary counselling in mental health care is presented along with a description of its development and a discussion of barriers. There is an opportunity for naturopathic doctors to use this tool or other resources to support individuals experiencing mental illness through dietary counselling and to be leaders in the use of diet change for the treatment of mental health conditions.

Key Words Nutrition, mental health, psychiatry, dietary counselling, nutritional psychiatry, naturopathic medicine, naturopathy

INTRODUCTION

Mental illness is the leading cause of disability in Canada, with 1 in every 3 Canadians affected in their lifetime.[1,2] Each year, around 15% of Canadians use health services for mental health concerns, and there is an estimated economic burden of $51 billion dollars per year.[2] The current model of mental health care in Canada involves treatment options that include pharmacologic and psychosocial interventions.[3] Pharmacological treatments can be efficacious and show evidence of improving quality of life for those suffering from mental health disorders. However, adverse side effects, patient hesitancy, and lack of efficacy among many individuals limit these treatments' potential to provide relief. Cognitive behavioural therapy and other psychotherapy approaches have proven to be efficacious and cost-effective treatment methods, but barriers such as cost and availability of service providers are significant.[4] It is evident that there is a need for novel or complementary mental health treatment approaches and prevention strategies.

The Canadian healthcare system is working to become more collaborative, accessible, and equitable when it comes to mental health.[5] The Mental Health Commission of Canada has identified opportunities for change and has developed new frameworks and strategies that include promoting mental health support across the lifespan, fostering recovery and well-being for individuals of all ages, and providing access to the right combination of services and treatment approaches.[5] Naturopathic doctors (NDs) and other complementary care services can help support this transition to a more collaborative and accessible model of mental health support.[6] NDs operate according to a model of whole health delivery.[6] They help improve mental health and overall well-being through evidence-based interventions while ensuring there is continuity between health services and taking the determinants of health into account.[6]

Many patients seek complementary or alternative care when conventional treatment options are not accessible, effective, or well-tolerated.[7] There is a growing body of evidence to support the role of non-pharmacologic interventions in the treatment of

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mental health disorders. Naturopathic care is often sought because of its strength in holistic assessment and management. According to a recent global survey of naturopathic practice, mental health concerns account for 11% of patient visits, putting it in the most prevalent category of health conditions seen in naturopathic medicine.[8] NDs use a variety of modalities to support mental well-being, including dietary supplements,[9] exercise prescription,[10] herbal medicine,[11] acupuncture,[12] and homeopathy,[13] each with mounting evidence. However, the authors of this paper suggest that dietary counselling as a tool for mental health promotion is underutilized within the naturopathic profession and represents an enormous opportunity for NDs to improve the mental health of their patients as well as lead a shift in Canadian mental health care that is focused on health promotion (rather than symptom management), supportive of patient self-efficacy, and, ultimately, impactful in lowering the burden of mental illness in our society. This paper will review evidence on the relationship between diet and mental health and present a newly developed clinical tool which can be used to facilitate dietary counselling as a therapeutic approach to mental health care in clinical practice.

Observational Evidence on the Role of Nutrition in Mental Illness Pathogenesis

The last decade has seen the emergence of mounting observational evidence that nutrition plays a role in the development of mental illness. One systematic review of prospective observational studies that looked at the relationship between diet quality and depression risk found that higher diet quality (regardless of the diet type) was associated with a lower risk of symptoms of depression at a later follow-up time.[14] This review also found that a diet with a lower inflammation score was associated with a lower risk of depressive symptoms.[14] This relationship occurred in a linear, dose-dependent fashion,[14] suggesting that even small improvements may be associated with a protective effect. A recent systematic review of observational studies looking at the relationship between the Mediterranean diet and Axis I disorders (anxiety, depression, eating disorders, schizophrenia, etc.) found that this diet pattern was associated with reduced symptoms of Axis I disorders, especially depression and anxiety.[15] An additional recent systematic review and meta-analysis of observational studies that looked at ultra-processed food consumption and mental health outcomes showed that increased consumption of processed foods was associated with increased odds of anxiety and depressive symptoms.[16] It is important to note that while this evidence highlights a relationship between diet and mental health, this relationship is recognized as being bidirectional in nature. Because some of the observational studies included in the systematic reviews described were cross-sectional, casual relationships cannot be definitively identified. Cross-sectional studies measure exposures and outcomes at the same time, making it hard to definitively identify a cause-and-effect relationship. In contrast, cohort studies measure baseline diet exposures and follow participants for a period of time, monitoring for the development of a disorder; as such, they are better able to identify causal pathways. Many cohort studies have identified a relationship between poor baseline diet quality and the subsequent development of mental illness,[14] suggesting that diet quality is having an impact on mental health outcomes; however, in order to understand the therapeutic potential of dietary modification among individuals experiencing these conditions, it is essential to explore the experimental research that has been conducted.

Experimental Evidence on the Role of Nutrition in Mental Health Treatment

The past 5 years has seen the emergence of several high-quality randomized clinical trials on the role of diet changes in the treatment of mental health disorders. The "SMILES" trial in Australia was a randomized controlled trial that measured the impact of dietary counselling for adults with major depressive disorder.[17] Fifty-six adults with moderate to severe depression and a poor-quality baseline diet completed the 12-week trial. They were randomized to a diet support group (n=31) or a social support group (n=25) and depression was assessed as a primary outcome using the Montgomery–Åsberg Depression Rating Scale (MADRS).[17] The dietary support consisted of nutritional counselling from a clinical dietician that included motivational interviewing, mindful eating habits and goal setting to help implement a modified Mediterranean diet. The dietary support group had a significantly greater improvement on the MADRS than the social support group ($p<0.001$), with a number needed to treat of 4.1.[17] At the conclusion of the intervention, 1 in 4 participants no longer met the criteria for major depressive disorder. Economic evaluation of this study revealed that the dietary intervention resulted in a lower health sector cost and societal cost as a result of less frequent healthcare visits and lower cost of unpaid productivity.[18] This study was the first to show that dietary improvement can be an efficacious, cost-effective option for the treatment of depression.

Another study called HELFIMED assessed the effect of a Mediterranean-style diet intervention in combination with fish oil supplementation in a group of adults with depression.[19] Ninety-five adults with self-reported depression were randomized into two groups: one received Mediterranean-diet cooking workshops for 3 months and fish oil supplementation for 6 months, while the comparison group attended social support groups for 3 months. Blood samples were taken and mental health, quality of life, and dietary questionnaires administered at baseline, 3 months, and 6 months.[19] Results showed that the Mediterranean-diet group had a greater reduction in depression symptom severity and improvement in quality of life when compared with the social support group. Interestingly, while the dietary counselling component lasted 3 months, the improvements observed in that time were maintained at the 6-month follow-up.[19] A gap in the current research is the lack of experimental evidence on the effects of dietary counselling for the treatment of anxiety disorders; however, this gap is currently being addressed by the EASe-GAD study. This wait-list controlled pilot trial is the first trial to explore the effects of dietary counseling combined with omega 3 supplementation for adult women with generalized anxiety disorder.[20] This study is currently in progress.

Mechanisms

Several mechanisms have been identified which might explain the relationship between diet patterns or constituents and mental health outcomes.[21] While a comprehensive review of these mechanisms is beyond the scope of the present article, a brief summary is presented.

Dietary glycemic index has been recognized as an important factor in mental health. The brain cannot make or store sugar. Therefore, it relies on blood sugar as a source of energy.[22] When blood sugar is poorly regulated, hypoglycemia may occur; hypoglycemia symptoms overlap significantly with the symptoms of anxiety and depression and may exacerbate mental health symptoms. Cohort studies have shown an association between a higher glycemic index diet and both higher odds of depression and higher depression symptom scores.[22] In a meta-analysis, anxiety was also found to be associated with poor glycemic control.[23]

Dietary fibre also appears to be a constituent that impacts mental health. In addition to improving glycemia, dietary fibre increases the diversity of the gut microbiome, which in turn directly affects the brain through the microbiota–gut–brain axis, a complex bidirectional pathway that involves the production of a range of neurotransmitters and other neuroactive substances and modulates neurogenesis, inflammation, immune activation and hypothalamus–pituitary–adrenal axis activity.[24]

Adequate protein intake provides essential building blocks for the synthesis of neurotransmitters. In experimental studies, the depletion of the amino acid tryptophan has been shown to induce depression in susceptible individuals.[25] Dietary fats play a critical role in cell signalling, and the relative proportion of fatty acids in the body impacts inflammation levels.[26] Inflammation is emerging as a highly important and modifiable risk factor in the development and progression of depression and anxiety symptoms.[27] Observational data show increased inflammation levels in some people with mental disorders, and the experimental administration of inflammatory cytokines induces mood disturbance.[28] Early evidence suggests that anti-inflammatory agents may be able to mitigate depression symptoms.[29] It has been established that the Mediterranean diet and other healthy diet patterns decrease systemic inflammation, likely through the effects of phytochemicals found in vegetables, fruit, herbs and spices, fibre, and omega-3 or omega-9 fatty acids.[30,31] One proposed mechanism mediating the effects of inflammation on mental health is the kynurenine pathway. In the presence of inflammation, tryptophan that would be otherwise used for serotonin synthesis is used to produce quinolinic acid and kynurenic acid instead.[32] While the mechanisms connecting dietary factors and mental health are just emerging, they add to our understanding of how diet modification might cause mental health changes.

Barriers

It is evident that adequate nutrition is a critical lifestyle factor that contributes to both physical and mental health, yet dietary counselling is significantly underutilized within a range of healthcare sectors.[33,34] Nutritional interventions have far-reaching and well-documented beneficial effects on a wide range of health outcomes;[35] however, due to the nature of implementing behavioural change, barriers to utilization exist.

One of the barriers limiting the use of dietary counselling in mental health care may be health professionals' educational and knowledge gaps. A recent international survey explored the opinions of psychiatrists, psychologists, and psychotherapists on nutritional medicine literacy.[36] Results showed that while health professionals were interested in using nutrition in their mental health care practice and see it as a critical pillar in their biopsychosocial care, education and adequate knowledge of nutrition were reported to be lacking.[36]

An additional barrier to implementing nutritional medicine in practice is the difficulty associated with patient behaviour change. Behavioural changes require motivation, consistency, time, skill, and effort on the part of the patient, which is often harder than taking a supplement or medication. It is also important to note that depression and other mental health issues involve cognitive and behavioural symptoms that can affect motivation, which can also present as a barrier to behavioural change.[37] An Australian study in 2019 conducted interviews with general practitioners (GPs) to explore their perceptions surrounding implementing lifestyle behavioural changes in practice.[38] Themes that emerged were centred on general practitioners' lack of time and tools to initiate behavioural change, as well as the perception that behavioural change will not be implemented or elicit benefits in their patients.[38] That being said, the importance of lifestyle behaviours was recognized and was identified as an aspect of primary care that GPs wish to improve.[38] In a qualitative study conducted in 2020, patients were asked about their opinions on behavioural change in practice after recent appointments with their GPs.[39] Themes that emerged were that patients wish to discuss lifestyle behaviours more frequently, and that discussions around behavioural change are generally welcomed and expected.[39] Therefore, the concern that dietary counselling may be poorly received by patients may not be accurate.

Another barrier that is often presented to the author team when discussing the potential role of diet counselling as a treatment for mental disorders was cost. As part of the SMILES study cost effectiveness analysis, researchers compared the cost of participants' baseline diets with the SMILES diet; they found that the recommended diet was less costly than the participants' baseline diet.[17] This may have been attributable to both the decrease in processed/prepared foods and meat products and the increase in inexpensive plant-based protein sources and more time spent cooking at home.

While dietary counselling and behaviour change are challenging, they are feasible. In the studies described earlier in this article, participants with moderate to severe depression were able to make significant improvements in their dietary habits when provided with consistent support, guidance, and accountability from a qualified health professional using behaviour change strategies such as goal setting and motivational interviewing.[17,19]

A Recently Developed Tool to Support Diet Change Among Individuals Experiencing Mental Illness

In response to some of these barriers, and in an effort to support mental health professionals' engagement with dietary counselling, a project was completed to develop a clinical tool and clinician

guide.[40] Two scoping reviews inspired this project. One explored all of the research on the relationship between dietary patterns or constituents and anxiety while the other explored this topic with respect to psychotic disorders.[41,42] These reviews sought to systematically identify and synthesize all of the evidence on these topics. In total, the reviews incorporated the findings of 1,541 and 822 articles, respectively. Both found an association between lower disorder incidence or symptom severity and higher intake of vegetables and fruit, omega-3 fatty acids, and several micronutrients and phytochemicals. Associations were found between a higher incidence or symptom severity and high fat diets, inadequate tryptophan and dietary protein, and high intake of sugar and refined carbohydrates. While this evidence is considered preliminary due to a large proportion of pre-clinical and observational studies, these findings are consistent with previously published literature on the principles of healthy eating. Despite these meaningful results, it is known that the incorporation of new evidence into clinical care is generally slow[43] and the authors have undertaken a knowledge translation project aimed at increasing the use of this evidence in clinical care.[40]

Due to emerging evidence that diet is likely a significant, modifiable risk factor for mental health concerns and the dearth of existing tools and educational materials, the objective of the project was to develop a worksheet and clinician guide to facilitate nutritional counselling for those with mental health conditions.[40] The process of creating the tool began with a draft created by the research team using evidence from the scoping review, along with Canada's Food Guide.[44] The creation of the draft worksheet was guided by social cognitive theory, which highlights the importance of goal setting, social norms, self-efficacy, and self-control.[40] Previous research on implementing dietary changes in those with mental illness was also considered while creating the draft.[40] The worksheet presents dietary recommendations in a simple format with clear instructions for the patient. It also addresses the commonly cited financial barrier by highlighting inexpensive healthy food options.[40] The worksheet has a positive and encouraging tone and includes interactive components and opportunities to promote engagement, action planning, and goal setting.

This worksheet draft and accompanying clinician guide were then pilot-tested during 75-minute virtual focus groups with psychiatrists and 15- to 30-minute phone interviews with individuals with lived experience with psychosis.[40] The participants rated the worksheet on a 3-point scale for how encouraging, useful, attractive, informative, interesting, trustworthy, and easy-to-understand they perceived it to be. There were also open-ended questions to gather qualitative feedback. All interviews were recorded and transcribed. Based on the interview feedback, the clinician guide and worksheet were revised.[40] The final product was shared with the participants, who reported that it satisfied their needs and was adequately modified. The worksheet (in English and French, Appendices 1 and 2) and clinician guide (Appendix 3) serve as a resource to support healthcare providers in incorporating dietary counselling into a treatment protocol for mental health concerns.

When considering the use of dietary counselling as a treatment strategy, it is important to highlight some characteristics of the participants involved in the studies reporting therapeutic benefit. In the SMILES and HELFIMED studies, participants were eligible if their baseline diet was suboptimal. As such, diet improvement may not yield the same degree of benefit among individuals already eating a high-quality diet. With respect to other treatments, it is evident that dietary counselling can be used adjunctively. In the SMILES study, 82% of participants were using psychopharmaceuticals, psychotherapy, or a combination of the two while participating, suggesting that this strategy might be useful regardless of other interventions used.[17]

CALL TO ACTION AND CONCLUSIONS

The burden of mental illness is high, and currently available treatments do not meet the needs of all people affected. There is emerging and compelling evidence that diet is an important modifiable risk factor in the development and progression of mental illnesses, and early evidence suggests that diet modification is an effective therapeutic intervention that is currently underutilized in mental health care. While perceived barriers such as cost and patient resistance exist, they are not adequately supported by evidence. There is an opportunity for NDs to be leaders in the use of dietary change for the treatment of mental health conditions. Naturopathic doctors have extensive training in clinical nutrition; additionally, longer patient visits allow sufficient time for nutrition education and behaviour change strategies, such as goal setting, action planning, identification of barriers, and problem solving. Naturopathic practice has an emphasis on lifestyle and behavioural change, and the use of dietary change for the treatment of mental health conditions is highly consistent with the philosophy of naturopathic medicine and the principles of treating the root cause and creating the conditions for health. Overall, the naturopathic profession is well positioned to improve the lives of those with mental health conditions through dietary counselling. Our intent is to encourage NDs to utilize this new tool to facilitate dietary counselling with people experiencing mental illness and lead a shift in the delivery of mental health care in Canada.

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APPENDIX 1: EATING WELL FOR MENTAL HEALTH WORKSHEET[a]

Eating well for mental health

A tool to support people impacted by mental illness

The food we eat affects our body and mind. You can make healthier choices that will improve your health.

Why is healthy eating important to me? _____

Read the recommendations below. Circle foods that appeal to you.

Choose complex carbs

- Whole grain bread, pita, tortilla, or pasta instead of white
- Instead of white rice, try brown rice, wild rice, quinoa, oats, millet
- Vegetables like potatoes, sweet potatoes, yams, corn, squash, cassava

Choose healthy fats like olive oil and sources of omega-3

- Eat fish and seafood (oysters, mussels, shrimp) at least 3 times per week
- Add nuts, seeds or avocado to meals, or enjoy as a snack
- Decrease deep fried foods (French fries, fried chicken)

Reduce highly processed foods and sugar

- Drink water instead of pop, juice and iced-tea
- Have cookies, cakes, muffins, ice cream, candy as a special treat, not every day

Add vegetables & fruits to meals and snacks

- Try to include different colours
- Add salad or veggies and dip to meals. Explore frozen and canned vegetables
- Try fruit that is fresh or frozen as a snack or dessert

Eat protein-rich foods throughout the day

- Try eggs, fish, seafood, chicken, turkey, beans, lentils, nuts, seeds, tofu, cheese, meats and wild game

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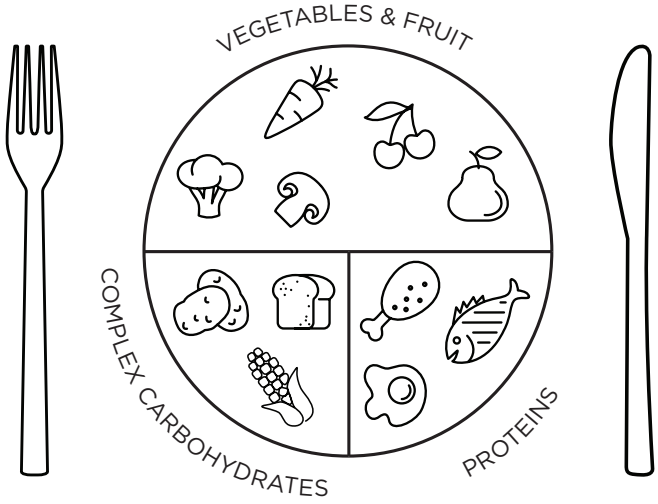

I'm going to try / I might like:

_____

Two Day Sample Meal Plan:

	Day 1	Day 2
Breakfast	Oatmeal/ porridge with nuts or seeds and berries	Eggs with whole grain toast or potatoes and fruit
Lunch	Salad with protein-rich food and healthy fat	Turkey sandwich with side of sliced cucumbers and carrots
Dinner	Whole grain pasta with tomato sauce and added ground chicken and vegetables	Brown rice stir-fry with shrimp or tofu and frozen vegetables
Snack or Dessert	Vegetable sticks with hummus or guacamole	Plain yogurt with fruit

Healthy eating doesn't need to cost more:

Lower Cost Healthy Foods	Price (in Canadian dollars)
Frozen vegetables and fruit	$3-4 per bag (5 or more servings)
Canned fish and seafood (tuna, oysters, salmon, mussels, sardines)	$1.50-4 per can (1-2 servings)
Canned beans and lentils	$1-2 per can (2 servings)
Eggs	$3-4 per dozen (6 servings)
Whole grains in large packages	$5-6 per bag (5 or more servings)
Tofu	$3-4 per package (3 servings)

Tip: Shop at budget grocery stores, look for sales and stock up on non-perishable foods

My goals

Habit I would like to continue: _____

Changes I would like to make: _____

Who can help me achieve these goals?_____

Preparing food for yourself and making healthy food choices is self-care. Small changes add up. Eat and prepare meals with others.

Revised May 2023

a Created by modifying Supplemental Materials from "Design and pilot evaluation of an evidence-based worksheet and clinician guide to facilitate nutrition counselling for patients with severe mental illness," by L. LaChance, M. Aucoin & K. Cooley, BMC Psychiatry 21, 556 (2021), https://doi.org/10.1186/s12888-021-03575-7. Copyright 2021 by LaChance, Aucoin, Cooley. Licensed under CC BY 4.0. Adapted with permission.

APPENDIX 2 : BIEN MANGER POUR SA SANTÉ MENTALE[b]

Bien manger pour sa santé mentale

Un outil pour aider les personnes touchées par une maladie mentale

La nourriture que nous mangeons affecte notre corps et notre esprit. Vous pouvez faire des choix plus sains qui amélioreront votre santé.

Pourquoi une alimentation saine est-elle importante pour moi? _____

Lisez les recommandations ci-dessous. Encerclez les aliments qui vous plaisent.

Choisissez des glucides complexes

- Pain, pita, tortilla, ou pâtes de grains entiers au lieu de blanc
- Au lieu du riz blanc, essayez le riz brun, riz sauvage, quinoa, avoine, millet
- Des légumes tels que des pommes de terre, patates douces, ignames, maïs, courge, manioc

Choisissez de bons gras comme l'huile d'olive et des aliments riches en oméga-3

- Mangez du poisson et des fruits de mer (huîtres, moules, crevettes) au moins 3 fois par semaine
- Ajoutez des noix, des graines ou de l'avocat à vos repas ou savourez en collation
- Diminuez les aliments frits (frites, poulet frit)

Réduisez les aliments ultras transformés et le sucre

- Buvez de l'eau au lieu de boissons gazeuses, jus et thé glacé
- Mangez des biscuits, gâteaux, muffins, crème glacée, bonbons comme friandise spéciale, pas tous les jours

Ajoutez des légumes et des fruits à vos repas et à vos collations

- Essayez d'inclure différentes couleurs
- Ajoutez à vos repas une salade ou des légumes accompagnés d'une trempette. Découvrez les légumes surgelés et en conserve
- Essayez des fruits frais ou surgelés en collation ou dessert

Mangez des aliments riches en protéines durant la journée

- Essayez les œufs, le poisson, les fruits de mer, le poulet, la dinde, les légumineuses, les graines, le tofu, le fromage, la viande et le gibier sauvage

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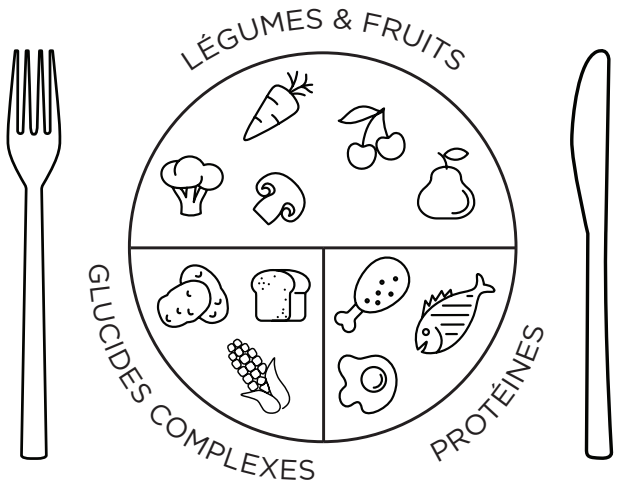

Je vais essayer / je pourrais aimer:

_____

Exemple de plan de repas de deux jours:

	Jour 1	Jour 2
Déjeuner	Gruau accompagné de noix ou de graines, et de petits fruits	Œufs avec pain grillé ou pommes de terre et fruit
Dîner	Salade accompagnée d'un aliment riche en protéine et bon gras	Sandwich à la dinde accompagné de tranches de concombre et de carottes
Souper	Pâtes de blé entier accompagnées de sauce tomate, de poulet haché et de légumes	Sauté de riz brun aux crevettes ou tofu et légumes surgelés
Collation ou dessert	Légumes en bâtonnets avec houmous ou guacamole	Yogourt nature accompagné de fruits

Une alimentation saine n'a pas besoin de coûter plus cher

Aliments sains à moindre coût	Prix (dollars canadiens)
Légumes et fruits surgelés	3-4$ par sac (5 portions ou plus)
Poisson et fruits de mer en conserve (thon, huîtres, saumon, moules, sardines)	1.50-4$ par boîte de conserve (1-2 portions)
Légumineuses en conserve	1-2$ par boîte de conserve (2 portions)
Œufs	3-4$ la douzaine (6 portions)
Grains entiers en grande quantité	5-6$ par sac (5 portions ou plus)
Tofu	3-4$ par paquet (3 portions)

Truc: Magasinez dans des épiceries économiques, recherchez des produits à prix réduit et faites le plein d'aliments non périssables

Mes objectifs

Habitude que j'aimerais continuer: _____

Changements que j'aimerais faire: _____

Qui peut m'aider à atteindre ces objectifs? _____

Cuisiner soi-même et faire des choix alimentaires sains, c'est prendre soin de soi. Les petits changements s'additionnent. Manger et préparer des repas avec les autres.

Révisé en mai 2023

b Created by modifying Supplemental Materials from "Design and pilot evaluation of an evidence-based worksheet and clinician guide to facilitate nutrition counselling for patients with severe mental illness," by L. LaChance, M. Aucoin & K. Cooley, BMC Psychiatry 21, 556 (2021), https://doi.org/10.1186/s12888-021-03575-7. Copyright 2021 by LaChance, Aucoin, Cooley. Licensed under CC BY 4.0. Adapted with permission.

APPENDIX 3: EATING WELL FOR MENTAL HEALTH CLINICIAN GUIDE[c]

Eating well for mental health Clinician Guide

Overview:

- Objective: Integrate basic nutrition psychoeducation into psychiatric care
- Who is this handout for? Individuals with severe mental illness or schizophrenia spectrum disorders (SSD) during periods of relative clinical stability. This tool has been developed to be delivered by a health care professional without formal nutrition training. Introduce this handout when you would normally discuss health behaviours such as sleep, substance use or physical activity.
- Reference for handout content: Aucoin M, LaChance L, Cooley K, Kidd S. Diet and psychosis: a scoping review. Neuropsychobiology. 2020;79(1-2):20-42.

Suggested Agenda:

Page 1

- Ask the patient for permission to discuss their diet and provide some basic rationale for doing so. You could read the introductory statement. If the patient declines, consider asking again at a later date.
- Ask "Why is healthy eating important to you?" to increase motivation and engagement.
- As you review the 5 recommendations, prompt the patient to circle options that appeal to them.
- Provide rationale for recommendations as per the table below if indicated.

Page 2

- Sample plate: This is a visual representation of the recommended relative proportions of different food categories in an ideal meal.
- Sample meals: Review sample meals with patient.
- Prompt patient to generate an idea of a meal that they could try based on the sample plate or sample meals. Record this on the handout.
- Healthy eating doesn't need to cost more: Discuss how spending $10 could allow them to include several items from the list. Consider pointing out the relatively increased cost of processed, convenience and restaurant foods. Direct patient to a social worker if food insecurity is a concern.
- My goals:
    - *Habit I would like to continue*: Encourage patient by acknowledging and celebrating small successes to increase motivation and self-efficacy.
    - *Changes I would like to make*: Goal setting has been shown to increase accountability and likelihood of success. Consider choosing one of the 5 recommendations from page 1 as a goal.
    - *Who can help me achieve these goals?* This prompt serves to help mobilize others who can support, facilitate and hold the patient accountable to dietary change. Consider family members, friends, case manager, family doctor, dietitian, social worker, nurse, OT or others.
- Closing Statement: When possible, aim to keep messaging positive, celebrate small victories and provide encouragement.

Practical Considerations:

- Pace yourself: Implementing dietary changes is a gradual process and will not occur after one session. Consider setting one goal in the first session and revisiting the topic of nutrition at later times to follow up on the goal and make additional changes.

- Behaviour modification: Draw from your existing skills in behaviour modification. If you have knowledge of behavioural activation, motivational interviewing or another approach, remember they can be applied to dietary change as well.

- Cultural sensitivity: Consider asking patients about their culture's traditional foods. Many meals and recipes can be adapted to use grains, meat, bread-products, vegetables and spices from different cultures.

- Therapeutic diets: A small body of literature supports special diets as a therapeutic option for SSD. If patients are interested in gluten-free or ketogenic diets, please refer them to a nutrition professional.

    - Kelly DL, Demyanovich HK, Rodriguez KM, Cihakova D, Talor MV, McMahon RP, Richardson CM, Vyas G, Adams HA, August SM, Fasano A. Randomized controlled trial of a gluten-free diet in patients with schizophrenia positive for antigliadin antibodies (AGA IgG): a pilot feasibility study. Journal of psychiatry & neuroscience: JPN. 2019 Jul;44(4):269-76.
    - Sarnyai Z, Palmer CM. Ketogenic Therapy in Serious Mental Illness: Emerging Evidence. International Journal of Neuropsychopharmacology. 2020 Jul;23(7):434-9.

- Dietary assessment: If you are interested in conducting a basic dietary assessment, consider asking any of the following questions prior to reviewing the 5 recommendations on page 1:
    - What is your usual pattern of meals and snacks? Do you cook at home or buy prepared foods?
    - Take me through a typical day of eating.
    - Do you avoid any foods?
    - How many servings of vegetables do you eat per day?
    - How many times per week do you eat fish or seafood?
    - What beverages do you usually drink? (look for hidden sources of sugar)

- Portion Sizes: For guidance, search "Zimbabwe Hand Jive"

Recommendation	Supporting Evidence	Mechanism of Action
Choose complex carbs	-Observational studies have reported higher intake of refined carbohydrates and lower intake of fibre in individuals with SSD	-Complex carbohydrates are higher in fibre -A diet rich in fibre can improve blood glucose regulation (Level 1) and support a healthy gut microbiome composition (Level 1) -A healthy gut microbiome can support mental and physical health via the gut-brain axis and by modulating systemic inflammation; probiotic supplementation in patients with SSD has shown benefit (Levels 2)
Choose healthy fats like olive oil and sources of omega-3	-Observational studies have reported low levels of essential fatty acids such as omega-3 in individuals with SSD -Intervention studies of omega-3 fatty acid supplements have demonstrated efficacy in early psychosis (Level 2), clinical high risk of psychosis (Level 2), and metabolic outcomes in chronic schizophrenia (Level 1)	-Dietary fatty acids are incorporated into neuronal cell membranes and play important roles in modulating membrane fluidity and signal transduction -Inflammation is relevant to the pathophysiology of SSD. Omega-3 fatty acids have anti-inflammatory properties.
Reduce highly processed foods and sugar	-Observational studies have reported higher intake of processed food and lower diet quality in individuals with SSD -Intervention studies aimed at improving diet quality (as part of a multi-component interventions targeting health behaviours) have shown benefit for mental health outcomes in individuals with SSD (Level 2)	-Processed foods tend to be higher in sugar and lower in fibre and micronutrients. A high intake of processed foods can displace more nutrient-dense foods from the diet.
Add vegetables & fruits to meals and snacks	-Observational studies have reported low intake of vegetables and fruit in individuals with SSD -Observational studies have reported low levels of vitamin C and folate in individuals with SSD. -Intervention studies of folic acid in individuals with SSD have reported reduced negative and general symptoms of schizophrenia (Level 1)	-Vegetables and fruits provide micronutrients such as folate and vitamin C as well as fibre, antioxidants and phytonutrients -Human and animal studies suggest that improvements in SSD symptoms in response to vegetable or phytonutrient supplementation are mediated by a reduction in inflammation and oxidative stress
Eat protein-rich foods throughout the day	-Intervention studies of essential amino acid supplements have reported benefit on positive, negative, general (Level 1) and cognitive (Level 2) symptoms of SSD -Observational studies have reported low levels of zinc and vitamins B12 and B6 in individuals with SSD -Intervention studies of zinc supplements have reported benefit on positive and negative symptoms of SSD (Level 2) -Intervention studies of vitamins B6 and B12 have reported benefit on general symptoms of SSD (Level 1)	-Insufficient dietary protein consumption leads to deficiency in essential amino acids which cannot be produced by the body. Protein rich foods are also important sources of zinc, vitamin B12 and vitamin B6. -Essential amino acids serve important biological roles such as neurotransmitter synthesis and NMDA receptor modulation

Level of evidence 1 (highest) to 5 (lowest) ranked according to OCEBM Levels of Evidence Working Group*. "The Oxford Levels of Evidence 2". Oxford Centre for Evidence-Based Medicine. https://www.cebm.ox.ac.uk/resources/levels-of-evidence/ocebm-levels-of-evidence

[c] From "Design and pilot evaluation of an evidence-based worksheet and clinician guide to facilitate nutrition counselling for patients with severe mental illness," by L. LaChance, M. Aucoin & K. Cooley, BMC Psychiatry 21, 556 (2021), https://doi.org/10.1186/s12888-021-03575-7. Copyright 2021 by LaChance, Aucoin, Cooley. Licensed under CC BY 4.0. Adapted with permission.

Applying the Attrition Model to the Medical System: A Critique of the Current Resistance by the Naturopathic Profession in Canada to the Dominant Paradigm

Leslie Solomonian,[1] ND, MPH and **Bethany Osborne,**[2] PhD

ABSTRACT

The premise and attrition model of resistance proposed by some in the anti-psychiatry movement are relevant to all subspecialties of medicine. Themes of monopolization, capitalization and marginalization harmfully affect the delivery of health care across all domains and minimize systemic and structural contributors to health and disease. Naturopathic medicine offers promise to effectively support individuals and communities in navigating modern obstacles to good health but may, in practice, be inadvertently reinforcing the dominant paradigm. The attrition model offers guidance for a steady, strategic resistance instead.

Key Words Integrative medicine, social and ecological determinants of health

INTRODUCTION

The anti-psychiatry movement posits that the modern medical paradigm has harmfully pathologized diverse emotional and cognitive experiences of the world, simultaneously monopolizing the field of mental health.[1] What is pathologized as mental disease may be an attempt by the human brain to cope within a deeply wounded social and ecological environment.[2]

The tendency of the dominant medical model to reduce disease to parts and separate individual health from the environment is not unique to the field of psychiatry. Almost all medical disciplines tend to pathologize the individual, rather than seeing signs and symptoms as a body's struggle to respond to unhealthy social and ecological influences in an attempt to survive.[3,4] Human DNA, and the cells, tissues, organs and body systems commanded by its code, evolved to anticipate certain conditions for optimal health. When the environment does not provide these conditions, the body and mind activate complex mechanisms to adapt to the perceived threat,[5] manifesting as "disease."

The principles and practice of naturopathic medicine honour this complex holism of human health, its dependence upon ideal conditions, and its efforts to adapt to less-than-optimal circumstances. However, the profession arguably struggles to play a more meaningful role in the healthcare sector amidst the hegemony of the biomedical paradigm, a dominance which is reinforced by oppressive social, political, and economic systems. The naturopathic profession is not immune to these forces and may in fact be reinforcing them through its own efforts to legitimize.

The attrition model was first described by those involved in the movement for prison abolition and later applied to members of the anti-psychiatry movement, notably Bonnie Burstow.[1] Advocates of attrition argue that a feasible approach to challenging or reforming a dominant system is a process of wearing down or chipping away. Guiding questions can provide direction for thoughtful tactical planning towards a long-term goal:[1]

1. If successful, will the actions or campaigns that we are contemplating move us closer to the long-range goal of [reformation]?
2. Are they likely to avoid improving or giving added legitimacy to the current system?
3. Do they avoid "widening" the net [of the dominant system]?

We argue that, despite the promise of naturopathic medicine to address the current gaps in the healthcare system, efforts by the naturopathic profession have mostly served to reinforce the dominance of the biomedical paradigm as opposed to effectively challenging it. The naturopathic profession would do well to look to the framework of attrition to anchor strategies of advocacy and avoid perpetuating dominant systems.

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How Did We Get Here?

The dominant Western "health" system is coloured by capitalistic, objectivist, Eurocentric worldviews that place profit ahead of the health or well-being of people or the planet.[6-9] The history of institutionalization of "madness," in particular, runs closely parallel to systems of colonization and incarceration for the purpose of control.[10,11] These same forces underpin the evolution of modern medicine in the form of abhorrent experimentation on racialized, enslaved, and incarcerated individuals.[12-14] Colonization, genocide, and ecosystem destruction have also resulted in catastrophic loss of ecological memory and traditional knowledge.[15,16] In the end, this loss harms all who share the planet.

Although this machinery has been in motion for centuries, the Flexner Report grounded North American medical training in North America in a reductionistic, biomedical paradigm, effectively excluding other models.[9,17,18] The rise of pharmaceutical medicine in the mid-20th century informed the ways in which Canada's publicly funded healthcare system was first designed. The priority was ensuring that all Canadians had access to both hospital care and the substances required to address the leading causes of morbidity and mortality at that time. The vision for universal health care was never intended to stop there and remains limited to a small sphere of regulated healthcare providers.[19] Since then, shifting social and ecological determinants of health have led to a tsunami of non-communicable chronic diseases for which psychophysiological mechanisms well adapted to the conditions in which the human genome evolved are less helpful.[20,21] In a publicly funded system limited by finite resources and radically rising costs of health care, medical doctors must restrict time spent with individuals in order to serve more patients, significantly limiting the ability to practice patient-centred care.[22]

While the approach typical of the biomedical paradigm—even the biopsychosocial paradigm—can be lifesaving, it fails to address underlying causes of illness. The model of medicine that came to be in the first half of the 20th century is neither a cost-effective nor efficacious approach to these concerns; the dominant medical system was not designed to deal with them and contributes directly to the drivers that created them.[9,23] When so many resources are poured onto the worsening fires of planetary, community, and individual health, little remains to expand or reform the public health system to better prevent or mitigate them, even if the will was there, by those who hold power (see above).[24] (Some domains of dominant health systems, particularly nursing and the specialization of family and community medicine, acknowledge this.[25] Many publicly-funded healthcare providers are active and vocal advocates for structural change.)

Naturopathic medicine and other holistic paradigms are arguably better equipped to manage the dynamic complexity of individual health[26,27] but have been systematically marginalized.[9,27] Forces of global capitalist systems and Eurocentric ways of knowing bias medical scholarship and unduly influence disease management to the benefit of few and significant detriment of most.[28-31] The lobby power of philanthropists and pharmaceutical companies unduly sway health policy and practice.[32-34] While members of other health professions may be partially funded through socialist mechanisms, most are reliant on private enterprise. This inherently makes their commodified services inaccessible to many, or deprioritized in a system in which health care is perceived as "free," or dismissed as "alternative" at best and "quackery" at worst (see https://en.wikipedia.org/wiki/Naturopathy as a very public example). Consumers of privately provided healthcare services such as naturopathic medicine tend to sit in the upper strata of income and education, paying out-of-pocket, or using extended health benefits from employment.

This tiered system presents a harm of omission, denying others choice, and the opportunity for informed consent in health care,[35] and is a contributor to the complex mechanisms by which poverty predicts poor health.[36] It forces most people into the biomedical system, which has myriad consequences, including denial of care for those who do not meet the necessary criteria for a pathology,[37] stigmatization through pathologization of a normal state of being, disempowerment when told that healing lies solely within the biomedical domain or that a treatment does not exist at all. Those who only have access to dominant approaches such as pharmaceutical or surgical treatments also experience harms of commission when they suffer from unmitigated adverse effects. This is particularly true if a system only values "disease-oriented" as opposed to "patient-oriented" outcomes.[38]

A Critique of the Naturopathic Profession's Resistance to Biomedical Dominance

Naturopathic medicine is not innocent of the hegemony inherent in the dominant biomedical model, nor is it immune to tainting by the same themes of white supremacy and neoliberalism. The current framework of naturopathic medicine emerged from a Eurocentric origin, and has built itself through misappropriation and colonization of healing traditions from around the world.[39] Efforts to regulate naturopathic medicine make entry inaccessible to many due to educational and economic barriers, most notably members of marginalized communities from which many practices have been co-opted.[40,41] This also marginalizes and stigmatizes non-regulated traditional healers,[42] with dire consequences when the disregard for non-Eurocentric epistemologies in which these paradigms are rooted threaten planetary health overall.[4,43]

Efforts to meet mainstream standards of medical education and healthcare delivery in an attempt to demonstrate the profession's credibility perpetuate the biases that underpin the dominant paradigm. The construction of the system of modern medicine has been actively reliant on racism, misogyny, classism, heterocisnormativity, and genocide that caused and continue to cause devastating pain and suffering.[44] From the "Tuskegee Study of Untreated Syphilis," which withheld treatment from African American men to observe the natural progression of syphilis,[45] to the systematic exclusion of women from clinical trials,[46] to horrific nutritional experimentation on Indigenous children in residential schools,[47] to the pathologization of non-heterocisnormative sexual behaviour,[48] harm continues to reverberate through interpersonal and generational transmission of trauma and deeply embedded implicit and explicit bias resulting in systemic inequity across all

of society, including medical training and healthcare delivery—naturopathic too.[49,50]

Yielding to pressure to prove that naturopathic medicine is evidence-based according to dominant standards—which are biased by forces of reductionism and capitalism—risks minimizing the complexity of health and disease that naturopathic medicine claims to honour.[51,52] Success at generating acceptable evidence not only reinforces dominant paradigms, it empowers co-optation of these approaches in the form of the subspecialty of "integrative medicine."[42,53]

Due to the exclusion of naturopathic medicine from many collectivist insurance schemes, the cost of training demanded by regulatory standards, and the increasingly high cost of living, business training is a core element of naturopathic training to ensure that graduates are entrepreneurially competent. This can stray towards a mercenary approach.[54] Botanical and nutritional approaches are not immune to the siren call of the "natural health product" industry, such as the nutriceutical portfolio acquired by Nestle,[55] reducing systems of medicine to a commodified resource which not only introduces a conflict of interest but may also increase the risk of harm to both individuals[56] and the environment.[57] The emphasis on the use of for-profit laboratory investigations in the name of individualized or holistic health risks legitimizing a biomedical approach. Judging the success of doctors by the economic health of their business runs counter to the urgently essential role of the healthcare system in stewarding the health of the planet.[58]

The "therapeutic order" is a framework by which naturopathic principles can be integrated and applied to assess and manage health concerns, typically at an individual level and from a pluralistic perspective.[59] Truly seeking root cause and treating the whole, however, requires a broader perspective when we consider how much of individual health is impacted by social and ecological determinants.[60] Deeply embedded factors such as behavioural norms, economic circumstances, educational opportunity, and access to blue and green space have far more influence on individual health—even behavioural "choices"—than most naturopathic doctors (NDs) tend to acknowledge, placing a significant emphasis on *docere* and the onus for health on the individual. This tendency is rooted squarely among the meritocratic and individualistic values on which capitalism relies.[61]

Colonizing, controlling, commodifying, and individualizing naturopathic medicine perpetuates the problems within the dominant structures, as opposed to wearing them down.

How the Attrition Model Can Help

We argue that efforts by the naturopathic profession to legitimize itself have mostly served to reinforce the dominance of the biomedical paradigm as opposed to challenging it and propose some reflections on a different approach. The attrition framework lends shape to a long-term goal of deconstructing a powerful system, such as the dominant medical institution. A particular tactic is unwise if it does not effectively serve to achieve this goal, particularly if it serves to reinforce hegemony.

Diversity is recognized as beneficial to the resilience and health of systems,[62] from ecological to cultural.[16] "Mad Pride," as a part of the broader anti-psychiatry movement, encourages a celebration of diversity as opposed to categorization and pathologization.[63] Rather than attempting to demonstrate that naturopathic training is legitimate because of the ways in which it is similar to conventional training, we recommend a celebration and elevation of diverse and non-reductionist approaches. We encourage members of the naturopathic profession (and other non-dominant healing paradigms) to unapologetically embrace and claim their distinct way of being in the world, challenging the dominant framework as opposed to contorting in an attempt to fit it.

Countering the racist, colonialist, and patriarchal foundation of modern health care requires naturopathic institutions to critically acknowledge the profession's roots in the same soil and take meaningful action to make reparations. This includes a centring of anti-oppression, social justice, and planetary health in core naturopathic curriculum, not just in the form of adding graduate competencies, but equally in program design and delivery.[64,65] It requires an active integration of and commensurate compensation for the traditional knowledge systems that provide context for the medicines on which the profession relies in order to use them without misappropriation. This may also require us to humbly relinquish the use of some altogether.

Eurocentric approaches to knowledge must be actively questioned instead of blindly accepted as truth.[66] This requires a critical analysis of what we mean by and how we teach, generate, and apply "evidence" and directly name and interrupt the violence of epistemicide,[67] defined by Patin et al. as the "killing, silencing, annihilation, or devaluing of a knowledge system."[68]

The profession must resist the pressure from dominant systems to adhere only to a biophysical view of life. Vitalism is a philosophy of health that has deeply informed the evolution of naturopathic medicine and parallels other healing traditions that recognize a life force beyond the biochemical.[69] We encourage the profession to continue to defer to the healing power of nature, the force that links all parts of the interdependent web of life on this planet and presses toward homeostasis at all levels if not interfered with.[70,71]

Part of the challenge with centring concepts of vitalism in naturopathic practice is that it is difficult to measure using standard research methodologies that seek to reduce variables to their simplest components. Some within the naturopathic profession are engaging in "whole-systems" research, which achieves acceptable standards of evidence while upholding a holistic model of care.[72] If paired with cost–benefit analyses, positive results may interest those that manage budgets. Emphasizing patient-oriented outcomes in research is also a way of understanding the effects of naturopathic practice.[73] Patient-centred models are also essential in training and practice as a fundamental domain of evidence-informed practice.[74,74] Naturopathic doctors must continue to see patients as people first, avoiding the temptation to specialize in diseases, as current approaches to training and practice can do.

Naturopathic doctors deserve to be adequately compensated for their time and expertise. However, a transactional model of health care introduces an unavoidable conflict of interest, shifting the role of provider towards entrepreneurship as opposed to that of

providing a service to society.[76] Some NDs enjoy funded positions that allow for the provision of integrative care (although many are still for-profit organizations, such as the Cancer Treatment Centers of America). Some have established practice models that increase access to naturopathic care. We encourage educational institutions and professional associations to build capacity in social innovation and to nurture relationships that allow for a more equitable model of care provision,[77] as well as knowledge generation and translation.[78] Expanding public funding to include NDs and other allied professionals may increase access to health care, but it risks further diluting resources and forcing a reductionistic and reactive approach, compromising the model of care on which naturopathic medicine is based. Thus, any solution in this domain must involve radical interrogation and reconstruction of deeply embedded social and economic systems in order to effectively address and mitigate the fundamental causes of disease, domains that may or may not be traditionally viewed as health-related. This includes but is not limited to a reworking of the system by which health care is provided and compensated,[79] investment in early childhood education,[80] overhaul of food supply systems,[81] healthier urban design,[82] and an overall multidisciplinary implementation of strategies to propel towards an ecological civilization that seeks to operate within (rather than be superior to) the laws of nature.[83]

This is a massive task that requires skills of effective advocacy. More NDs are seeking credentials and positions in public health, policy, and academia. Advocating for holism within dominant systems has the potential to shift policy. An ND was instrumental in creating the most recent iteration of the Canada Food Guide.[84] Representatives from the naturopathic profession have sat on the Natural Health Products Advisory committee. Naturopathic doctors also feature prominently in the conversation about elevating principles of planetary health,[85] and they hold public office.

While change from within is critical, NDs who sit outside the walls of power are also encouraged to engage in coordinated advocacy to shift dominant systems, including partnering publicly with other movements pushing for social and ecological change. Naturopathic doctors can disseminate knowledge by writing for and speaking to audiences outside the profession as a means to challenge dominant narratives and elevate naturopathic philosophy in common awareness. Advocacy efforts can also include galvanizing members of the public to push for electoral reform, aggressive climate action, and social changes that improve health. Direct action such as becoming involved in community gardens or other grassroots initiatives fulfill naturopathic principles while creating alternatives to the dominant structure.

Questions for Consideration

We don't pretend that these recommendations aren't daunting, or potentially risky. Facing a formidable and powerful structure with courage and tenacity is the spirit of the attrition framework. "Backcasting" is a strategic approach that "is particularly helpful when problems at hand are complex and when present trends are part of the problems."[86] This dovetails nicely with the principles of the attrition model in that it requires one to envision the ultimate goal, and determine what tactics are necessary to arrive at that goal. We encourage those within the profession—whether in a leadership role, or individual practitioners—to ponder the following questions when considering how best to advocate for or from within the profession:

- How is the biomedical model of health care limited in the face of current global determinants of health?
- Given the increasing threat of planetary breakdown and escalating global inequity, how must the healthcare system evolve in order to optimally support population health?
- What will the consequences be for individuals and communities if responsive changes are not implemented?
- What are the underlying values of an ideal healthcare system? How does that look?
- In what way do the paradigm and principles of naturopathic medicine (and other non-dominant systems) intersect with these values?

CONCLUSION

The attrition model provides guidance for applying strategic pressure to a dominant structure, seeking to challenge and erode it over time. We argue that the naturopathic profession—in attempting to legitimize its place—has thus far failed to challenge the dominant system. Rather, efforts have served to perpetuate its premises, and widen its hegemonic net.

We propose that a multidisciplinary and holistic approach, appropriate reliance on evidence, and genuinely informed consent requires that power structures be challenged to create space for and universal access to approaches other than an exclusively biomedical one. This requires deliberate integration of diverse epistemologies of medicine, decolonizing medical education, prioritization of lifestyle medicine and the principles of planetary health, and more effective structures to integrate care. Naturopathic medicine holds great promise in these domains, but only if this end goal is held in mind and not undermined.

Opportunities exist through naturopathic education, scholarship, clinical practice, and advocacy to erode the dominant model of health care and reshape it into an integrative system that draws from many diverse healing traditions and ways of knowing. At its core, this requires a deep questioning and humble profession-wide reflection of the origins of and influences on the naturopathic approach, and a willingness to radically critique the way in which the naturopathic profession contorts to and perpetuates the colonial and capitalistic foundations of the dominant system. We encourage naturopathic doctors and all champions of non-dominant healing paradigms to have confidence and pride in the ways in which diversity tends to make all things better, and to remain grounded in the goals and guiding questions of the attrition model.

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Effectiveness of Cold Spinal Spray on Blood Pressure and Heart Rate Variability in Patients with Hypertension—A Randomized Controlled Trial

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ABSTRACT

Background: The application of cold to the spine is documented as favourable for reducing blood pressure in patients with hypertension (HTN). However, hydriatic application in the form of a cold spinal spray (CSS) has not yet been explored.

Objective: To find the effectiveness of CSS on cardio autonomic variables among males with HTN.

Methods: One hundred male patients with HTN visiting the outpatient service were included in this randomized controlled trial. A single session of CSS (15°C–19°C) was given to 50 patients for a period of 20 minutes for the study group, and the control group was made to lie down on the spinal spray tub for 20 minutes without any intervention. Baseline blood pressure and short-term heart rate variability (HRV) measurements were obtained prior to the intervention, followed by a subsequent assessment after a 20-minute interval for both groups.

Results: Following 20 minutes of CSS a significant decrease was observed in systolic blood pressure (136.48±14.15 mmHg to 126.20±13.18 mmHg, $p<0.001$), diastolic blood pressure (87.96±6.77 mmHg to 84.06±6.84 mmHg, $p<0.006$), pulse pressure (48.44±11.99 mmHg to 42.08±10.88 mmHg, $p<0.007$), and mean arterial pressure (104.09±8.12 mmHg to 98.05±7.88 mmHg, $p<0.001$). No significant changes were noted in HRV variables in either of the two patient groups.

Conclusion: The current study findings suggest that a single session of CSS intervention could lower both systolic & diastolic blood pressure, pulse pressure and mean arterial pressure in male hypertensive patients. Further studies are needed to find the long-term effect of CSS among patients with HTN.

Key Words Autonomic functions, cardiovascular disorders, complementary and alternative medicine, hydrotherapy, naturopathy

INTRODUCTION

Hypertension (HTN) is a leading medical condition that is characterized by elevated systemic arterial blood pressure.[1] Worldwide, HTN is estimated to cause 7.5 million deaths per year, which is around 12.8 % of the total all-cause mortality. A report from multi-national representative samples showed that the occurrence of HTN was higher in males than in females.[2] In addition to being a primary contributor to chronic kidney failure, HTN also puts people at risk for heart failure, myocardial infarction, and stroke. In India, 300,000 of the 1.5 million annual fatalities caused by cardiovascular illnesses could be prevented with effective HTN control.[3] The World Health Organization supports the combination of non-pharmacological treatments and conventional antihypertensive medications in people with HTN to facilitate better management and lower mortality rate.[4] Massage, reflexology, mud therapy, hydrotherapy, acupuncture, and yoga are commonly used as non-pharmacological interventions to manage HTN.[5] Hydrotherapy is also known as pool therapy, aquatic therapy, and water therapy in the naturopathic medical system.[6] Hydrotherapy is used in various forms (water, ice, or steam) with the purpose of promoting health or treating a variety of disorders[7-10] at different temperatures, pressures, lengths of time, and sites, either internally or externally.[11] A localized, minimally pressurized (1 pound per square inch [PSI]) external hydrotherapy procedure called a spinal spray exposes the spinal region to water at a specified temperature for a predetermined amount of time in order to obtain the desired results.[12] A previous study reported sympathetic domination among healthy male volunteers immediately after cold spinal spray (CSS).[12] Another study showed that cold application in the form of a spinal bath with a duration of 20 minutes could reduce blood pressure in hypertensive patients.[13] Therefore, the response to cold exposure on healthy individuals and those with HTN appears to be contradictory. The objective of this trial is to investigate the immediate effect of CSS in male patients with HTN.

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MATERIALS AND METHODS

The current study includes 100 male patients aged 30–70 years old, diagnosed with HTN, recruited for the study after obtaining signed informed consent. Patients with spinal deformities, systolic blood pressure (SBP) above 160 mmHg, diastolic blood pressure (DBP) above 100 mmHg, and more than two groups of anti-HTN medicine were excluded. The study was approved by the institution's ethics committee.

Sample Size

Using G*power 3.1.9.4 software, the sample size was determined based on a recent study,[13] with effect size = 0.414, alpha value = 0.05, and power = 0.80.

Randomization

Through computerized randomization, patients were divided into two groups. To generate a sample size of 50 in each group, the simple randomization approach using a 1:1 ratio was applied to 100 patients. The sequentially numbered opaque and sealed envelope (SNOSE) approach was used for allocation concealment. An investigator who was not directly involved in the evaluation carried out the randomization. Patients in the control group (n=50) were made to lie down on the spinal spray tub without receiving the CSS, whereas the research group (n=50) received the CSS. Baseline and 20-minute post-intervention data were collected for all patients at the same time of day, between 9 am and 12 pm. Figure 1 consort chart represents the schematic design of the study.

Intervention

The CSS group was instructed to wear minimal clothing, exposing their entire back to the flowing stream of water while lying on the spinal spray tub. The spinal spray tub features a centrally positioned fiber-perforated tube, which is connected via a pipeline to a 0.5 HP (horsepower) motor located underneath the tub and connected to the water supply. The patient was positioned supine on the bathtub, and the instrument was activated with water at 15°C to 19°C. Over a duration of 20 minutes, a continuous stream of water was sprayed into the spinal area through the perforated tube. In contrast, patients in the control group were instructed to wear minimal clothing and spend 20 minutes lying on the spinal spray tub without receiving cold-water spraying.

Outcome Measurements

Blood Pressure

Using a non-invasive arm-type semiautomated electronic blood pressure monitor (Omron), blood pressure readings were recorded before and immediately after 20 minutes in both groups in a sitting position. A minimum of two measurements were made, with a rest period of 1 minute between the measurements, and the final outcome was calculated using the average of two readings. If the difference between the two measurements was > 10 mmHg, a third measurement was taken after a 1-minute rest period, and the average of the two measurements that did not differ by > 10 mmHg was used to get a final value.

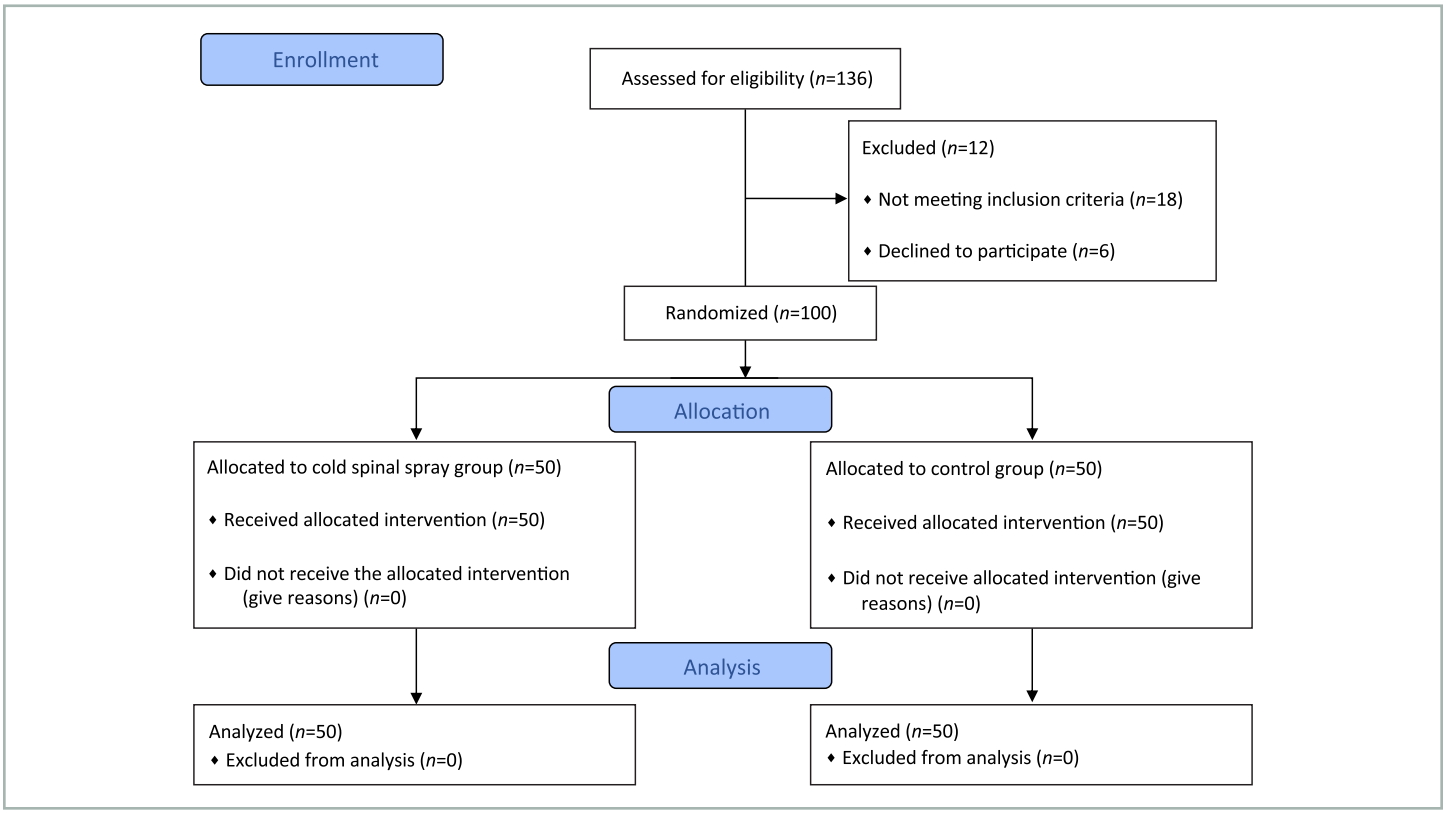

FIGURE 1 Consort Flow Diagram

Heart Rate Variability Spectrum

A 16-channel polygraph was used to measure the heart rate (HR) and short-term heart rate variability (HRV) before and after the intervention (BIOPAC MP160, 16-channel polygraph). For the purpose of recording the electrocardiogram, the Ag/AgCl pre-gelled electrodes were positioned using the limb lead II configuration. Data was collected using a 2000 Hz sampling rate. Using HRV analysis software (Kubios HRV version 2.0) created by the Biomedical Signal Analysis Group, baseline and post-intervention HRV data was collected and tabulated into time domain and frequency domain analysis (University of Kuopio, Finland). The time domain HRV variables include (1) the mean of the intervals between adjacent QRS complexes or the instantaneous heart rate (RRI), (2) the standard deviation of RR intervals (SDNN), (3) heart rate (HR), (4) Root mean square of successive RR interval differences (RMSSD), (5) the number of interval differences of subsequent NN intervals greater than 50 ms (NN50), and (6) percentage of successive RR intervals that differ by more than 50 ms (pNN50). Similar to this, the frequency domain of HRV is also examined, including the low-frequency (LF) band (0.04–0.15 Hz) and high-frequency (HF) band (0.15–0.4 Hz) in normalized units. The following formulas were used to calculate measurements such as mean arterial pressure (MAP) and pulse pressure (PP). SBP – DBP was used to calculate PP, and (DBP + 1/3*PP) was used to calculate MAP.[14]

Data Analysis

Means and standard deviations are used to express data (mean±SD). The Kolmogrov-Smirnov test was used to determine whether the data was normal. Indicating a normal Gaussian distribution was a p value of > 0.05. R statistical software version 4.2.0 was used to run the Wilcoxon signed rank test, Mann Whitney U test, and paired and unpaired t-test on the HRV data sets because they were not normally distributed.

RESULTS

In total, 136 patients were recruited for the trial, of whom 100 met the inclusion criteria (Figure 1). The CSS group consisted of 50 patients, with an average age of 54.02 ± 7.47 years and a BMI of 26.43 ± 3.24 kg/m^2. The control group also comprised 50 patients, with an average age of 54.48 ± 9.84 years and a BMI of 27.89 ± 5.21 kg/m^2. Among the patients in the CSS group, 32% were on diuretics, 36% were on ACE inhibitors, and 30% were on beta-blockers. In the control group, 26% were taking diuretics, 34% were on ACE inhibitors, and 32% were on beta-blockers.

Demographics of the patients who participated in the study are presented in Table 1. No significant differences were noted between the groups at baseline, and they were comparable. Immediately after CSS, a significant reduction in SBP (p<0.001), DBP (p<0.006), PP (p<0.007) and MAP (p<0.001) was noted in the CSS group. For the HRV, all variables (RRI, HR, SDNN, RMSSD, NN50, pNN50, LF, HF, LF/HF ratio) showed no significant changes in both CSS and control groups (Table 2).

TABLE 1 Demographic and anthropometry details of participants

	Cold spinal spray (n=50)	Control (n=50)
Age (years)	54.02±7.47	54.48±9.84
Height (meters)	1.65±0.07	1.62±0.07
Weight (kilograms)	70.92±10.24	72.93±13.09
Body mass index (kg/m²)	26.43±3.24	27.89±5.21
Diuretics	16 (32%)	13 (26%)
ACE inhibitors	18 (36%)	17 (34%)
Beta-blockers	15 (30%)	16 (32%)

TABLE 2 Changes in BP, and HRV parameters in included patients

	CSS (n=50) Mean±SD			Control (n=50) Mean±SD		
Parameters	**Before**	**After**	**p value**	**Before**	**After**	**p value**
SBP (mmHg)	136.48±14.15	126.20±13.18	<0.001	127.16±12.6	126.12±13.51	0.7
DBP (mmHg)	87.96±6.77	84.06±6.84	0.006	83.36±7.16	82.82±7.77	0.8
PP (mmHg)	48.44±11.99	42.08±10.88	0.007	43.90±9.62	42.90±10.47	0.4
MAP (mmHg)	104.09±8.12	98.05±7.88	<0.001	97.87±8.13	97.08±8.63	0.8
RRI (ms)	774.32±115.95	803.88±122.18	0.2	785.46±126.87	801.92±131.10	0.5
SDNN (ms)	61.89±46.97	46.63±35.33	0.2	39.84±31.78	40.29±29.59	0.5
HR (beats/min)	77.14±13.40	75.28±13.18	0.4	77.56±14.41	75.94±14.36	0.4
RMSSD (ms)	62.86±48.68	48.37±48.11	0.2	34.63±26.66	34.37±24.45	0.7
NN50 (count)	22.68±25.13	20.43±24.18	0.5	26.38±36.59	26.32±37.29	0.9
pNN50 %	7.74±6.99	5.86±6.91	0.089	9.43±12.55	9.03±12.36	0.8
LF (n.u)	50.91±17.38	52.78±19.00	0.6	52.03±18.62	56.32±20.36	0.2
HF (n.u)	48.27±17.17	50.35±17.11	0.7	47.69±18.39	43.51±20.73	0.2
LF/HF %	1.42±1.14	1.65±1.39	0.4	1.52±1.30	1.79±1.49	0.4

SD = standard deviation; BP = blood pressure; HRV = heart rate variability; SBP = systolic blood pressure; DBP = diastolic blood pressure; PP = pulse pressure; MAP = mean arterial pressure; RRI = instantaneous heart rate; SDNN = standard deviation of RR intervals; HR = heart rate; RMSSD = square root of the mean of the sum of the squares of differences; NN50 = the number of interval differences of subsequent NN intervals greater than 50 ms; pNN50 = percentage of successive RR intervals that differ by more than 50 ms; LF = low frequency; n.u. = normal units; HF = high frequency.

DISCUSSION

The current randomized controlled trial aimed to measure the effects of CSS on blood pressure and heart rate variability in male patients with HTN. This study found that a single session of CSS decreased SBP, DBP, PP and MAP in male patients with HTN. However, no changes in HRV parameters were observed in our study. In contrast, a previous study involving 60 patients with HTN reported significant reductions in LF, LF/HF ratio, and significant improvement in HF after 20 minutes of CSS by employing water temperatures between 18°C and 24°C.[15] The CSS possibly has an impact on all organs through nerves which are connected with the spine. Based on the temperature used in spinal spray, blood vessels may constrict or dilate.[12] Twenty minutes of cold application to the spine resulted in the activation of the parasympathetic system. It is widely documented that temperature affects blood pressure, which might be the cause for the decrease in SBP, DBP, PP and MAP in our study.[15]

In the current study, one of the following possible mechanisms might have led to the reduction in blood pressure. CSS may lead to immediate vasoconstriction which results in an increase of vascular pressure thereby activating the baroreceptors in the aorta and carotid sinus. This reduces sympathetic activity by stimulating the vagus nucleus and causing vasodilation and a drop in blood pressure.[16] CSS activates the transient receptor potential cation channel subfamily M (melastatin) member 8 (TRPM8) which is a thermally modifying sensory neuronal protein. TRPM8 reduces sympathetic activity and has a hypotensive effect.[17] Additionally, localized activation of TRPM8 by cold promotes the release of Ca2+ in the sarcoplasmic reticulum, which depletes stores of Ca2+ and inhibits vasoconstriction.[18] An increase in SBP of 10 mmHg will increase the risk of secondary cardiovascular disease (CVD) events by 15%. SBP is a more reliable indicator of cardiovascular diseases, particularly in persons under 50.[19] MAP, which is described as the average blood pressure during the cardiac cycle, is a vital element in the perfusion of significant organs. Even more than SBP and DBP, MAP has been proven to have clinical prognostic value in predicting the risk of CVDs, and it has also been shown to be a primary risk factor for predicting the risk of stroke.[20] Similarly, PP is the difference between SBP and DBP which predict adverse health outcomes in populations, and patients with cardiovascular or renal disease.[21]

No adverse effects were reported by the patients. This study had limitations in that it only assessed the immediate effects of CSS on blood pressure in male patients with HTN. Future research should aim to investigate the long-term effects of CSS on BP to provide further substantiation of our findings. Another potential limitation was the inclusion of only male patients, driven by the higher prevalence of HTN in males compared with females. However, this restriction limits the generalizability of our conclusions to a broader population. The absence of female participants hinders our ability to evaluate gender-specific effects, thereby reducing the applicability of our findings. To address this limitation, future studies should consider including both male and female participants to enable a comprehensive evaluation of gender differences and enhance the external validity of the results.

CONCLUSION

The study finding suggests that CSS could reduce blood pressure in male patients with HTN. Further randomized controlled trials are required to determine the long-term effects of CSS on HTN.

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CONFLICTS OF INTEREST DISCLOSURE

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

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Addendum: Challenging the Maligning of Homemade Human Milk Substitutes During a Shortage of Commercial Formula

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In Table 2 of the article "Challenging the Maligning of Homemade Human Milk Substitutes During a Shortage of Commercial Formula," we analyzed nutrition based on the recommended energy intake per day[1] and received feedback post-publication that analyzing by standard volume would be helpful to readers. For ease of analysis by volume, in this Addendum we compare an approximation of the nutritional profile of 100 mL of human milk[2,3] with the same quantity of a commercial substitute,[4] a homemade substitute, and the World Health Organization (WHO) emergency infant feeding recipe.[5] See Table 3 below. While feeding needs vary depending on an infant's age and weight, for

TABLE 3 Comparison of human milk, commercial formula, homemade substitute, and WHO emergency recipe by volume, with USDA RDI standards provided as a reference

	USDA RDI for 4.5 kg infant	Human milk (100 mL)	Commercial substitute (100 mL)	Homemade human milk substitute (100 mL)	WHO formula (100 mL)
Energy (kcal)	475	67.90	68.00	77.89	46.82
Millilitres required for 475 kcal	—	699.56	698.53	609.83	1,014.52
Protein (g)	9.10	1.00	1.35	2.10	2.20
% of total energy	—	5.89	7.94	10.65	18.80
Carbohydrate (g)	60.00	6.68	7.60	6.40	4.79
% of total energy	—	39.37	44.71	32.46	40.95
Fat (g)	31.00	4.25	3.60	5.03	2.15
% of total energy	—	56.31	47.65	58.10	41.29
Minerals					
Calcium (mg)	200.00	31.04	53.00	79.00	82.52
Phosphorus (mg)	100.00	13.58	29.00	65.46	67.65
Magnesium (mg)	30.00	2.91	54.00	51.74	8.06
Iron (mg)	0.27	0.03	1.22	1.19	0.00
Zinc (mg)	2.00	0.16	0.68	0.18	0.28
Manganese (mg)	0.00	0.00	0.01	0.00	0.00
Copper (mg)	0.20	0.05	0.05	0.03	0.00
Iodine (mg)	0.11	0.00	0.01	0.01	0.00
Selenium (mg)	0.02	0.002	0.002	0.001	0.001
Sodium (mg)	110.00	16.49	18.20	41.06	25.51
Potassium (mg)	400.00	49.47	73.00	201.45	100.68
Chloride (mg)	0.18	0.00	43.00	0.00	0.00

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TABLE 3 Cont'd.

	USDA RDI for 4.5 kg infant	Human milk (100 mL)	Commercial substitute (100 mL)	Homemade human milk substitute (100 mL)	WHO formula (100 mL)
Vitamins					
Vitamin A (mcg)	400.00	59.17	60.00	66.18	21.48
Vitamin D (mcg)	10.00	0.10	1.03	2.00	0.74
Vitamin E (mcg)	4000.00	77.60	904.5	833.33	33.55
Vitamin K (mcg)	0.00	0.29	6.10	0.29	0.20
Vitamin C (mg)	40.00	4.85	8.10	8.01	0.00
Thiamine (mg)	0.20	0.01	0.05	0.03	0.04
Riboflavin (mg)	0.30	0.03	0.10	0.08	0.09
Niacin (mg)	2.00	0.17	0.68	0.16	0.04
Pantothenic acid (mg)	1.70	0.18	0.34	0.07	0.10
Vitamin B6 (mg)	0.10	0.01	0.04	0.03	0.00
Folic acid (mcg)	65.00	4.85	10.80	39.23	0.00
Vitamin B12 (mcg)	0.4	0.05	0.20	0.041	0.36
Choline (mg)	125	15.52	16.20	9.42	11.94

WHO = World Health Organization; USDA = United States Department of Agriculture; RDI = recommended dietary intake.

context we have also noted the volume required for a 4.75 kg (10.47-lb) infant, which is the standard reference point for the United States Department of Agriculture recommended dietary intake (USDA RDI).[1] It is imperative to note that in order to meet this caloric target, an infant must ingest a 45% greater volume of the WHO emergency recipe than of human milk or a commercial substitute. Practically speaking, increasing the quantity that an infant ingests by this amount would be a near impossible task, arguing for a more nutritionally dense alternative. In comparison, this homemade substitute requires 13% less volume than human milk to achieve the same caloric goal, while also providing the vitamins and minerals essential for infant development (many of which are missing from the WHO formula). As was discussed previously, although there are some clear nutritional excesses that could pose risks in the long term, in emergency feeding situations where both human milk and commercial formula are unavailable, homemade substitutes such as the one analyzed here could provide a reasonably safe option for short-term use.

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Corrigendum: Challenging the Maligning of Homemade Human Milk Substitutes During a Shortage of Commercial Formula

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In the article "Challenging the Maligning of Homemade Human Milk Substitutes During a Shortage of Commercial Formula," the first author's name was misspelled. Amanda Watters' name was misspelled as "Waters." The author list in the original article has been updated to reflect this change.

In addition, following publication of the above article, the authors noticed an error in Table 2. The rows labelled "% of total energy" (rows 3, 5, and 7) reflect the decimal equivalent and not the percentage. A corrected version of Table 2 is below.

TABLE 2 Nutritional comparison of human milk, commercial formula, homemade substitute, and WHO emergency recipe; USDA RDI standards for a 4.75 kg infant provided as comparison; volumes of milk and substitutes reflect 475 kcal.

	USDA RDI for 4.5 kg infant	Human milk per 698 mL	Commercial substitute per 712.50 mL	Homemade substitute per 608 mL	WHO recipe per 1016 mL
Energy (kcal)	475*				
Protein (g)	9.10	6.98	9.43	12.76	22.36
% of total energy	-	5.89	7.94	10.78	18.80
Carbohydrate (g)	60.00	46.67	53.10	38.92	48.72
% of total energy	-	39.37	44.71	32.87	40.95
Fat (g)	31.00	29.67	25.15	30.57	21.83
% of total energy	-	56.31	47.65	58.10	41.29
Minerals					
Calcium (mg)	200.00	216.74	370.32	480.23	838.78
Phosphorus (mg)	100.00	94.82	202.63	397.99	687.66
Magnesium (mg)	30.00	20.32	377.31	314.57	81.96
Iron (mg)	0.27	0.20	8.52	7.23	0.01
Zinc (mg)	2.00	1.15	4.75	1.08	2.80
Manganese (mg)	0.00	0.00	0.07	0.00	0.00
Copper (mg)	0.20	0.35	0.36	0.16	0.01
Iodine (mg)	0.11	0.00	0.07	0.06	0.00
Selenium (mg)	0.02	0.01	0.01	0.01	0.01
Sodium (mg)	110.00	115.14	127.17	249.66	259.30
Potassium (mg)	400.00	345.42	510.07	1224.81	1023.45
Chloride (mg)	0.18	0.00	300.45	0.00	0.00
Vitamins					
Vitamin A (mcg)	400.00	413.15	419.24	402.40	218.32
Vitamin D (mcg)	10.00	0.68	7.16	12.17	7.49
Vitamin E (mcg)	4000.00	541.84	6319.97	5066.67	341.04

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TABLE 2 Cont'd.

	USDA RDI for 4.5 kg infant	Human milk per 698 mL	Commercial substitute per 712.50 mL	Homemade substitute per 608 mL	WHO recipe per 1016 mL
Vitamins (cont'd.)					
Vitamin K (mcg)	0.00	2.03	42.62	1.74	2.05
Vitamin C (mg)	40.00	33.87	56.60	48.71	0.00
Thiamine (mg)	0.20	0.07	0.38	0.17	0.38
Riboflavin (mg)	0.30	0.35	0.66	0.49	0.94
Niacin (mg)	2.00	1.20	4.75	0.99	0.42
Pantothenic Acid (mg)	1.70	1.26	2.38	0.44	1.01
Vitamin B6 (mg)	0.10	0.07	0.29	0.16	0.00
Folic Acid (mcg)	65.00	33.87	75.46	238.52	0.00
Vitamin B12 (mcg)	0.40	0.34	1.40	0.25	3.69
Choline (mg)	125.00	108.37	113.19	57.30	121.32

WHO: World Health Organization; USDA: United States Department of Agriculture; RDI: recommended daily intake.
*Caloric requirement for infants is appropriate to age (a proxy for velocity of growth) and weight: A simple estimate is 100 cal/kg/day.[33]