

- 🔥 Collaboration in the Time of COVID-19: Lessons for Community Shared Care Models
- 🔥 COVID-19: A New Wave of Chronic Disease
- 🔥 Assessing for the Co-morbidities and Factors That May Affect a Patient's Risk and Response to COVID-19
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The journal of the Canadian Association of Naturopathic Doctors

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Vital Link

The journal of the Canadian Association of Naturopathic Doctors

Volume 27, No. 2

Naturopathic Care and the COVID-19 Pandemic: Challenges and Possibilities

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The *Vital Link* is the flagship journal of the Canadian Association of Naturopathic Doctors (CAND). It publishes on a wide variety of topics related to the research and practice of naturopathic medicine in Canada, promoting our profession to Canadians, government, other health care professionals and insurance companies, raising awareness of our unique role in supporting the health of Canadians.

Forthcoming Themes

Vol. 27, No. 3 Naturopathic Geriatric Care

Vol. 28, No. 1 Health Equity

Submissions

As a general naturopathic medical journal, we encourage submissions related to themes of our upcoming editions, and also in our identified core areas of concern including: mental health, health of vulnerable populations, community and planetary health. Contributors should keep in mind that while the main audience for the *Vital Link* is practicing Naturopathic Doctors, we encourage authors from any discipline to submit articles to our editorial team for peer review.

Current Submission Guidelines are available on request from our Editor at dmtrevorrow@cand.ca.

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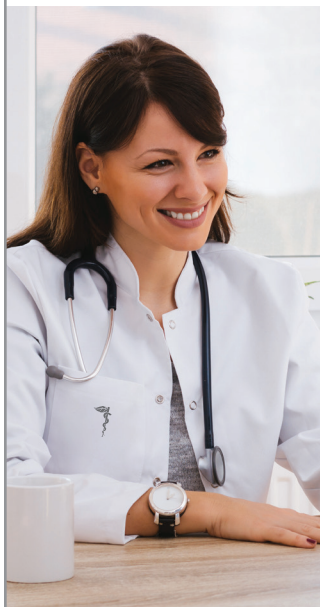
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Update from the Chair and Executive Director

Mark Fontes, ND, Chair and **Shawn O'Reilly**, Executive Director



Dear members,

We hope you and your families have been keeping well during this challenging time. Over the past several months we have certainly encountered many difficulties and obstacles including changing our clinic policies and procedures, operating in new and different ways, communicating with patients about these changes and working through the governments various financial aid programs which we continued to update you on.

More recently, it has been reassuring to see many of us returning to our clinics to continue to provide the important care we provide to patients. Telemedicine has its advantages and conveniences but we have heard from many of you that patients have requested in-person care more of late and it is in that setting that we can truly work to the full scope of our profession. Naturopathic medicine is crucial to the health of all Canadians and the impact of this pandemic has amplified the importance of our work.

We continue to be in regular contact with key members of government including the Ministry of Finance, Health Canada, the Public Health Agency of Canada (PHAC) and the Natural and Non- Pharmaceutical Health Products Directorate (NNHPD). Our advocacy efforts on behalf of the profession focus on access to the government's financial benefits as well as stressing the value of naturopathic medicine during this critical health crisis. As provided in one of our COVID-19 updates, following a request from the CAND, PHAC updated its Health Sector Guidelines to remove reference to "naturopaths" in the section on Pre-Hospital Care and Community Care (section 3.2.5), replacing it with the correct title "Naturopathic Doctors". We also stressed our concern that naturopathic doctors were not included in the list of "Additional Health Care Workers" under section 4.3.2, "Optimal Use of Health Care Workers" alongside nurse practitioners etc. PHAC committed to considering changes to the list to include naturopathic doctors for the next iteration of the guidance document. In a recent meeting with PHAC we underlined the importance of ensuring all qualified health care practitioners, including naturopathic doctors are utilized to their full potential to deal with the impact COVID – 19 is having on the health of Canadians. Our request was noted and will be given further

consideration by the PHAC Secretariat. At that meeting, and as NDs are experts in lifestyle management, PHAC accepted our offer of assistance in developing communications for the public on the importance of sleep, eating a healthy diet, exercise and mental health in order to maintain optimal health as the country deals with this pandemic.

Earlier this year, the CAND announced that it had established the Diversity & Inclusion Committee chaired by Board Director Dr. Sandra Murphy, ND. At our Annual General Meeting, we asked that any members who were interested in assisting in this important work reach out to the CAND. We thank all of you who have volunteered your time. The Committee held its inaugural meeting over the summer to discuss the issues within the profession, goals and to outline action items to address them. As a first step, The CAND Board of Directors and Staff will undergo cultural competency/ anti-racism/LGBTQ2S+ friendly training. We will update the membership as this important work continues.

The CAND board of directors is comprised of eleven naturopathic doctors from across Canada who are committed to supporting the profession and advocating for improved awareness and access to naturopathic medicine. On September 9th, we held a virtual board meeting to plan for the fall and revisit our goals and strategies to better serve our members.

Part of this work includes bringing more awareness to the important work we do as naturopathic doctors and the value of naturopathic medicine. As shared at the Annual General Meeting in June, we are very excited about the launch of our new communications and engagement strategy, which is focused on pro-active positive messaging about our profession and the important role we have in the health care system. All messaging is anchored in our strategic platform – "Better Health, Together". We will be looking to all members to get involved and share how naturopathic medicine contributes to the health and wellness of Canadians. We will continue to provide you with more information and how you can get involved as the plan continues to roll out.

On behalf of the CAND board of directors, we would like to thank all of our members for your continued support.

Thank you,

Mark Fontes, ND
Chair

Shawn O'Reilly
Executive Director



How do we as a profession respond to the COVID-19 Pandemic?

Marianne Trevorrow, MA, ND

I will admit, when we first discussed the idea of doing a Vital Link edition on the COVID-19 pandemic back in early April of this year, I thought it was both something we simply had to do and, from an editorial standpoint, quite anxiety provoking. The essential part I think everyone will understand; this is a once in a lifetime pandemic that has greatly affected our professional as well as our family and community lives. Some of us have lost family members, friends or colleagues to this disease, or seen loved ones or colleagues suffer with acute or long-term courses of COVID. Our political and economic worlds have also been upended, in Canada and globally.

Many of us learned during training about the possibility of a pandemic occurring along the lines of the Spanish Flu of 1918, or remember the SARS, MERS or even the H1N1 flu outbreaks from earlier in this century. Few outside the epidemiology community, however, could foresee the scope and trajectory of a pandemic on the scale of COVID-19 when word first started spreading about a novel coronavirus back in early 2020. After all, the trajectory of previous coronavirus outbreaks (SARS in 2003 and MERS in 2012), while terrifying in their own way, were both mostly contained within a year of the identification of an outbreak. With COVID-19, the initial cases of this novel virus were declared to the World Health Organization from Wuhan City, China, in December 2019. On January 30th, 2020, only a month later, a 'public health emergency of international concern' was declared by the WHO. Subsequently, this was upgraded to a pandemic, or a 'worldwide spread of a new disease' on March 11th. Now, in mid-October 2020, we are eight months into the pandemic, that as of this writing has claimed approximately 9300 lives in Canada,¹ and over 1 million worldwide.²

Certainly, many of our members have felt powerless and frustrated by provincial or territorial government guidelines that have left naturopathic doctors sidelined from contributing to front line care.

Many practices closed for in person or 'non essential' care in March, then re-opened with new requirements for COVID screening and Personal Protective Equipment (PPE) for in person care, with preference given to telehealth consults. There is no question that this has been a year of overwhelming change, confusing and often rapidly changing provincial Public Health, Ministry of Health, or College directives. For so many of us, good self-care has taken a back seat to negotiating these new realities, which include the financial imperatives of keeping practices going with mandated closures and added costs and administrative burdens with PPE and COVID screening, in addition to juggling family and professional responsibilities. There is no question that burnout levels are rising as a result, even if NDs are not technically on the front lines.

As an editor, this is also where the anxiety-provoking part came in. Many high impact/well known conventional medical journals have had to either correct or retract hastily thrown together studies or epidemiology on COVID. The WHO has also decried the wide reach of misinformation about the virus and potential treatments, conventional or CAM. With all this going on, how could our authors and reviewers keep up with the state of what is known for *integrative naturopathic* care with the new and rapidly changing reality of COVID-19? There is still so much that we don't know about how to treat this virus or its complications. For example, there is still considerable controversy about which patients are most at risk for complications, or who is likely to have a more prolonged course of infection or long-term post-viral symptoms.

At the same time, there is no question that naturopathic care matters in this conversation about the long term health-care response to the pandemic in Canada. Now that we are facing a second wave of new cases in several provinces, and concerns about the mental health of many Canadians facing further disruptions or lockdowns, we will be increasingly called on to treat patients who have sidelined preventative care during this crisis, or who are apparently recovered from COVID but still suffering from post-viral symptoms. There is an opportunity now for the CAND and our members to contribute to a more public and productive discussion of the value of naturopathic doctors, and call attention to the evidence that NDs are already providing careful and kind care and have been for years.³

This issue leads off with our usual CAND Board update, as well as a guest editorial on the collaboration of naturopathic doctors into a community health clinic in a post-COVID practice setting. There are specific challenges, as well as benefits accruing to all sides in this new practice environment as pointed out by Gilbert and Chowdury.

We have two clinical practice reviews this edition that are COVID-19 themed. One, by Berninck et al, focuses on diagnostic criteria for the so-called 'long tail' or post-viral symptoms of COVID-19 infections, and discusses a preliminary framework for treatment in a primary care naturopathic setting. Similarly, Lloyd and Saunders review what is known to date about how to recognize patients at increased risk of complications or post-viral presentations, using laboratory and other diagnostic criteria. They also discuss appropriate screening protocols and introduce some of the evidence from the WHO sponsored 'rapid reviews' on T&CM therapies that could benefit these patients.

Our next two articles discuss the effects of the COVID-19 pandemic on specific populations of interest; pregnant and post-partum people, BIPOC, and Indigenous communities. These authors raise important concerns about working with these populations that will become increasingly relevant as we learn to adapt to the new clinical reality brought about by the pandemic.

Our research/commentary section contains a summary of the WNF 'rapid reviews' that are forthcoming for publication in a special edition of *Advances in Integrative Medicine* (Elsevier) and elsewhere. Here, our members get a first look at some of the completed reviews from their CAM research colleagues.

Finally, we have a thought-provoking piece by Solomonian et al, arguing for a systems perspective on COVID-19 as a manifestation of unsustainable economic, environmental and social organization. They outline a naturopathic critical theory that incorporates an Indigenous worldview with naturopathic philosophy in a way that they argue will ultimately help create a collaborative redesign on both the micro- and macro-societal levels.

I want to give special notice to our editorial review team for this edition, who have stepped up with careful reviews on a topic that is new to all of us. Reviewers are often the unsung heroes for journals like ours and I want to thank everyone who helped steer these articles to publication. We also welcome three new internationally based colleagues to our editorial board this edition; Paola Cubillos (Colombia), Matt Brignall (USA) and Lara Briden (NZ), as we continue to diversify our board and expertise in anticipation of moving to an indexed, open format in 2021/22.

Finally, I would like to introduce our new Associate Editor Cyndi Gilbert. Many of our members know her as senior clinical faculty at CCNM, or in one of her several other leadership roles in the profession. She joined me for this edition, and has already provided invaluable support for streamlining our editorial and review processes, including formulating more standardized peer review guidelines. We are also working on diversifying our editorial board, and continuing on our stated mission to focus on social determinants of health and health equity.

There are more exciting changes ahead for *Vital Link*, but for now, I hope everyone enjoys this very timely edition. My inbox, as always, is open at drmtrevorrow@cand.ca

Marianne Trevorrow, ND.

Marianne Trevorrow, MA, ND
Editor in Chief.

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Collaboration in the Time of COVID-19: Lessons for Community Shared Care Models

Muna Chowdhury, MD, FCFP and Cyndi Gilbert, ND



Almost a decade ago, two doctors met in the hallway at the Parkdale Queen West Community Health Centre (PQWCHC) where they both worked. Dr. Muna Chowdhury, MD like many medical doctors, didn't know much about naturopathic medicine because when she was being trained, naturopathic doctors were only cursorily mentioned and not presented as allied, regulated health professionals. Like many primary care providers, she was initially hesitant to connect PQWCHC clients with naturopathic doctors, felt she had limited knowledge about their training and scope of practice, and lacked previous contact in an interprofessional setting with shared clients.¹ She also perceived a paradigm conflict between evidence based primary and naturopathic care, which she believed was not evidence-based. As a naturopathic doctor, Dr. Cyndi Gilbert, ND, in turn, had received little training or mentorship on how to work as a member of a healthcare team with medical doctors, nurses and nurse practitioners, physiotherapists, psychotherapists, and registered dietitians.

As they continued to work with shared clients, these perceptions shifted into mutual respect and frequent cross-referral that included the entire primary care team. For example, MDs and NPs now regularly refer clients to the naturopathic clinic for routine pelvic exams and PAPs, chronic pain management, lifestyle counseling, and general adjunctive care, freeing their time up for more complex case management. In the other direction, the naturopathic clinic frequently consults with the primary care team about laboratory testing and monitoring, referrals, and available community and social services, as well as acting as a bridge to conventional care when clients are reticent to follow standards of care, e.g. taking antipsychotic medications or chemotherapeutics or following through with surgical recommendations.

The benefits of interprofessional collaboration in community settings work in multiple directions. Clients benefit from coordinated, multidimensional, patient-centered care. Healthcare providers learn from each other and gain a better understanding of each profession's scope of practice and value in the circle of care. Unfortunately, there are scarce examples in Canada where naturopathic doctors have been fully integrated into primary care health teams.^{2,3}

As we started to organically share clients, we noticed the benefits that our clients were experiencing. Many of our clients had extensive, complex psychosocial needs, and having an additional healthcare provider offered clients greater opportunities to express their needs and concerns, which increased therapeutic benefit and adherence to recommendations. Community team providers also benefited from a greater understanding of their overall biopsychosocial health, as each individual provider is often privy to aspects of the client other providers may not be. With clients'

consent, sharing knowledge that could be relevant to management enabled us to provide superior care to our clients overall. Through collaboration and communication, we realized we were best able to address our clients' concerns in a thorough and safe manner.

From the clients' perspective, having access to allied health providers offered them a choice they might not have had in our Community Health settings. For example, many clients were interested in what they could do to improve their health using lifestyle medicine, herbal and/or dietary supplementation. Many were already self-prescribing; and some clients failed to disclose their use of herbal medicines and dietary supplements to their providers.⁴ As we worked together, clients disclosed more with every provider because they understood us as working together for their benefit. Initially, we asked clients to sign release of records forms to gather and share information. Clients who had previously expressed fear of their MD judging them for working with a ND or fear of their ND judging them for taking pharmaceuticals, shifted their perspective as they witnessed us working amicably and engaging in frequent cross-referral. Nowadays, when asked to share information about what other strategies or supplements they are using to address their health, clients most frequently respond saying "Isn't that information already in my chart? No? Just ask my ND/MD."

At the same time, when working with allied providers in the same facility, we became more mindful of our limitations regarding different areas of health and accessed additional supports, including consultation with colleagues when needed. With the internet at their fingertips, clients would often come to Dr. Chowdhury asking for non-prescriptive ways to help alleviate what was concerning them; many wanted a natural option. She would then more comfortably

advise them to connect with the naturopathic team for proper assessment and management of these therapeutics. Conversely, if a client was taking prescription medications, Dr. Gilbert, ND would connect with their primary care provider (NP or MD) before recommending natural health products (NHPs) to ensure safety and reduce the risk of prescription/NHP interactions. Collaboration enabled each provider to act as a bridge ensuring clients received congruent, synergistic, and resourceful healthcare.

With all that being said, restrictions on in-person appointments as a result of COVID-19 precautions mandated by the Ontario Ministry of Health have significantly impacted the ways in which we collaborate on patient care at the Parkdale Queen West Community Health Centre. The move to telemedicine and remote delivery of healthcare services for the naturopathic clinic, as well as a significant reduction of in-person care for PCPs meant that we were no longer providing care at the same physical site. As a result, conversations and quick check-ins to discuss client care between appointments halted, as did spontaneous consults regarding appropriate assessment, treatment, referrals and/or case management. During the early days of the pandemic response, there were immediate client concerns to manage and frequent adjustments to our individual practices; loss of collaboration ended up becoming a secondary consequences of these changes. While we noticed the lack of social interactions with colleagues; immediate clinical demands overshadowed considerations of how we could adapt to our altered work conditions, including maintaining ongoing clinician communication.

Five months on however, we are reflecting on how we can redefine and restructure our communication to better serve our clients. Although the naturopathic clinic operates relatively independently as a Community Partner, PQWCHC clients aren't aware of the nuances of institutional structures and procedures, or the barriers to inter-provider communication. They don't know, for example, that the NDs and the other primary care providers use incompatible software for recording client encounters and cannot automatically access their complete patient record, even if they do consent. This is a common issue with conventional and allied health based EMR platforms, and one for which there is no simple solution. In order to ensure that clients receive truly integrated healthcare, with continued COVID related restrictions on in person clinical encounters, we are working at alternate strategies and look to possible technological solutions to help us communicate in new ways.

Software that allows for secure text messaging between providers and e-faxing brief consult notes to keep each other up to date will help ensure continuity of care, even when providers are not overlapping in office due to social distancing requirements. Scheduling phone calls or secure video chats to discuss case management may also be helpful, either with or without the client present, as the need arises. Inclusion of Naturopathic Doctors attending virtual Primary Care meetings at PQWCHC also helps to promote interprofessional collaboration, communication, and knowledge sharing.

Medical Doctors, Naturopathic Doctors, and other Regulated Health Professionals working in community settings can apply many of these strategies as well. Leveraging both overlap and specificity of scope of practice supports respectful and constructive interprofessional

relationships. Effective referral letters, commitment to Public Health and critical analysis,⁵ and knowledge sharing activities through Grand Rounds, Journal Clubs, or other Continuing Education opportunities can bridge both physical distance and gaps in approaches to clinical care.⁶

Overall, communication and cooperation are both critical foundations when working towards shared goals of improving patient outcomes through prevention-oriented, patient-centered primary care.⁷ During the time of COVID-19, these strategies and further innovations in collaborative care models are more important than ever. 🌱

About the Authors

Muna Chowdhury, MD, FCFP is a family physician at Parkdale Queen West Community Health Centre in Toronto ON. She has extensive experience in all aspects of adolescent health and expertise in providing primary and mental health care to high risk and homeless youth, including those identifying as Indigenous, LGBTQ, and Refugees. As a University of Toronto faculty member, she enjoys teaching and mentoring learners at all levels. Dr. Chowdhury is involved in leadership, advocacy and program development related to adolescent health at the provincial and federal levels. Dr. Chowdhury is also a Registered Yoga Teacher, a Reiki Master and a Mindfulness Practitioner.

Cyndi Gilbert, ND (she/her) is a naturopathic doctor, author, and faculty member at the Canadian College of Naturopathic Medicine. As a healthcare provider with a focus on mental wellness, trauma, and 2SLGBTQIA+ health, she regularly bears witness to the health impacts of social determinants and experiences of discrimination. She advocates for a collaborative, anti-oppressive, and harm reduction approach that centers patients' voices and experiences. Cyndi facilitates cultural competency training for NDs, as well as providing curriculum and policy guidance to naturopathic schools and private clinics. She also supervises the naturopathic teaching clinic at the Parkdale Queen West Community Health Centre in Toronto ON.

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COVID-19: A New Wave of Chronic Disease

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Abstract: While the number of deaths and hospitalizations caused by the novel coronavirus SARS-CoV-2 and the disease it causes (COVID-19) have captured public attention, a wave of chronic disease is also resulting from the pandemic. Some survivors of COVID-19, even those whose symptoms were too mild to warrant hospitalization, have struggled with persistent symptoms months after initial infection. SARS-CoV-2 affects several body systems and generates a wide variety of symptoms including dyspnea, myalgia, fatigue, and brain fog. It is yet unknown who is at risk of long-term disease, how long these symptoms may last, and what the long-term sequelae of the damage inflicted by this virus may be.

NDs must adapt their practices to include consideration of COVID-19 as a differential diagnosis or root cause for a wide range of clinical presentations. The purpose of this article is to review the evidence of some of the longer-term effects and symptoms of COVID-19 that NDs may encounter in clinical practice, with background information on other post-infection syndromes for context.

Around the world, millions have now been infected by SARS-CoV-2, the novel coronavirus that causes the illness known as Coronavirus Disease 2019 (COVID-19).^{1,2,3} As of this writing, hundreds of thousands of those infected have died. Understandably, much of the attention this pandemic has commanded has been on the dramatic struggle for survival in overwhelmed intensive care units (ICUs) and emergency rooms. It is a mistake, however, especially for practitioners, to measure the impact of COVID-19 by deaths only.⁴ It is now clear that many will face significant health challenges for a prolonged and unknown period of time, regardless of how severe their initial acute infection.⁵ This prolonged symptomatic period is becoming known as the “long tail” of this disease.⁵ As more data emerges about longer-term health implications of COVID-19, and experts share their experiences of the long-term health implications of other infectious diseases, it’s becoming obvious that we will be witnessing a significant new wave of chronic disease.⁶

While it is critical that all healthcare providers recognize signs of acute SARS-CoV-2 infection, naturopathic doctors (NDs) may be more likely to see patients after the acute infectious stage. These patients may have symptoms that do not fit the current popular understanding of COVID-19 (its course, demographics affected, and body systems involved), and they may be struggling to find adequate health care related to these issues or even a health care provider who believes that they are genuinely sick. There is also the possibility that COVID-19 may trigger health issues that may appear to be unrelated. Moving forward, NDs must adapt their

practices to include consideration of COVID-19 as a differential diagnosis or root cause for a wide range of clinical presentations. The medical and scientific communities’ understanding of this pandemic - its risks, wide range of effects, mechanisms, and long-term health implications - is rapidly developing. The purpose of this article is to review the evidence of some of the longer-term effects and symptoms of COVID-19 that NDs may see in their clinical practice, to review the effects of other viruses and relevant syndromes in order to provide important context, and to highlight the relevance of this information to a naturopathic clinical practice. The article concludes with some suggested general approaches to treatment, but specific recommendations are beyond the scope of this article.

Chronic disease following acute infections

Post-infection syndromes are seen after an acute infection with a number of different microbes. Examples include fatigue, myalgias, orthostatic intolerance and headache caused by *borrelia burgdorferi* (Lyme)⁷ bacterium and West Nile virus,⁸ myalgic encephalomyelitis/chronic fatigue syndrome caused by Epstein-Barr virus and human herpesvirus-6,⁹ and similar syndromes following the 1918 H1N1 flu, Ebola, and the virus causing Severe Acute Respiratory Syndrome (SARS).¹⁰ Fatigue and exercise intolerance resulting from mitochondrial oxidative stress are common features of post-infection syndromes.^{10,11} Although mechanisms of action are not yet clear, some predictors of the development of these chronic syndromes include severity of infection, the degree to which microbes induce “cytokine storms”, and Th2 dominant immune responses.¹⁰

Post-viral syndromes have been documented for the two previous coronavirus epidemics, SARS and Middle East acute respiratory syndrome (MERS)¹²⁻¹⁴. A wide range of persistent symptoms has been reported with each of these infections, including respiratory compromise, decreased quality of life, psychiatric symptoms¹²⁻¹⁵ and autonomic dysfunction.^{16,17} Although there is little information on the typical course of prolonged illness in non-hospitalized patients, emerging data suggests that persistent symptoms of unknown length may also occur in some people following COVID-19 infection.¹⁸

Prolonged recovery is common in hospitalized patients with COVID-19, especially among those who experienced Acute Respiratory Distress Syndrome (ARDS).^{2,4} While the general course of COVID-19 in outpatients with “milder” symptoms is believed to be recovery within two to three weeks, extended debility is also being observed among this population. In a survey of 294 patients recovering from COVID-19 from multiple US medical centers, 35% of respondents reported persistent symptoms at 14-21 days, with mean symptom count of seven, and more than half reporting at least one persistent symptom.¹⁸ Consistent with data from hospitalized patients, older age and number of comorbid diagnoses were significantly associated with prolonged illness.¹⁸

One of the more striking findings in this survey was that among adults age 18 to 34 years of age without comorbidities, one out of every 5 patients exhibited prolonged symptoms, with fatigue, dyspnea, and cough being the most common.¹⁸ Among those without comorbidities, there is as yet no indicator who may be more at risk of developing these sequelae.¹⁸

Since the common narrative of COVID-19 has been that patients who do not require hospitalization will fully recover in two to three weeks, those with persistent symptoms are often not believed by their families or even their doctors.¹⁹ Thousands of people are now participating in “long-hauler” online support groups and symptom tracking apps¹⁹⁻²¹ created to support those who’ve had confirmed or suspected cases of mild COVID-19 (not requiring hospitalization), but whose symptoms have been debilitating and have continued beyond 2 weeks.²⁰ *Body Politic* surveyed 640 long-haulers and found: “... about three in five are between the ages of 30 and 49. About 56 percent have not been hospitalized, while another 38 percent have visited the emergency room but were not admitted. About a quarter have tested positive for COVID-19 and almost half have never been tested. Some became sick in mid-March, when their home countries were severely short on tests (most survey respondents live in the U.S. and the U.K.). Others were denied testing because their symptoms didn’t match the standard set.”^{19,20}

Preliminary studies suggest that up to 85% of patients have symptoms beyond 2 weeks, and up to 55% have 3 or more symptoms.⁴ Reported post-acute symptoms include fatigue, headache, brain fog or difficulty thinking despite normal brain scans, poor concentration, anosmia, pharyngitis, dyspnea, cough, chest pain, post-exertional fatigue, heart palpitations, dizziness, headaches, seizures, intense muscle pain, and

various neurological symptoms, many of which fall under autonomic dysfunction.^{5,16,19,20,22} These symptoms sound remarkably like chronic fatigue immune deficiency syndrome (CFIDS), and while there are many similarities, it would be errant to label this as such. It’s important that clinicians and researchers consider and address the possible ways in which the SARS-CoV-2 virus might be causing this specific post-viral syndrome.^{13,14} The mechanisms to explain this range of signs and symptoms are not yet known, although possible explanations are inflammation, maladaptive changes to the immune response,¹⁵ persistent or cyclical microvascular issues reducing oxygen delivery to tissues, and disruption to the gut microbiome.^{6,13,14} Prospective studies of recovery from COVID-19 are needed to elucidate symptom duration and time of return to baseline function, as well as who is at risk of extended debility. Clinicians will need to consider prolonged recovery from COVID-19 in the differential for the above symptoms.

Systems

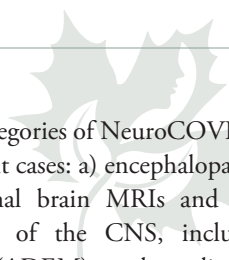
SARS-CoV-2 enters cells via the ACE2 receptor,^{6,16,17} which is present in multiple organs including lung, heart, gut, kidney, vasculature, and nervous system.^{16,17} Organs with these receptors appear to be differentially affected by COVID-19, which may suggest that cell infection is multifactorial,²³⁻²⁵ and differentiates this from previous coronaviruses. Several systems affected by SARS-CoV-2 are detailed here.

Pulmonary

COVID-19 was first described as a pneumonia of unknown origin,^{26,27} and caused alarm due to its potential to lead to ARDS.²⁸ Chest CT scans of COVID-19 patients have shown a distinctive pattern of ground-glass opacities (GGOs), and consolidation to be the most common findings, both of which can appear within days of symptom onset.^{28,29}

Lingering dyspnea is a common post-acute complaint; an Italian study of 179 previously hospitalized COVID-19 patients found that dyspnea was reported by 43.4% of patients at 60 days after symptom onset.⁴ GGOs have also been noted in imaging of SARS, MERS, and avian flu patients; these were observed to begin to improve within 6 months of infection, though the presence of such visible lesions had stronger correlation with some loss of pulmonary function compared to those who had none.³⁰

Importantly, two studies have documented GGOs in asymptomatic individuals infected with SARS-CoV-2 who did not progress to overt illness.^{31,32} While it is likely that COVID-19 patients hospitalized for pulmonary symptoms of the disease will have subsequent lung damage that will affect their ongoing health, further research will determine how prevalent asymptomatic lung changes are in the larger population, whether these lesions resolve, and whether these asymptomatic findings may subtly impact pulmonary function and long-term health.³³



Cardiovascular

Rich in ACE2 receptors, the heart muscle is affected by SARS-CoV-2. Direct myocardial viral invasion has been shown by postmortem myocyte inflammation in autopsy samples,^{6,34} and several studies have documented elevated troponin levels in hospitalized patients, indicating virus-induced myocardial invasion and inflammation.^{22,34,35}

While patients with risk factors such as hypertension, obesity, and advanced age are more vulnerable to severe outcomes from COVID-19, the adverse effects of this virus on the heart has been observed in younger people without known underlying conditions.²² An Italian study compared cardiac findings of 100 COVID-19 patients (mean age 49, two-thirds of whom had not required hospitalization) with those of healthy controls.²² Two months post-infection, cardiovascular magnetic resonance imaging showed significant differences between cases and healthy controls in structural changes and cardiac blood markers.²² The concern is that some of this damage may be long-term and lead to decreased cardiac capacity, chronic heart disease, or heart failure.²² Further study will help to clarify long-term effects.

A cardiovascular risk of COVID-19 that was not immediately understood is the unique propensity of the virus to initiate blood clots. It's now known that SARS-CoV-2 acts on the endothelial lining of blood vessels (perhaps via ACE2 receptors), triggering thrombi throughout the body that impair local and regional circulation or travel via the circulatory system to trigger organ damage, pulmonary emboli, strokes, and myocardial infarctions.³⁶

Neurological

The neurological COVID-19 sequelae dubbed "NeuroCOVID"¹⁶ may be the most complex and variable. Neurological symptoms that have been documented in association following SARS-CoV-2 infection include headache, altered consciousness, ataxia, acute cerebrovascular disease, hyposmia, seizure, hypoguesia, neuralgias, and mood disorders as well as the secondary effects due to stroke and ischemia associated with this infection.^{12,16,37,38} Similarly, sequelae of SARS and MERS coronavirus infections included encephalopathy, encephalitis, ischaemic and haemorrhagic stroke attributed to hypercoagulability, sepsis and vasculitis, and GBS.^{12,16}

Other than ischemia, processes by which the nervous system is affected in COVID-19 are currently unproven. Suspected mechanisms of injury include direct attack on neurons by the virus, incidental damage from hypoxia or fever, and induced autoimmune disease.^{12,39} How the virus gains entry to the CNS is unclear. Possible mechanisms of entry include entry via damage to the vascular endothelium of the blood-brain barrier (BBB), and retrograde transmission via the olfactory nerve.^{16,32,38,39} Other coronaviruses have been shown to spread via neuronal retrograde, through ascending the cranial nerves or through the chemo- and mechanoreceptors of the lung, crossing synapses and ultimately reaching the brainstem.^{16,39}

Neurologists in the U.K. identified 4 categories of NeuroCOVID as early as March 2020, based on 43 patient cases: a) encephalopathies with psychosis or delirium but normal brain MRIs and CSF analyses; b) inflammatory syndromes of the CNS, including acute disseminated encephalomyelitis (ADEM), a demyelinating autoimmune disease affecting the CNS; c) ischemic strokes; and d) disorders of the peripheral nervous system (including Guillain-Barré syndrome, a demyelinating autoimmune disease affecting the PNS).¹² SARS-CoV-2 viruses were present in the CSF of approximately half these cases.¹²

Several studies have documented the association of COVID-19 with dysregulation of the autonomic nervous system.^{40–42} Dysautonomia (DA) results from the over- or under-reaction of the sympathetic or parasympathetic nervous systems. Symptoms of DA are wide-ranging, including: orthostatic hypotension, unstable blood pressure⁴⁰, erectile dysfunction, bladder and bowel problems,⁴⁰ non-epileptic seizures,⁴¹ gastric motility issues,⁴³ and postural orthostatic tachycardia syndrome (itself a constellation of symptoms, including fatigue, dizziness, tachycardia, light-headedness, anxiety, tremors, and exercise intolerance).⁴⁴ DA has also been associated with other infections, including the viruses HIV, coxsackie B, hepatitis C, mumps,⁴⁰ Epstein-Barr,^{40,43} herpes,⁴³ SARS, and MERS.¹⁷

SARS-CoV-2 invasion of the CNS may also be associated with new onset or worsening anxiety and depression.³⁸ One study that tracked symptoms in 114 patients who had tested positive for COVID-19 found that olfactory dysfunction (OD) had a stronger correlation with anxiety and depression than did upper respiratory symptoms of cough, dyspnea, or fever, all of which are presumably represented more severe disease and therefore presumed to be more challenging to mental health.³⁸ Further studies to validate the finding and examine causality and duration of effect are needed to fully understand the implications of this research. Given that OD is estimated to be even greater than the reported prevalence of 34–68% of patients with COVID-19,³² an infectious etiology of depression and anxiety, may further compound the concerning mental health trends associated with social and financial losses resulting from the pandemic. Clinicians should remain aware of the increasing need of mental health supports, as well as a potential infectious etiology of new or exacerbated mental illness symptoms in patients.

Endocrine

Diabetes is a major international health issue.⁴⁵ Patients with pre-existing type 2 diabetes (T2DM) have a greater risk of severe COVID-19 outcomes and death.^{46–50} Worsening glycemic control in existing T2DM as well as new onset type 1 diabetes (T1DM) has been observed with current and previous coronavirus infections including SARS.^{50–52} Although the mechanism of action is yet unclear, direct medication interactions, impaired glycemic control, direct pancreatic injury via ACE2 receptor binding, and new development of auto-antibodies in genetically predisposed individuals, have been shown.^{47–50,53–55}

Other systems

Unfortunately, long-term effects of COVID-19 are likely not isolated to just the pulmonary, cardiac, neurological, and endocrine issues outlined above. There is also emerging evidence of sequelae related to the kidneys, male fertility, and possibly more⁵⁶⁻⁶⁰. This is a rapidly evolving area of research to follow in the months and years to come.

What can be applied to naturopathic clinical care?

As naturopaths, a large focus of our care is on disease prevention and health promotion. Anyone, regardless of age or health status, can become gravely ill from COVID-19. Still, it's important to maintain and improve health to support patients and reduce risk of poor outcomes due to comorbidities. It's also critical for NDs to recognize and properly diagnose sequelae from previous or undetected SARS-CoV-2 infections. Prevention and generally supportive naturopathic therapies will likely be helpful. Recommended patient management approaches include: Establish the foundations for health, including good nutrition, sleep, and physical activity. This may include various immune supportive supplemental nutrients and herbs. Practitioners should be prepared to support patients within the realm of patients' available resources.

1. Monitor and manage patients' conditions recognized as risk factors for poorer COVID-19 outcomes (e.g., diabetes, chronic kidney disease, hypertension, obesity), and routinely screen patients for comorbidities where applicable.
2. Educating healthy patients that although the risk is less, they can still become very ill from a COVID-19 infection and experience long-lasting, debilitating symptoms. Fear-mongering isn't helpful, but there is a great deal of complacency regarding this virus among young and healthy people. NDs must help all patients understand the potential risks of COVID-19.
3. Encourage patients to follow public health guidance to reduce risk of COVID-19 exposure and transmission including mask-wearing, physical distancing, and sensible hand hygiene.⁶¹⁻⁶⁷ Remind patients that reducing spread and "flattening the curve" is not just about infection prevention, but also about buying science time to learn more about how this virus infects and how to prevent severe/long-term outcomes.
4. Teach patients with confirmed or suspected COVID-19 how to recognize early signs of dangerous conditions such as stroke, heart attack, ketoacidosis, or new onset neurological symptoms, and to report or seek prompt medical attention should these symptoms arise.
5. Upgrade your knowledge and skills as necessary to provide healing support for patients who may be experiencing the "long tail" of COVID-19. Monitor reports from post-infection clinics.^{4,57} Be prepared to see patients dealing with these sequelae.

Review what you know about the many treatment options we have in the naturopathic toolkit for decreasing inflammation, treating chronic fatigue, and for supporting mitochondrial function. Learn about post-viral autonomic dysfunction and supportive interventions to resolve or cope with the various expressions of dysautonomia.

6. Monitor patients who have tested positive for or possibly been exposed to COVID-19 as needed for potential sequelae (strokes, heart and lung function compromise, depression). It may take months or years to understand the consequences of these exposures for some people.
7. Take seriously any patient concern regarding brain fog, fatigue, and especially diminished exercise tolerance. Especially with abrupt or prolonged complaints, consider cardiac/pulmonary workup. Do not dismiss the experience of these patients. Autonomic dysfunction especially is very hard to "see" via any known testing.
8. Validate your patients who are finding their recovery difficult. Patients often do not get the support they need from family and friends who don't understand why they're "still sick". Help your patients understand that recovery may be gradual, even with continued treatment.
9. Recognize that patients with persistent symptoms may need consistent support and assistance with advocacy, especially in light of an already burdened health care system now facing chronic sequelae due to COVID-19.

It has long been clear that COVID-19 is infectious and deadly. Months after the initial outbreak in Wuhan, China, we are still learning about acute and chronic multi-organ implications resulting from COVID-19, and understand that disease sequelae may impact the quality of life for patients for extended periods. Naturopathic medicine aims to identify the root cause of disease and remove obstacles to cure, and we are well-positioned to be especially useful as thousands of recovering patients will be dealing with complex and frustrating symptoms and chronic disease. Helping all patients (regardless of their age or health status) understand the seriousness of this virus is of utmost importance. This should be done without fear mongering, but instead, in the true nature of *docere*. This is an opportunity for NDs to provide kind guidance and leadership — to their patients in clinical practice, to their communities through social media and educational offerings, and to the profession through continued research and development of evidence for effective and evidence-informed naturopathic management of the various aspects of this new wave of chronic disease. 🔥

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Assessing for the Co-morbidities and Factors That May Affect a Patient's Risk and Response to COVID-19

Iva Lloyd, BScH, BCPP, ND and Paul Saunders, PhD, ND, DHANP, CCH



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Abstract: The COVID-19 pandemic has impacted every country in the world and every aspect of how we live. A number of comorbidities and characteristics have been associated with increased risk of mortality for those that contract COVID-19. Naturopathic doctors have an essential role to play in supporting public health's policies around prevention and in assessing for and addressing factors that may contribute to increased risk. It is also critical that the naturopathic profession understand the characteristics of SARS-CoV-2 and the potential long-term impacts on health for those that have had the virus. This article reviews the current research around COVID-19 and highlights the laboratory testing that may be indicating when assessing for risk and the symptoms that patients may present with post-COVID that may need to be addressed.

Introduction

In December 2019 in Wuhan, China, Province of Hubei, patients began lining up outside of hospitals with a mysterious illness. In late December China notified the World Health Organization (WHO) of this new, serious respiratory infection. On March 11, 2020, the WHO declared a global pandemic now known as SARS-CoV-2 or COVID-19 as the virus had spread to Japan, South Korea, Iran, ski resorts in Italy and Austria, and across the balance of Europe and North America.¹ It was labeled SARS-CoV-2 as the first coronavirus that emerged in late 2002 which caused severe acute respiratory symptoms was referred to as SARS-CoV or in some cases SARS-CoV-1. The SARS-CoV-1 pandemic ended in June 2003 with a total of 8098 reported cases globally, 774 deaths, and a fatality rate of 9.7%; including some 250 cases and 38 deaths in Toronto, Canada.² A related respiratory virus also caused by a coronavirus was the Middle East Respiratory Syndrome (MERS-CoV) which emerged in 2012 and resulted in 2494 reported cases with 858 deaths across 27 countries and had a fatality rate of 34%. MERS-CoV was common in dromedary camels and zoonotic cases continue to occur.³ The current SARS-CoV-2 appears to be less deadly, but more transmissible. As of September 4th, 2020, the global count is over 26 million cases and 864,000 deaths with a global fatality rate of about 3.3%.⁴ Genetically SARS-CoV-2 is 79.6% similar to SARS-CoV-1 and 96% like bat corona virus.⁵ As of yet, there is no successful coronavirus vaccine, although there were many attempts for SARS-CoV-1 and MERS-CoV.⁶

The majority of people that contract COVID-19 are believed to recover on their own. Although there are certain substances and procedures that are in current use to ease COVID-19 symptoms, there are currently no vaccines, drugs or substances either in conventional health-care or in the realm of Traditional and Complementary

Medicine (T&CM) recognized by the Canadian government as effective in treating COVID-19.^{4,7} There is a growing number of research studies and clinical trials being conducted around the world with the aim of helping the global healthcare community understand SARS-CoV-2 and how to prevent and treat those affected. The WHO website on COVID-19 includes 18 established research resources including the *Lancet*, *Jama* and Elsevier that provide open-access to the research on COVID-19.⁸ During this global pandemic we have seen unprecedented collaboration and sharing of research findings. With the aim of having naturopathic treatments considered as viable options in the management of COVID-19, the World Naturopathic Federation (WNF) worked with over forty naturopathic researchers, practitioners and content experts around the world to complete ten rapid reviews. Table 1 highlights the rapid reviews that have been completed to-date. These rapid reviews have been published individually and as a special open-access issue of the scientific journal *Advances in Integrative Medicine* (Elsevier).⁹

What is becoming clear is that COVID-19 is here to stay, at least for the next few years. Naturopathic doctors in Canada and other parts of the world have been restricted by governments and regulators to treat COVID-19.¹⁰ However, naturopathic doctors have a key role in working with patients to address the co-morbidities that are associated with increased risk of serious disease and mortality, to help patients manage the tremendous mental-emotional strain this pandemic is having on them and their families, and to work with patients that have had, or believe they had, COVID-19 and are experiencing residual health effects. With the dissemination of the rapid reviews conducted by the WNF, there is reason to suspect that naturopathic treatments and other T&CM treatments will be given consideration by the global healthcare world in the management of COVID-19.

This practice-based article provides naturopathic doctors with an understanding of COVID-19. It outlines what we currently know about the virus, it discusses some of the questions that have been raised about COVID-19 and how it affects organ health and it highlights those laboratory tests to consider when assessing a patient's increased risk for the co-morbidities associated with COVID-19 and for those patients that continue to have symptoms after experiencing COVID-19.

What We Know About COVID-19

Symptoms

According to the WHO, about 80% of patients that contract COVID-19 have mild symptoms or are asymptomatic. For those that have symptoms, they can range from mild, moderate to severe with a high degree of variability amongst patients.⁴ The most common symptoms include a fever of 38.1°C or greater; cough or worsening of a chronic cough; shortness of breath; difficulty breathing; diminution, loss of sense of taste or smell or altered taste or smell; chills; headaches; unexplained fatigue, malaise; muscle aches or myalgia; nausea, vomiting, diarrhea and/or abdominal pain; pink eye or conjunctivitis; and runny nose, nasal congestion without a known cause such as allergy.¹¹⁻¹³ Morbidity and mortality are higher in individuals 60 years old and above, based on data from China, South Korea, Italy and elsewhere.¹³⁻¹⁶ There is a lot of overlap between COVID-19 and the common cold or influenza, but the symptoms that are unique to COVID-19 include a loss of taste and smell, and early symptoms of serious disease including decreased oxygen saturation.^{17, 18}

Susceptibilities To Contracting COVID-19

Who is at risk of contracting COVID-19 has changed since the onset of COVID-19 and is influenced by the testing that is being done. Individuals with underlying conditions such as diabetes type II, cardiovascular disease (CVD), cancer, chronic kidney disease, chronic obstructive pulmonary disease (COPD) and obesity or BMI >30 appear to be at the greatest risk of severe symptoms or increased mortality if they contract COVID-19.^{11,12} According to the US Centers for Disease Control and Prevention (CDC), individuals with underlying conditions are 6 times more likely to be hospitalized and 12 times more likely to die compared to those who have no such conditions.¹⁹ As of May 30, 2020, 1,761,503 cases and 103,700 deaths had been reported to the CDC, with 1.3 million included in the analysis and data on underlying health conditions available for 287,320 (22%) of which 198,979 had one or more other conditions and 88,441 had none. 45.4% of those with cardiovascular disease or diabetes were hospitalized versus 7.6% without an underlying condition. 19.5% of COVID-19 patients with underlying conditions died compared to 1.6% with no underlying condition and among ICU (intensive care unit) admissions the rates were 8.5% and 1.5%, respectively.²⁰ Another susceptibility factor may be age, especially when there are comorbidities.²¹ Confirmed cases in the USA were 902 per 100,000 for 80 years old and up, and 550.5 per 100,000 for 50-59 years old.²² Social determinants of health such as employment,

housing, socioeconomic status, health care access, and racism are also factors that appear to impact infection rates. In a CDC study of those diagnosed with COVID-19, 33% were Hispanic, 22% Black and 1.3% were Native American /Alaska Native; yet these people accounted for 18%, 13% and 0.7% of the USA population, respectively.²³ Also those individuals that are Native American are reported to be 5.3 times more likely to be hospitalized compared to Caucasians, Blacks 4.7 times and Hispanics or Latino individuals are 4.6 times more likely. Likewise American Indian are 1.4 times more likely to die if they get COVID-19 compared to Caucasians, Blacks are 2.1 times more likely, and Hispanic or Latino individuals are 1.1 times more likely.¹¹ These differences are a concern in some countries such as the United States as Hispanic health aid workers represent 17.1% of the entire health aide workforce.²³

Although males appear to have a high mortality rate, this difference may be due to lifestyle factors more than biological sex differences.^{19, 21} In a *Lancet* study published in August 2020, the overall male to female mortality sex ratio per 100,000 population in European countries was reported as 1.4.²¹ The higher mortality rate in men may be tied to higher baseline IL-8, IL-18 and CCL5 compared to women and a more robust T-cell response in women.²⁴ For people aged 0-9 years, the ratio was 0.81, a ratio of 1.9 in the 40-49 age group, 2.3 in the 50-59 year age group, 2.6 in the 60-69 years age group, and 1.65 in people older than 80 years.²¹

In the news there has also been reports of medications that have been associated with an increased risk of severe reaction or mortality to COVID-19. Two medications that have been studied are ACE inhibitors and proton pump inhibitors (PPI). The research on ACE inhibitors is varied. Some studies have indicated that patients on ACE inhibitors are at greater risk, others indicate that they are not.²⁵ The data on the use of PPIs, however, is quite clear. In a survey of 264,058 persons of whom 86,602 completed the survey, 6.4% reported testing positive for COVID-19. Those who took a PPI up to once a day were twice as likely to report having a positive COVID-19 test as those who did not (OR 2.15; 95% CI 1.9-2.44). Those who took the PPI twice per day were almost 4 times (OR 3.67, 95% CI 2.93-4.60) as likely to test positive for COVID-19. However, those who used an H2 receptor antagonist once per day were 15% less likely to report a positive COVID-19 test (OR 0.85; 95% CI 0.74-0.99).²⁶

An additional risk factor may be blood type. Some studies indicate that blood type A has the greatest risk, whereas other studies indicate that it is blood type AB or B. While these blood types are inconsistently associated with increased risk, blood type O appears to be consistently associated with a lower risk.^{27, 28} For example, an examination of blood type in 2173 COVID-19 confirmed patients from Wuhan and Shenzhen, China, found a lower risk with blood type O, $p < 0.001$.²⁷ Similar result were found among 775 patients and 950 controls from Spain and 835 patients and 1255 controls from Italy.²⁹ What is interesting about this data is that those with blood type O were also less likely to be infected by the SARS-CoV-1 virus.³⁰

Stages Of COVID-19

There are four stages associated with COVID-19: prevention, infection, escalating inflammation and recovery.³¹ Public health focuses on measures such as social distancing, hand washing and wearing of masks as preventive measures. Naturopathic practice follows the guidelines set by Public Health for prevention and includes a number of health promotion strategies as well. When a person contracts COVID-19 it generally starts as an upper respiratory tract infection which binds to target cells, similar to SARS-CoV-1, through the angiotensin-converting enzyme-2 (ACE-2) receptor which is expressed by epithelial cells of the lung, intestine, kidney and blood vessels.³² The ACE-2 receptor is more likely to be expressed at higher levels in type 1 or 2 diabetics and those treated with ACE-inhibitors and angiotensin II type-1 receptor blockers (ARBs) which up-regulate ACE-2.³¹ ACE-2 can also be increased by use of thiazolidinediones and ibuprofen as well as in lung diseases, cancer, and hypertension, but not by calcium channel blockers.³³ From the respiratory tract, COVID-19 can descend into the gastrointestinal tract, kidneys, and the individual's vasculature affecting different organ systems and causing multiple and diverse coagulopathy such as disseminated intravascular coagulation (DIC) often with dire consequences depending on which organ systems are attacked by the virus.³⁴ As the virus progresses to the inflammation stage, the result can be significant elevations in fibrinogen, hsCRP, and d-dimer and can lead to pulmonary vasculopathy.³³

Another organ system where symptoms can develop are the skin, especially in children, with chilblains or Kawasaki-like disease. The symptoms that manifest include non-purulent conjunctivitis, polymorphic rash, mucosal changes, swollen extremities, and in some cases shock and coronary artery aneurysms. This has also been labeled as pediatric inflammatory multisystem syndrome (PIMS).^{35, 36}

Testing for COVID-19

Reverse Transcription Polymerase Chain Reaction (RT-PCR) is the gold standard for diagnosis of COVID-19. RT-PCR may be positive with variable predictive value during the infection period, early infection, active phase of infection, and in the late and recurrent stages of infection. The optimal time for testing is in the first days after symptoms emerge. False negatives are more prevalent during the presymptomatic stages and during the recovery stage of the infection. It's important to note, however, that PCR tests can also remain positive long after individuals are no longer contagious.³⁷

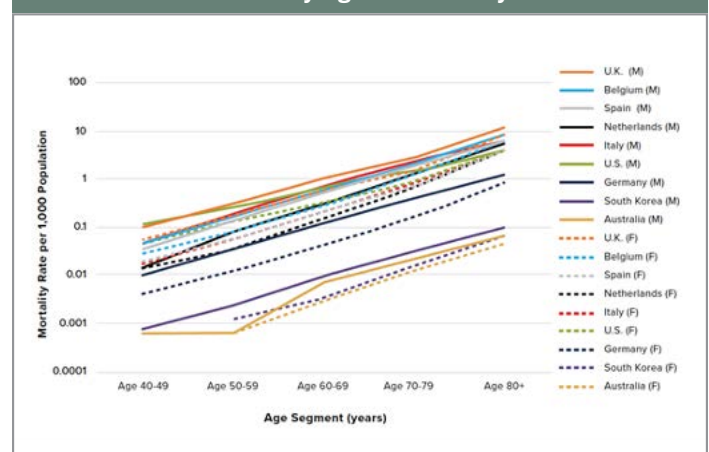
Antibody testing can be used to determine if an individual has had COVID-19, yet the timing of testing is critical as antibody detection is accurate 30% at one week, 72% at two weeks and 94% at three weeks.^{38, 39} Typically IgM values are initially elevated in 5-7 days followed by elevation of IgG values at about 3 weeks. IgG levels were significantly lower in asymptomatic compared to symptomatic individuals ($p=0.005$) and median duration of viral shedding was significantly longer in the asymptomatic group, 15-26 days ($p=0.028$), therefore indicating a weaker immune response to COVID-19.³⁹ It is important to note that at the time of writing there were no approved antibody tests for use in Canada.⁴⁰

Risk and Mortality Rates

Healthcare workers appear to have a higher mortality rate when infected by a coronavirus. Mortality rates for SARS-CoV-1 in Guangdong, China, as of November 2002 were 10% among the general population and 23.1% among health-care workers. Similarly for COVID-19 in Wuhan, China, the population mortality was 2.9% while among health-care workers it was 16%.⁴¹ The high death rate among health-care workers is assumed to be due to repeated virus exposure, exposure to multiple strains, high doses with each exposure, and re-infection over a shorter period of time.

Death rates increase with age as shown in Figure 1.⁴² The highest rates are in individuals aged 70-80 plus in all countries. In Italy and Germany, male mortality has been 2.5 to 3.5 times that of female mortality in all except those 80-years-old or greater. The cause of higher male mortality was initially thought to be because more men than women smoke, but that finding does not hold in Italy where smoking rates by sex are nearly equal. The tendency for increased mortality in males is similar to what was seen in the 2003 with the SARS-CoV pandemic in Hong Kong where mortality rates were 22.3% for males and 13.2% for females, and in mice infected with SARS-CoV males were much more susceptible suggesting that sex differences in immune response may be a factor, or it could be as simple as compliance with handwashing and other protective measures in humans.⁴²

FIGURE 1: Death rate by age and country.⁴²



Addressing Susceptibilities

Health promotion is a central tenet of naturopathic care and involves addressing a patient's susceptibilities and risk factors. Due to the correlation of increased severity of COVID-19 associated with certain comorbidities, it is reasonable for naturopathic doctors to address the nutrient deficiencies, lifestyle factors and environmental factors that are known to be associated with these comorbidities. It is not about the promise of being immune to the virus, it is about ensuring that each person is as healthy as they can be for the health challenges that they may face.

Nutrient deficiencies

Nutrient deficiencies are associated with diabetes and cardiovascular disease and other co-morbidities associated with COVID-19.⁴³⁻⁴⁵ Specific nutrient deficiencies such as vitamin A, vitamin B12, vitamin C, vitamin D, zinc, omega 3 fatty acids, as well as lower levels of glutathione, and melatonin can impact immune and inflammatory responses.^{31, 46} Although there is an absence of high quality, contemporary clinical research to support the therapeutic use of these nutrients in reducing symptoms associated with acute respiratory infections, the following is a quick overview of the findings from rapid reviews conducted by the WNF:

- Vitamin C may improve respiratory function and decrease the severity of respiratory infections. It is an essential micronutrient involved in various cellular functions of both the innate and adaptive immune system and it has powerful antiviral properties by the way of increasing Natural Killer (NK) cells.⁴⁷
- Vitamin D deficiency is associated with an increased risk of acute respiratory tract infections.⁴⁸ A number of the co-morbidities for COVID-19 are also associated with deficiencies in Vitamin D, including obesity, diabetes type II and cardiovascular disease and hypertension.⁴⁹⁻⁵⁰
- Zinc is essential in many aspects of infection and inflammatory healing processes. Research indicates that zinc may potentially decrease the risk, duration and severity of acute respiratory infections, particularly for people at risk of deficiency.⁵¹
- N-acetyl cysteine (NAC), administered intravenously, may help improve outcomes in people with acute respiratory distress syndrome and may assist in improving markers of inflammation or oxidation.⁵² NAC is needed to make and replenish glutathione. Glutathione is one the body's most important antioxidants involved in the regeneration of vitamins C and E. Glutathione deficiency, often correlated with low vitamin D levels, may be an important underlying factor leading to serious COVID-19 infections.⁵³
- Melatonin has antioxidant properties as well as speculative antiviral and anti-inflammatory effects.^{54,55} Melatonin levels naturally decrease with age, but they are also affected by a person's adherence to the natural circadian rhythm. Sunlight stimulates the production of serotonin which is a precursor to melatonin. Daylight exposure in the elderly and appropriate sleep hygiene lead to better sleep and higher melatonin production.⁵⁶

Lifestyle Factors

There are several lifestyle factors that are known to be associated with respiratory health and with inflammation management.³¹ Although research evidence is lacking to show the benefit of lifestyle changes on either the infection rate or clinical outcomes of COVID-19, SARS-CoV-2 is a reminder of the importance of addressing diet, sleep, stress management, movement, and other lifestyle factors where possible to help with general health promotion and to assist in the prevention and management of chronic non-communicable diseases where possible.

- **Diet** is an aspect of lifestyle that most naturopathic doctors assess.⁵⁷ Historically a well-balanced diet with a focus on fresh fruits and vegetables, lean protein and whole grains as well as adequate hydration was believed to provide the required nutrients for health and healing.⁵⁸ Although research is lacking to support these recommendations, there is data to suggest that ultra-processed foods do increase mortality risk in multiple countries.⁵⁹
- **Sleep** is increasingly becoming recognized as essential to immune health.³¹ The body heals optimally during deep sleep and sleep itself can have an anti-inflammatory effect.⁶⁰ Short sleep, disrupted sleep and even prolonged sleep are associated with decreased immune function.^{61,62}
- **Movement** is important for immunity. As this virus is affecting respiratory health and oxygen-carrying capacity it is very important to remind patients that movement on a daily basis is associated with a decreased risk of respiratory infections and a decreased risk of infections becoming severe.⁶³
- **Breathing** is essential to life. The ability to take a deep, full breath is an indicator of overall respiratory function.⁶⁴
- **Time outside** helps to provide the skin exposure to the sun and thus the production of vitamin D, which is essential to immune health. It can also increase the activation of T-cells resulting in a faster immune-response.⁶⁵

Co-morbidities

As discussed, the co-morbidities that have been associated with an increased risk of severity or death due to COVID-19 include diabetes, cardiovascular disease and chronic inflammatory states.^{11,12,19} In June of 2020, it became clearer that SARS-COV2 targets the vasculature, affecting the cardiovascular system as well as the respiratory system, involving physiological processes related to oxidative stress, reactive oxygen species, inflammation and disruption to the endothelial membranes of blood vessels.⁶⁶

Table 2 outlines some baseline laboratory testing that may assist in identifying any underlying co-morbidities that may be addressed by naturopathic care. Key points include:

- HbA1c is a 4-month measurement for blood sugar control and is diagnostic for diabetes, as well as a marker for identifying people at high risk.⁶⁷
- Creatine kinase (CK) assesses for muscle damage. CK-MB is specific for heart muscle. Brain natriuretic peptide or proBNP is often used as part of an assessment for a cardiovascular event, but it may also be used as marker for overall heart health and blood vessel health, particularly if heart failure or aneurysms are suspected.⁶⁸
- CRP indicates general inflammation within the body, whereas hs-CRP is inflammation associated with cardiovascular blood vessels.⁶⁸
- A CBC is often association with assessing for infection, yet a high WBC can indicate inflammation, especially if the neutrophil to lymphocyte ratio is above 3.⁶⁹

COVID-19 and Chronic Inflammation

What is the most concerning about SARS-CoV-2 is that the deleterious effects are less about the rate of viral replication and more about the level of inflammation that is caused by the virus. Inflammation is an active and passive complex process impacted by many factors including nutrient levels, the extracellular matrix, the presence of inflammatory signaling molecules and genes, the microbiome, epithelial barrier health, lifestyle and other factors.^{31,70}

The SARS-CoV-2 virus attaches to the epithelium of the lung with spike proteins on the ACE2 receptor.³² The lungs, blood vessels, heart, kidney and digestive system all have ACE2 receptors on their endothelial barriers. As the viral load increases the virus produces the enzyme 3CL protease which inhibits a person's innate immune response and allows the virus to spread to the ACE2 receptors in other organs, disrupting cell integrity and altering organ function.³²

Ideally, the inflammatory response resolves on its own, but in a subset of people, inflammation continues to amplify, and may result in endothelial damage that can cause scarring, fibrosis, organ damage, autoimmunity and even death.⁷⁰ In the media, people who report prolonged symptoms associated with COVID-19 are often referred to as 'Long Haulers'.^{71,72} Chronic symptoms reported by people diagnosed with COVID-19 include shortness of breath, extreme fatigue, difficulty concentrating, brain fog and a variety of other symptoms depending on the person.⁷³

Post COVID-19 organ damage can affect many different organs, but has an affinity for the liver, heart, kidneys and brain. The three stages of neurological sequelae associated with COVID-19 include:

- NeuroCovid Stage 1: Damage due to the virus is limited to the epithelial cells of the nose and mouth. The main symptom is a loss of smell or taste. It is important to note that acute loss of smell is a significant prognostic symptom indicating COVID-19.
- NeuroCovid Stage 2: Cytokine storm that begins in the lungs travels in the blood vessels to all body organs. Results in the formation of blood clots and causes small or large strokes in the brain.
- NeuroCovid Stage 3: An overactive cytokine storm damages the blood brain barrier and virus particles invade the brain. The result is seizures, confusion, coma or encephalopathy.⁷⁴

Assessing for the impact of organ changes may be considered for any patient whose symptoms haven't resolved after being ill with a confirmed case of COVID-19 or an undiagnosed respiratory infection. When you examine the laboratory findings of those that have severe COVID-19 symptoms or those that have died as a result of COVID-19, the results resemble what you would expect to see when patients die of a cardiovascular events, such as a heart attack or a stroke with high values in ALT, LDH, CK-MB, D-Dimer, hs-CRP and ferritin, along with leucopenia and lymphopenia.⁷⁵ When you have patients that report "never being well since a known or

suspected case of COVID-19", it is the opinion of the authors that it would be prudent to run laboratory tests to assess for chronic inflammation, kidney and liver health status, cardiovascular health and hypoxia. Table 3 outlines the key post-COVID-19 laboratory tests to consider. Some highlights include:

- ALT is more specific for liver or heart disease whereas AST is more specific for hepatitis, trauma and alcoholism. A high ALT/AST ratio indicates liver damage. High ALT along with elevated LDH and CK-MB indicates increased risk of a cardiovascular event.⁷⁶
- When ferritin levels are very high they may indicate congestion in cerebral blood flow, chronic inflammation or disease, elevated iron intake, liver disease or hemochromatosis.⁷⁷
- The laboratory indicators that demonstrate the highest risk of mortality include an increase in D-dimer, high ferritin or lactate dehydrogenase (LDH) levels or a progressive decrease in lymphocytes over time⁷⁸
- Signs of ongoing inflammation include high hs-CRP, ferritin and/or ESR. In-office testing of oxygen saturation can also be an efficient way of detecting those patients with 'silent' hypoxia. Pulse oximeter readings below 95% can indicate a high risk of mortality and the need for referral to emergent care for further investigation.⁷⁹

Conclusion

Patients will be visiting naturopathic doctors expecting them to provide medical advice related to COVID-19. Patients will be looking for support with respect to overall immune and mental health, ways to address co-morbidities associated with increased risk of COVID-19, advice related to supportive measures or because they are concerned that they had or suspect they had COVID-19 and have not felt well since. Although naturopathic doctors in Canada, at this current time, cannot directly treat patients with COVID-19, it is imperative that they stay informed of the physical and mental impact on patients and how to properly assess for them. Laboratory testing is an essential tool as part of a thorough assessment. 🔥

TABLE 1: World Naturopathic Federation Rapid Reviews

RAPID REVIEWS

Vitamin C
Vitamin D
Zinc
Quercetin
N-Acetyl-Cysteine
Essential Oils
Echinacae (*Echinacae spp*)
Elderberry (*Sambucus nigra*)
Sea Buckthorn (*Hippophae rhamnoides*)
Ivy Leaf (*Hedra helix*)

TABLE 2: pre-COVID Testing Recommendations

CATEGORY	LABORATORY TESTING
Diabetes	Fasting glucose HbA1c
Cardiovascular Disease	Cholesterol, lipoprotein A/B ratio, creatine kinase (CK or CK-MB), hs-CRP, blood gases, electrolytes, proBNP, Vitamin K
Inflammation	CRP, ESR, Ferritin, Neutrophil/ Lymphocyte ratio
Immune Status	CBC, Vitamin D, Omega 3 Index, Zinc, Vitamin B12, Magnesium
Organ Health	eGFR, Creatinine, AST, ALT

TABLE 3: post-COVID Testing Recommendations

CATEGORY	LABORATORY TESTING
CBC	Looking for progressive lymphocytopenia, leukopenia (chronically WBC may go high), eosinopenia.
↑ BUN / Creatinine	Decrease in kidney function is common
↑ AST, ALT, LDH	Indicates liver damage. AST/ALT ratio <1 indicates liver disease. ↑ LDH high risk indicator
↑ hs-CRP, ↑ ferritin and ↑ IL-6 and other IL markers	Indicators of inflammation.
↑ D-Dimer, ↑ Troponin, ↑ Cardiac myoglobin (CK-MB), ↑ proBNP	Indicate heart disease and increased risk of myocardial infarct or stroke
↑ Lactic acid (l-lactate)	Indicate hypoxia
↑ bicarbonate	Indicates acid-base imbalance and underventilation of the lungs.

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- ▶ **MSK1 is central to the transcription of inflammatory cytokines** in various conditions that do not respond well to conventional pharmacology, including drug resistant cancers and autoimmune disease.
- ▶ **Only BDMC downregulates MSK1 in both the cytosol and the cell nucleus** resulting in superior pain and inflammation control over Standard Curcumin.

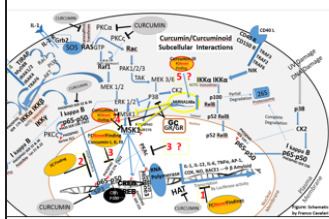
MSK1 - multiple points of facilitative activity

-a nuclear kinase that regulates chromatin relaxation and other nuclear events key to transactivation including NF- κ B p65/p50 transactivation.

-phosphorylates nuclear p65 at serine276 at the transactivation domain of p65 to facilitate transactivation of this TATA-less transcription factor (TF)

-phosphorylates nuclear CREB serine133 (co-transcription factor) to activate the TF

-phosphorylates Histone 3 serine10 to facilitate chromatin remodelling

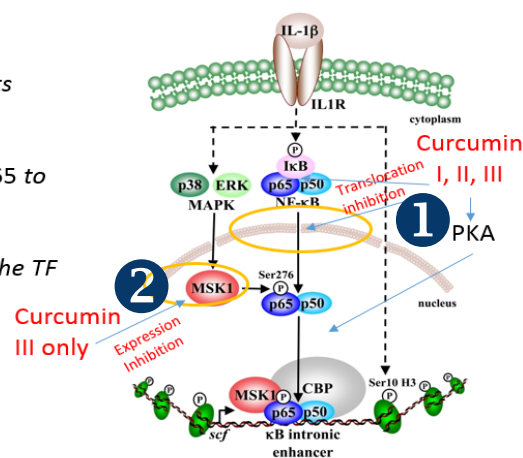


NF- κ B p65/p50

Transactivation of as many as 150 genes;

Immune system recruitment; Inflammatory response; Cell survival.

-IL-1, IL-2, IL-6, IL-8, IL-10, IL-12, TNF α , COX, MMP-9, ICAMs, BACE1 (β -A)



- 1 Standard Curcumin inhibits NF- κ B translocation only.
- 2 BDMC inhibits NF- κ B activation by inhibiting MSK1 in both the cytosol and the cell nucleus.

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Perinatal Mood and Anxiety Disorders during the COVID-19 Pandemic in Canada

Danielle Watson, ND



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Abstract: According to emerging research, Perinatal Mood and Anxiety Disorders (PMADs) have increased during the SARS-CoV-2 pandemic. The psychological stress associated with the pandemic has made new mothers more vulnerable to mental health issues. A number of factors have been shown to predispose mothers to this, including, financial, relational, seclusion, changes to perinatal care and fear of the virus. Research has also identified protective factors, including sleep, support and exercise. Given the sequelae of untreated mental health issues, impacting the entire family unit, it is important that naturopathic doctors are aware of this and have strategies to support mothers in the perinatal period.

Introduction

The current global pandemic due to SARS-CoV-2 has led to an increase in the risk of Perinatal Mood and Anxiety Disorders (PMADs) for new mothers. Previously, PMADs occurred in up to 20% of new mothers,¹ making it the most common complication of the perinatal period. This illness has both social & neuroendocrine risk factors that mediate its development. In Canada, death by suicide is one of the leading causes of maternal mortality in the postpartum period.² Emerging research demonstrates that the impact of the pandemic is leading to an increase in maternal mental health issues.³⁻⁵ Clinicians should be aware of this increased risk, as well as how naturopathic medicine can support mothers in the perinatal period.

The current pandemic of novel SARS-CoV-2 was first identified in Wuhan, China but has since spread internationally.⁶ Perinatal populations have been identified as one of the vulnerable populations that are affected by the virus, due to the immune-compromised state of pregnancy.⁷ The perinatal population is more prone to viral respiratory infections, such as influenza, severe acute respiratory syndrome (SARS) and Middle East Respiratory syndrome (MERS).^{8,9}

The fears surrounding this rapidly spreading virus, coupled with the lack of definitive knowledge regarding vertical transmission, assessment & management of perinatal women infected with COVID-19, has resulted in increased stress among pregnant women.^{7,9} Parenting challenges have arisen, with many experiencing changes to income, employment, and childcare needs.¹⁰ The United Nations Population Fund recently estimated that unwanted pregnancies have increased sharply during the lockdown and that women are at a considerably higher risk of domestic violence.¹¹ As such, there are both psychological & socioeconomic stressors presenting for parents, that have all been associated previously with increased parental mental health needs.¹²

Recent research has identified that the mental health repercussions of the COVID-19 pandemic on the perinatal population represent a major public health challenge.¹³⁻¹⁵ Targeted & timely care is needed to prevent mediate adverse mental health outcomes.¹⁶

Perinatal Mood and Anxiety Disorders

Perinatal Mood and Anxiety Disorders (PMADs) are one of the most common postpartum complications affecting 10–20% of perinatal women.¹⁷⁻²² In addition to their negative impact on maternal health, PMADs can have long-term adverse effects for children, including delayed cognition, socio-emotional development and poor mental health outcomes later in life.²³⁻²⁴ Mothers naturally experience a range of emotions in the days following labour, with almost 85% of new mothers reporting symptoms of what is colloquially called the ‘baby blues’.²⁵ The ‘Baby blues’ are defined as periods of weepiness, anxiety or irritability that occur 3-10 days after birth.²⁵ This can last for a few hours to a few days. During this time, mothers also need rest, proper nutrition, hydration and support. The hormones that supported pregnancy (estrogen & progesterone), drop significantly from supra-physiologic levels, down to their non-pregnant state. Low blood sugar and lack of sleep likely also contribute to these changes in mood. All women go through an expected period of adjustment during the postpartum time. However, it is important to recognize what is ‘normal’ during this time and what represents a perinatal mood and anxiety disorder. Table 1 details the range of perinatal mood and anxiety disorders.

Reasons for the Increase in PMADs

Research from 2016 identified four major categories of stressful life events that contributed to the development of perinatal mood & anxiety disorders.²⁶ The effects of the pandemic have made most of these factors part of daily life. The research identified that financial,

relational, trauma-related or emotional stressors all increased the risk of perinatal mood & anxiety disorders. Many families have experienced changes to their financial security, as workplace restrictions have altered to accommodate pandemic measures. Relational issues are also likely, given both the social distancing measures and the increased likelihood of conflict within the home with 'stay-at-home' orders. Financial issues & balancing work with childcare, may also contribute to relational stressors. Anxiety around the COVID-19 pandemic is common for many pregnant women—possibly compounded if those close to them have been affected by the virus. In addition to the global pandemic of the virus, the effects of containing the spread may have resulted in an unplanned sequelae of widespread perinatal mental health concerns.

Social support is one of the most significant protective factors for postpartum mothers from PMADS.²⁷ As such, pregnant women are often at increased risk for psychological problems due to social distancing.²⁸ In addition to this, mothers are reluctant to visit their doctors or hospital for fears of acquiring the virus while at a healthcare facility. This fear may result in an increase in pregnancy-related complications, due to a lack of prenatal or postpartum care⁹ and these complications have been associated with an increase to PMADS²⁹. To make matters worse, the widespread inaccurate or dis-information being spread from social media and other sources has resulted in increased anxiety for many pregnant women, in North America and abroad. In one international study, exposure to inaccurate information was found to increase anxiety in the general population which can be inferred to contribute to the severity of PMADS.³⁰

Due to the social restrictions that the pandemic has placed, most prenatal & breastfeeding classes have been cancelled or moved online. This has resulted in many mothers not acquiring the information they need to prepare for labour, newborn life or their own postpartum healing. Considerable research has indicated that breastfeeding education helps not only the rates of breastfeeding but mother's experiences with feeding their infant.³¹ If mothers are unable to access prenatal or postpartum breastfeeding support, mothers may instead find that they are unable to breastfeed successfully. This has also been associated with an increase in PMADS, as the expectation to breastfeed or the discomforts associated with poor breastfeeding (mastitis, clogged ducts, poor latch etc.) can affect a mother's mood.³²

Similarly, prenatal classes that discuss the labour process have been associated with better labour outcomes. Informed decision making has emerged as an important aspect to reduce unnecessary interventions, improve birth outcomes & increase the feelings of a positive birth experience.³³ As outlined in Table 1, risks for developing postpartum PTSD include a real or perceived trauma during the birth experience, which may occur if a woman is not informed about her birth or the decision-making process. Given the current pandemic, mothers are less likely to be able to attend prenatal classes, thereby missing the chance to speak with their providers on the topic of the labour process. Prenatal classes are also often a space for new mothers to make connections, and these changes have made this less available. It is too early as of yet, to have data regarding the efficacy of delivery of prenatal & breastfeeding classes online.

Similarly, from a clinical perspective, many mothers are reporting grief about the loss of an event that was meant to be celebrated with loved ones. Baby showers, family introductions, and celebrations, have all been altered for women in the perinatal period during this pandemic, due to the social distancing measures. For many mothers, this has resulted in grieving the experiences they thought they would have, changing long-held expectations surrounding this special life event.

Along with this grief, many mothers are also seeing an increase to their workload at home. This 'mental load' or the unequal division of household labour, which disproportionately affects mothers has increased substantially with the changes due to COVID-19. Clinically, throughout this pandemic, many mothers have reported a further increase to the mental load: grocery shopping (with changes to sanitizing & safety), buying diapers, childcare changes, often while balancing career & coordinated schooling for older children. The increase in mental load could lead to more stress for mothers during this time.

Effects of PMADs on the Family Unit: previous evidence

Research from other crises has also demonstrated that there are long-term implications for children of mothers who experienced high levels of prenatal stress due to a disaster.³⁴ In 1998, the ice storm crisis that affected Quebec resulted in power losses for 3 million people for up to 40 days. Researchers at McGill University in Montreal then had women who were pregnant in the most affected areas during that crisis complete questionnaires to ascertain their exposure to stress. They also assessed 89 of their children at 5 ½ years of age for standard tests of IQ and language ability. The researchers found that children exposed to very high levels of 'objective' stress during their mothers' pregnancies had poorer results on both IQ and language tests. Given the ubiquitous nature of these stressors, concerns of the long-term effects this will have on a children's mental and cognitive health are warranted.

High levels of prenatal stress can also lead to changes in the maternal immune system, increasing inflammation and the risk of prenatal infection.³⁵ There is speculation that epigenetic changes to the offspring can occur due to the dysregulation of the hypothalamic pituitary adrenal (HPA) axis, which can change glucocorticoid levels (cortisol and CRH) in the mother.³⁶ A systematic review of neuroimaging studies recently showed a significant association between that prenatal maternal anxiety and/or depression are changes to brain structure and function in children, suggesting long term effects of PMADs on child neuro-development.³⁷ There are also suggestions that the effects of post-partum depression can be felt by the entire family.³⁸ Research prior to the onset of the pandemic has indicated that perinatal mood and anxiety disorders can affect both parents and children—including their physiology and relationships.³⁸

Current Evidence in PMADs

Although research is only beginning to emerge on the aftereffects of the COVID pandemic on PMADs, recent studies have demonstrated an increase to perinatal mental health symptoms. One

study, published in the *Journal of Affective Disorders*, looked at the prevalence of maternal depressive and anxiety symptoms using an online convenience sample.³⁹ Researchers also identified both risk and protective factors, as well as current mental health service usage and barriers to treatment. In this study, 641 mothers of children 0-8 years completed an online survey. Results of this survey indicate that 33.16% of mothers with children 0-18 months, 42.55% of mothers with children 18 months-4 years and 43.37% of mothers with children 5-8 years old are experiencing clinically relevant depression. This represents an almost doubling in maternal mental health rates, compared to pre-pandemic reports.

Another study, through the University of Alberta found that prior to the pandemic, 15% of women self-identified with depression, whereas during the pandemic, this number rose to 40.7% of self-identified depression on the EPDS.⁴⁰ Similarly, 29% of women pre-pandemic reported symptoms of moderate to high anxiety, compared to 72% during the pandemic. Interestingly, they also noted that physical activity appeared to be protective factor against both anxiety and depression for those women meeting the recommended 150 minutes of moderate intensity physical activity.

A large pre-publication study at the University of Calgary has identified a similar trend. Of the 1987 mothers that participated, they found there was a 22% increase for depression and a 150% increase in feelings of isolation.⁴¹ This study noted that both sleep and support were protective factors for mental health—however, unlike the previous noted study, they did not find an association with exercise.⁴¹ This study also detailed a number of other parameters that were contributing to perinatal distress, such as job loss (18.3%), feelings of loneliness (92.9%), strain to their relationship (22.5%), changes to prenatal care (89%), and worries of virus harming unborn baby (29.8%).⁴¹

A recent study published in *Contemporary Family Therapy*, looked at the issue of perinatal mental health and COVID-19 pandemic through the biopsychosocial lens.⁴² This report also detailed recommendations for how providers can change their care for pregnant and postpartum mothers to be better supports during this time. This study indicated that it was found that almost half of pregnant mothers were not spoken to by their provider about the impacts COVID-19 would have on their perinatal care.⁴² Their recommendations include that all providers who work with pregnant and postpartum patients ensure that they fully communicate the changes caused by the pandemic, expectations around care and discuss perinatal mental health at every visit.⁴² This article also makes recommendations for ensuring that telemedicine or virtual support are made available for mothers.⁴²

Current Issues in care for PMADs In Canada

Unfortunately, even without the barriers created by the pandemic, accessing perinatal mental health care in Canada is challenging. It's estimated that even prior to the onset of the COVID pandemic, only 15% of new mothers who experienced a PMAD received professional care. Canada, unlike many other developed other

countries, does not have appropriate perinatal mental health screening guidelines, or readily available access to treatment. In the United Kingdom, the *National Institute for Health and Care Excellence* (NICE) has guidelines detailing the clinical management and service guidance for perinatal mental health.⁴³ The guidelines depict the principles of care and treatment, as well as information regarding screening and assessment and provision of interventions in this population.⁴³ Similarly in Australia, in 2017, the *Centre of Perinatal Excellence* developed national guidelines for perinatal mental health.⁴⁴ These guidelines provides a reliable standard for healthcare professional providing care to women in the perinatal period by summarizing the current available evidence—something that Canada does not have. Guidelines such as these are critical for helping mothers access screening, diagnosis and treatment of perinatal mental health concerns. As it is currently in Canada, stigma of perinatal mental health coupled with lack of both public and professional understanding of perinatal mood and anxiety disorders, leads many mothers to be unable to access treatment. Without appropriate screening, the onus of accessing care is left to mothers. With further barriers caused by the pandemic, there is an increased likelihood that Canadian mothers with PMADs will not receive treatment.

There is a high cost to leaving mothers untreated for perinatal mental illness. Implications of this affect both mother and child, as well as financially burden the Canadian public health care system. As the restrictions placed by the current pandemic leave mothers not only more vulnerable to perinatal mental illness¹⁴ but also less able to access treatment, this represents a massive financial cost to our already overburdened health care system. Current research has demonstrated that 74% of mothers reported issues with accessing other healthcare aside from prenatal visits due to the pandemic. As researchers have noted, 'a detailed mental health crisis program should be developed by introducing innovative strategies like teleconsultation services to give psychological assistance to pregnant mother to deal with secondary mental health challenges related with COVID-19'.⁴⁷ However, while both federal and provincial governments have announced funding for other mental health initiatives since the beginning of COVID-19 emergency measures, perinatal mental health has to this point not been addressed. Given the severity of downstream implications of untreated perinatal mental health, this lack of attention could bring on dire consequences for mothers, children & society.

Clinical Strategies

Clinicians, however, should still be aware of this increased risk of PMADs with the onset of COVID-19, as well as how naturopathic medicine can support mental health for mothers in the perinatal period. Current research has addressed three potential ameliorating factors for perinatal mental health specific to the post COVID-19 lockdowns: support, exercise & sleep.⁴¹

Discussing with patients the clinical guidelines supporting exercise and sleep during pregnancy are interventions that naturopathic doctors are well-equipped to provide. According to 2019 guidelines

for exercise from the *Journal of Obstetrics and Gynecology Canada*, pregnant women should accumulate at least 150 minutes of moderate-intensity physical activity weekly, over a minimum of 3 days a week, incorporating both aerobic, resistance and pelvic floor training to achieve clinically relevant health benefits and reductions in pregnancy complications.⁴⁹ Discussing with patients exercise safety for their pregnancy, recommending specific exercises targeted to their needs and providing guidance around this are all important aspects to address in appointments.

Although many aspects of typical perinatal supports are unavailable for mothers with provincial emergency measures in many provinces, continuing to discuss social supports with patients could be helpful. Naturopathic doctors can help to outline the professional supports a mother may need postpartum, such as lactation consultants, perinatal mental health professionals etc., so that a new mother is more likely and able to access them. As well, discussing safe supports by family, such as meal or grocery drop off, supports for older children or other needs, could also help alleviate some of the mental load felt by new mothers.

Although these three recommendations are specific to what the current research has seen to be helpful, naturopathic doctors should be aware of other approaches to treatment for perinatal mood and anxiety disorders. Research indicates that hormonally, thyroid function^{50,51} particularly can contribute to PMADs, specifically to postpartum thyroiditis, an autoimmune issue that can arise postpartum. Nutritionally, a number of micronutrients have been identified, including, low iron⁵², vitamin D⁵³, vitamin B6⁵⁴, vitamin B2⁵⁵, zinc^{56,57}, selenium^{55,58} and DHA levels may also contribute to PMADs. As such, a thorough nutritional diagnostic work-up is indicated for new mothers, as part of their naturopathic postpartum assessment. As well, the expected changes to hormones in the initial postpartum time may cause susceptible mothers to experience mood changes, however this relationship has not been shown to be causal.⁵⁹

Research also indicates some other dietary factors that can be helpful. The addition of probiotics, specifically those containing *Lactobacillus Rhamnosus* HN001, resulted in lower anxiety & depression scores postpartum.⁵⁷ As well, although there is conflicting evidence on healthy diet, specifically sufficient consumption of vegetables, fruits, legumes, seafood, milk and olive oil is beneficial for preventing PMADs.⁶¹ These interventions are known to be otherwise very helpful for pregnant women, and are likely discussions naturopathic doctors should have with their patients prenatally.

Conclusion

The current COVID-19 pandemic has led to a substantial increase in psychological distress for those in the perinatal period. Pregnant and postpartum mothers have previously been shown to be at a greater risk for mental health issues, and the changes associated with the pandemic have led to a substantial increase in anxiety and depression, according to the most current research. Many factors influence the development of perinatal mood and anxiety disorders,

with some identified factors related to the pandemic being: financial, relational, seclusion, changes to perinatal care, and fears of the virus. Some research has identified sleep, support and exercise to be protective factors against perinatal mental health issues—however this preliminary research is conflicting.

The far-reaching implications of untreated perinatal mental health issues, including the impacts on the mother, the child and the societal financial burden, make this crisis urgent. Given the substantial increase in perinatal mental health issues already seen, it is critical that Canada provides targeted support to mitigate the continued negative sequelae of perinatal mood and anxiety disorders. 🍂

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Socioeconomic Inequity and Inequality Results in Disproportionate Detrimental Impact to Racialized Populations in North America and the UK



Marillea Yu, ND and Jocelyn Faydenko, ND, DC

Abstract: Socioeconomic and health inequities often contribute to a higher incidence of chronic health conditions among the most vulnerable. The COVID-19 pandemic has been no exception, with disadvantaged communities demonstrating higher infection rates, morbidity, and mortality in Canada, the United Kingdom, and the United States. This article discusses the relationships between social determinants of health and the prevalence of COVID-19.

The coronavirus (COVID-19) pandemic, in both North America and the United Kingdom, has served to highlight socioeconomic and health inequities among the most vulnerable. The rapid infection rate and resulting social and economic restrictions have shown that certain communities are disproportionately affected by COVID-19.

Studies have shown that those who are most likely to be affected live and operate under numerous social and economic conditions that increase their risk of exposure, and often experience additional conditions such as racism and other forms of discrimination that are known to contribute to poorer health overall. For example, those who identify as Black or Indigenous in North America have been shown to have higher rates of chronic health conditions — often related to racism—that increase risk of morbidity and mortality and are known to worsen outcomes of COVID-19 once infected.^{1,2} Additionally, Indigenous communities in Canada and the US face unique challenges to health and well-being, both on- and off-reserve, which also contribute to increased vulnerability to COVID-19.^{3,4}

In Canada, nationally acquired disaggregated race-based data has not yet been made publicly available, despite repeated requests by advocacy groups for many years. A combination of factors, including significant data coming out of the US and the UK indicating racial disparities in COVID-19 infections, have motivated some Canadian municipalities to begin collecting statistics related to COVID-19, race/ethnicity, and socio-economic conditions. At present date, statistics are currently available only for Toronto and Peel Public Health in Ontario, and Montreal Public Health in Québec.^{5,6,7} Provincial statistics are available only from Ontario Public Health and nationally only from Indigenous Services Canada.^{8,9} Accuracy of data available is limited to completeness and currency of data collected, and the rapidly changing situation of COVID-19.

In the US and UK, several studies noted that ‘visible minority’ groups (including non-white and racialized populations) were

disproportionately affected by COVID-19, and often experienced more severe outcomes such as hospitalization and mortality, when compared to Caucasian individuals.^{2,10}

In the UK, Black and South Asian groups were more likely to test positive for COVID-19 compared to ethnic Caucasians.¹⁰ They also found that visible minorities were more likely to be socioeconomically disadvantaged, to be living with extended family, or in overcrowded dwellings, and more likely to hold lower-wage ‘essential’ jobs, all of which are conditions that put these groups at greater risk for virus exposure and transmission.¹¹

In the US, COVID-19 infections have led to nearly 171,000 deaths as of mid-August 2020, averaging approximately 1,100 deaths daily.¹² There has been a growing body of literature demonstrating that socioeconomically suppressed communities exhibit a higher risk of COVID-19 infection, morbidity, and mortality.^{13,14,15,16} These populations tend to have disparities related to healthcare access, housing/neighbourhood density, income inequality, and racial discrimination.¹⁴

Since the emergence of the COVID-19 pandemic in the US, several studies have been published that have looked at data associated with social determinants of health (SDOH) and COVID-19 prevalence. One study based in Chicago, found that social vulnerability and health risks both contribute to COVID-19 risk and incidence of death. Based on medical examiner data, 62.8% of COVID-19 deaths were African Americans, and the highest scores for social vulnerability and health risk factors were most predominantly seen in African American communities.¹⁷ Another study analyzed data related to SDOH and COVID-19 rates in the State of Massachusetts and found a higher burden of COVID-19 in populations with greater financial disparities, lower insurance coverage, and a greater number of workers deemed ‘essential’ (e.g. healthcare, social assistance, and transportation industries).¹⁸

An analysis of data collected from the Providence Health System, the third largest not-for-profit health system in the US, looked at sociodemographic and environmental variables and their association with COVID-19 infection. Higher risk for infection was seen in Asian, African- and Latin-American ethnicities, older individuals, non-English speakers, those with financial, housing or transportation insecurity, and people from areas with lower air quality. Many of those populations are more likely to face barriers to healthcare access and social distancing practices, making them more vulnerable to infection and illness risk.¹⁹

In the Province of Québec, Montreal Public Health used current COVID-19 data and compared it to census data from 2016. It was noted that areas with higher rates of COVID-19 infections also had the following associated factors: a high concentration of those working in occupations involving health care, social work, manufacturing and utilities, higher rates of 'unsuitable' housing (i.e. living in crowded conditions), household incomes below \$70K CAD, and a high percentage of population who identify as African Canadian. Other correlations included residents holding refugee status and dependence on public transportation.^{21,22}

In Ontario, information from Toronto Public Health showed that many racialized and lower income populations made up the majority of total COVID cases.⁵ Peel Region Public Health also showed higher prevalence of COVID-19 cases in racialized groups. Health care workers made up most positive cases (33%), followed by trades, transport and equipment operators (18%) and manufacturing and utilities (13%).⁸

The Enhanced Epidemiological summary by Public Health Ontario also looked at the ethnic diversity of neighbourhoods based on 2016 census data and associated COVID-19 cases.²³ Higher rates of infection were found in neighbourhoods with the highest levels of ethnic diversity, which also corresponded to a higher proportion of non-white residents; lower levels of income; a higher percentage of apartment dwellings; a higher proportion of overcrowded living conditions, and the highest percentage of inability to in either official languages.

Many jobs that have been deemed 'essential' are often associated with conditions that increase the risk of contracting and spreading COVID-19, by requiring working with the public in a manner that prevents workers from social distancing and practicing preventive hygiene measures.⁸ Many of these jobs are part time, poorly paid and lack normal employee benefits such as paid sick leave, leading to workers often staying on shift if symptomatic or exposed. They are predominantly held by visible minorities including recent immigrants; intersecting factors that often serve to further marginalize these community members.^{24,25}

In the case of racial disparities, a number of risk factors are often found to overlap across racialized individuals and households.¹⁸ This includes living in areas of higher population density, and living with multiple generations in one dwelling, which often results in overcrowding and the inability to practice social distancing. They are also more likely to be employed in an occupation that has been deemed 'essential', are often dependent on public transport, and are

often in a low-income bracket. They are also more likely to be unable to access adequate medical care due to factors including language barriers, lack of resources, location, and mistrust of the system.^{26,27}

As previously discussed, African-Canadian populations are at increased risk of contracting COVID-19.²⁹ To add to the issue, there is a higher prevalence of hypertension and diabetes in this population, as well as increased risk of morbidity and mortality related to disease outcomes. They also experience personal and systemic racism, and are subject to conditions of inequity and inequality, resulting from bias, segregation and discrimination. This can increase levels of stress, prevent access to appropriate medical care and have detrimental effects on overall health and well-being.^{30,31,32,33}

Across North America, Indigenous or First Nations populations, face numerous unique inequalities, regardless of living on- or off-reserve. Reserve lands are often located in very remote areas, with many subject to poor living conditions such as water and food insecurity, overcrowding in homes, and are under-serviced when it comes to health care and other social programs.^{35,36} Existing gaps between the conventional medical model of care and the understanding of Indigenous healing traditions serve to contribute to health inequality and may provide a frame of reference that does not reflect the actual needs of the community.³⁷

Current statistics on COVID-19 infections in the Canadian Indigenous population have been acquired exclusively from those who live on-reserve, despite many Indigenous people living off designated reserves. Those who live off-reserve may be counted in provincial and territorial statistics but are not distinguished as Indigenous. With this caveat in mind, according to data provided by Indigenous Services Canada,⁹ current on-reserve infections found are approximately one-quarter of the rate of the Canadian population at large. Fewer numbers may be due in large part to the relative isolation of most reserves from larger cities, as well as the measures many of these communities took to reduce risk of exposure, such as limiting travel and movement on- and off- reserve land.

American studies have shown that Indigenous communities, particularly the Navajo nation, have very high infections rates, made worse by crowded living conditions and water insecurity, as well as inability to access health care.³⁸ One Arizona study showed that 18% of positive cases and 13% of deaths occurred in Native American populations, despite only making up 5.3% of Arizona's population.³⁹

A number of studies have reviewed the effects of the SDOH's on Indigenous populations across North America and found poorer health outcomes related to conditions tied to income, employment, housing, and education.⁴⁰ In many of these areas, the Indigenous population faces increased challenges compared to the non-Indigenous population,⁴¹ including lower income, higher poverty, larger families, increased incidence of experiencing racism and discrimination and other factors that are positively correlated to poorer health outcomes. Studies of Canadian on-reserve Indigenous

populations showed an increase in prevalence of obesity⁴² and diabetes, compared to the non-Indigenous Canadian population, both risk factors for more severe COVID-19 sequelae.

In addition to Public Health measures already in place, additional considerations need to be taken in order to reduce viral transmission throughout the most vulnerable populations. Ensuring that protective measures are in place for those working under conditions that put them at increased risk are key. These include adequate personal protective equipment (PPE) and hand hygiene, and means to socially distance whenever possible. Additionally, these workers must be allowed paid sick leave without being concerned they will lose their employment. Finally, communities need explore ways to improve the underlying health of populations who are at increased risk of comorbid conditions through lack of accessibility to adequate food, exercise and social interconnections.

Many of the socioeconomic inequalities that have been outlined and identified exist as ongoing issues and have exposed the most vulnerable members of our communities to the worst outcomes of the COVID-19 pandemic, especially those who identify as African Canadian, Indigenous and other visible minorities. Conditions surrounding the determinants of health in racialized communities have allowed for the continued spread of COVID-19 among the most vulnerable of our population. The unique considerations presented by race and ethnicity in a multi-cultural society, as well as social and economic factors, need to be acknowledged and addressed in the overall plan if we aim to quickly and effectively contain such a threat, as well as address both tangible and intangible costs of these effects on public health outcomes.^{44,45}

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Jocelyn Faydenko, ND, DC is a recent graduate from the National University of Health Sciences (NUHS) in Lombard, IL, and has been active in the university's research department as a research assistant and research fellow over the past several years. Earlier this year, she and colleague Fraser Smith, ND, published an article on the use of cardiac biomarkers in the *European Journal of Integrative Medicine (EujIM)*. She will be starting a research residency this fall, and her clinical interests include cardiovascular disease, reproductive and sexual health, acupuncture, and natural products research.

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WNF Commentary: Rapid Reviews

Iva Lloyd, BScH, BCPP, ND and **Amie Steel**, ND, PhD

At the time of writing this commentary, knowledge on the pathogenesis of SARS-CoV-2 and how to effectively treat it is lacking. The role of naturopathic treatment approaches or those from the realm of Traditional and Complementary Medicine (T&CM) have received limited attention with respect to their potential role in this pandemic.

Based on contemporary research evidence, traditional knowledge and the extensive training and experience of naturopathic doctors (NDs) in pharmacognosy, herbal medicine and clinical nutrition there is reason to believe that naturopathic approaches warrant consideration among the span of possible aids to the global response to COVID-19. Hence, the naturopathic profession undertook the task of conducting rapid reviews to assess the role of specific recommendations in the prevention or treatment of upper respiratory tract infections (URTIs) inclusive of, but not limited to, COVID-19. The focus of all rapid reviews was limited to human studies specific to URTIs either as original research or systematic reviews.

With the support of nine naturopathic educational institutions which included a team of over 40 naturopathic researchers, practitioners and content experts from seven countries and five WHO world regions, in two short months the profession has produced ten rapid reviews related to the role of natural health products in treating acute respiratory tract infections, with a further two reviews in draft. These rapid reviews will be published individually and as a dedicated issue of the scientific journal *Advances in Integrative Medicine* (Elsevier publication). They will be made open-access – meaning they will be free for download. The Task Force was chaired by WNF President Dr Iva Lloyd with Dr Amie Steel and Professor Jon Wardle as research leads.

These rapid reviews demonstrate the naturopathic profession's dedication to evidence-informed decision making and their commitment to being part of the solution to this global pandemic.

The following is a brief overview of the findings from the completed reviews.

UPDATE

EDITORIAL

COMMENTARY

CASE REVIEW

PRACTICE

RESEARCH

TABLE 1: Brief Overview of Findings from Rapid Review of Evidence Reported in *Advances in Integrative Medicine* Volume 7, Issue 3 (Elsevier)

RESEARCH FOCUS	BRIEF OVERVIEW OF FINDINGS
Vitamin C²	Oral vitamin C may assist with the symptoms of acute respiratory viral infections (ARI) and common cold-induced asthma, but no studies have been identified justifying oral vitamin C for the prevention or treatment of coronavirus infections including COVID-19. When taken at onset of ARI, oral vitamin C may reduce the duration of symptoms including fever, chest pain, chills and bodily aches and pains. It may also reduce the incidence of hospital admission and duration of hospital stays. For individuals admitted to hospital with community-acquired pneumonia, vitamin C may improve respiratory function in more severe cases. No major adverse events nor interactions were reported by either method of administration. However, there is an absence of high quality, contemporary clinical research examining this topic. Current evidence suggests further studies are needed to better understand the value of both oral and IV vitamin C for ARI, including COVID-19.
Vitamin D³	Experimental evidence and observations in large cohorts are generally consistent that deficiency and insufficiency of vitamin D is associated with increased risk of ARTI, and supplementation for those with deficiency/insufficiency may lead to clinically meaningful reductions in the incidence of ARTI. Based on significant heterogeneity in published clinical trials there is however, insufficient evidence to draw conclusions regarding the impact of vitamin D supplementation on the severity or duration of ARTI, nor on outcomes related to lung injury or hospitalization from ARTI.
Multivitamins⁴	Based on the available evidence, multivitamin supplementation does not appear to reduce the incidence of ARTI or mortality (both ARTI-related and all-cause). The effect of multivitamins taken before infection on the duration of ARTI is unclear due to conflicting results across studies. Multivitamins may, however, reduce the symptoms associated with ARTI such as headache, conjunctivitis, and activity restriction but not the overall symptom scores.
Zinc⁵	Zinc may potentially reduce the risk of SARS-CoV-2 infections and shorten the duration and severity of illness, including recovery from stroke, through several mechanisms. Indirect evidence from systematic reviews have found zinc supplementation is effective for the prevention of acute respiratory infections in young children and zinc lozenges may reduce the duration of the common cold in adults. Safety concerns associated with high doses or prolonged intake of zinc include anosmia (loss of smell) and copper deficiency.
Quercetin⁶	Current evidence on the efficacy of quercetin supplementation in the treatment and prevention of COVID-19 is insufficient for its clinical recommendation at this time. Quercetin exhibits both immunomodulatory and antimicrobial effects in preclinical studies; however, only three human clinical trials, each with a low risk of bias rating, were identified in this rapid review. One study reported a decrease in incidence of upper respiratory tract infections following a competitive athletic event. A larger community clinical trial reported a benefit in older, athletic adults only.
N-Acetyl-Cysteine⁷	Current evidence suggests that N-Acetyl Cysteine (NAC) administration may help improve outcomes in people with acute respiratory distress syndrome (ARDS) and acute lung injury (ALI) – conditions that closely resemble the signs and symptoms of COVID-19. In this rapid review, NAC was predominately administered intravenously to patients with ARDS or ALI, who were at risk of or requiring mechanical ventilation, and were admitted to a hospital intensive care unit. Findings indicated that NAC administration may assist in improving markers of inflammation or oxidation, systemic oxygenation, the need for / duration of ventilation, rate of patient recovery and clinical improvement score. The effects of NAC on patient length of stay, CT/x-ray images, mortality rate and pulmonary complications were inconclusive.
Essential Oils⁸	Clinical evidence from published clinical trials identified in this rapid review suggests that oral administration of blends of certain essential oils (EO) can reduce symptoms of acute respiratory infections of viral origin in humans, namely acute sinusitis and acute bronchitis.

RESEARCH FOCUS	BRIEF OVERVIEW OF FINDINGS
<i>Sambucus nigra</i> (Elderberry)⁹	Collectively the evidence obtained from across five clinical studies involving 996 adults indicate that mono-herbal preparations of <i>Sambucus nigra</i> L. berry (<i>S. nigra</i>), when taken within 48 hours of onset of acute respiratory viral infection, may reduce the duration and severity of common cold and influenza symptoms in adults. There is currently no evidence to support the use of <i>S. nigra</i> berry for the treatment or prevention of COVID-19. Given the body of evidence from preclinical studies demonstrating the antiviral effects of <i>S. nigra</i> berry, alongside the results from clinical studies included in this review, further pre-clinical research exploring the potential role of <i>S. nigra</i> berry for the prevention and/or treatment of COVID-19 infection is encouraged.
<i>Echinacea</i> spp. (Echinacea)¹⁰	<i>Echinacea</i> supplementation may assist with the symptoms of acute respiratory infections (ARI) and the common cold, particularly when administered at the first sign of infection; however, no studies using <i>Echinacea</i> in the prevention or treatment of conditions similar to COVID-19 have been identified. Previous studies have reported that <i>Echinacea</i> may decrease the severity and/or duration of ARI when taken at the onset of symptoms. The studies reporting benefit used <i>E. purpurea</i> or a combination of <i>E. purpurea</i> and <i>E. angustifolia</i> containing standardized amounts of active constituents.
<i>Hedera helix</i> (Ivy Leaf)¹¹	Based on the evidence identified in this rapid review, <i>Hedera helix</i> preparations and herbal complex preparations including <i>H. helix</i> may be a therapeutic option for treating early symptoms of respiratory tract infections. The best effectiveness for <i>H. helix</i> preparations has been proven for coughing, as an expectorant and to reduce the frequency and intensity of cough. Only weak evidence was found for all other researched symptoms. Both adults and children tolerate <i>H. helix</i> well. Currently, there is insufficient evidence to recommend the use of this supplement in the treatment or prevention of COVID-19. However, the current evidence justifies further research to better understand its applicability in coronavirus infections.

COI: The authors have no relevant conflicts of interest to disclose.

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Through COVID-19 – A Systems Perspective: from Square to Circular Systems

Leslie Solomonian, BSc, ND, MPH, Laura Batson, MSc, ND, Cloe Franko and Adrienne Waunch



UPDATE

EDITORIAL

COMMENTARY

CASE REVIEW

PRACTICE

RESEARCH

Abstract: The corona virus that causes COVID-19 jumped from monkeys to humans in the context of deliberately designed systems of economic, environmental, and social organization which are referred to in this piece as “square”. These systems are not compatible with the circular patterns of nature that sustain life. The current pandemic is a symptom of complex mechanisms, and solutions must go beyond reductionist strategies. In order to truly address this crisis, we must critically examine its causes and their relationship to our worldview. Naturopathic philosophy can help orient us to a more holistic and complex way of seeing both how we arrived here, and how we can hope to move forward in a regenerative way.

COVID-19 has been described as a “wicked problem” — a complex issue involving multiple interlinked systems with no single cause and no clear solution.^{1,2,3} Although the actual infectious agent evolved and jumped to humans within a Chinese context, the origins and impacts of COVID-19 have emerged within deliberately designed systems of economic, environmental, and social organization established by dominant Eurocentric worldviews, which we refer to here as “square”. These systems are not compatible with the circular patterns of nature, the ecological systems that sustain life. The solution to the current pandemic must go beyond reductionist strategies, which are strategies that seek to understand complex systems through understanding their individual parts. In order to truly address this crisis, we must critically examine its causes and their relationship to our worldview. Naturopathic philosophy can help orient us to a more holistic and complex way of seeing both how we arrived here, and how we can hope to move forward in a regenerative way.

Tolle causam — Identify the root (route) cause

Throughout this piece, we are deliberately using both homonyms of root and route to draw attention to both the “where” and the “how” of the underlying causes of COVID-19. The word root refers to the roots of a tree that are hidden underground, rooted in place. It represents the “where” of the underlying causes: where the disease originates from. The word route is in reference to the pathways — the means by which the disease is carried out. It represents the “how” of the underlying causes. For example, if we are identifying Eurocentric square systems thinking as a *root* cause, then systemic racial oppression and environmental devastation to drive wealth concentration are *route* causes^{4,5} (a means by which Eurocentrism is carried out).

We argue that both the origins and consequences of the COVID-19 pandemic are firmly rooted in square systems thinking, which is in direct contrast to circular thinking. We elaborate on these systems throughout the piece; Table 1 provides a brief comparison between these two paradigms.

Square systems

During the European Scientific Revolution in the 16th and 17th centuries, systems of scientific, economic and social organization were invented that broke from the circular patterns of nature.⁸ These new systems followed linear principles and displayed linear patterns. They are referred to here as square systems. Capitalism, as a linear economic model, is characterized by unlimited growth, concentration of wealth, and measurement of national health as gross domestic product (GDP). These systems can only function through principles of competition and oppression, as opposed to cooperative cycles of exchange; and linear supply and waste chains (extraction from the earth to make products that end up in waste bins) rather than sustainable, regenerative cycles.¹¹ Humans invented scientific theories to rationalize these systems: Euclidean geometry and calculus that imposed linear abstractions onto nonlinear systems of nature, and biological theories of survival of the fittest that support capitalism and the systemic oppression on which it depends.^{12,13} Modern science applies a mechanistic lens that sees the world as a giant watch with linear cause and effect mechanisms; that divides disciplines into siloed subjects that result in a lack of understanding of the complex circular connections between biology, ecology, economy.¹⁴ The consequence is a reductionist worldview that carves bodies into components, the earth into resources we can extract, and people into beasts of labour that can be exploited for capital gain.^{15,16,17}

TABLE 1: Comparison between dominant paradigms of square vs. circular systems

	SQUARE ^{6,7,8} Linear principles and patterns of organization	CIRCULAR ^{9,10} Nonlinear principles and patterns of organization
Worldview	<ul style="list-style-type: none"> ■ People-centric ■ Linear ■ Self ■ Spirit separate from matter ■ Discrete 	<ul style="list-style-type: none"> ■ Land-centric ■ Circular ■ Self-in-relationship ■ Spirit-in-matter ■ Interconnected
Perceptions	<ul style="list-style-type: none"> ■ Parts ■ Objects ■ Quantities ■ Products ■ Structure 	<ul style="list-style-type: none"> ■ Wholes ■ Relationships ■ Qualities ■ Processes ■ Patterns
Principles and Patterns of Organization	<ul style="list-style-type: none"> ■ Top-down, centralized hierarchy, concentration of power and wealth ■ Individual, Siloed (dividing and categorizing knowledge into separate boxes and systems for decision-making) ■ Darwinian survival of the fittest ■ Linear cause and effect (a mechanical view of the world; linear principles of Newtonian physics are implemented to force change) ■ Determinism (designing systems with linear mathematics in order to predict and control; the belief that events are determined by causes outside of free will) ■ Euclidean geometry (imposing man-made, linear mathematics onto nature and culture) 	<ul style="list-style-type: none"> ■ Self-organization (the “rules” of organization emerge from within the system itself; not imposed by a single leader at the top or outside of the system) ■ Decentralization (leadership and decision-making is not located in one person or place but distributed throughout the system) ■ Feedback loops (each part of a system constantly receives and responds to feedback from all other parts of the system as a means to achieve homeostasis) ■ Fractal patterns (utilizing the nonlinear geometry of nature to guide systems of organization; similar patterns of shapes tend to emerge across scales of organization) ■ Deterministic Chaos (recognizing and working within the inherent unpredictability and chaos of nature's systems as opposed to attempting to determine and control a system's outcome) ■ Network/web (moving away from disconnected and siloed organization towards designing interconnected epistemologies and decision-making systems)

Square systems have been deliberately designed and perpetuated by those with social, economic and political power for personal gain through the use of oppression, division, and exploitation. European feudalism was the foundation of classical liberalism which went on to become capitalism, creating the socioeconomic conditions for the concentration of wealth and power.^{18,19} This worldview has manifested through worldwide imperial/colonial expansion, and destruction of Indigenous and traditional ways of knowing across the planet. Even within “eastern” cultures - such as the one in which the COVID-19 virus emerged - capitalism is the predominant square force driving the global economic system.²⁰ Capitalism is rationalized through the false theory of trickle-down economics. Instead, what it “trickles down” are classism, racism,

sexism, xenophobia, and the belief in white superiority.^{21,22,23,24} Each of these are clearly manifested in the fallout of COVID-19 and its disproportionate effects on Black, Indigenous, and People of Color (BIPOC), women, and people living in poverty.^{25,26,27}

Square systems thinking has resulted in neoliberal economics, white supremacy, patriarchy, anthropocentrism, imperial colonialism, genocide, and extractive capitalism (including wealth concentration, privatization of the commons, and waste generation).^{16,28,29,30} All of these systems are interlinked and reinforcing of each other. The consequences are devastating:^{16,17,31} systemic oppression, inequity of wealth and health, disparities in access to resources and education; mass extinction, loss of biodiversity, extreme weather events, loss of

arable soil, global warming, environmental intoxication, increased acidity of oceans; perpetual conflict and war, mass migration; and the arising of novel infectious disease, leading to pandemics.^{3,5,32,33,34,35}

Linear thinking leads to perceiving solutions that are also linear. These neither consider the complexity of the problem nor address its fundamental causes. For example, although public health strategies such as wearing masks, washing hands, physical distancing and a potential vaccine may be essential to mitigate the spread of this COVID, these strategies are proving to be problematic in unintended and inequitably distributed ways due to pre-existing faults in the underlying structures.^{3,34,36} Moreover, these strategies will fail to prevent future catastrophic consequences of the harmful systems that set the stage for this one.³⁷

Inequitable consequences associated with the global response to COVID-19

- Mental health crises and increased rates of suicide^{38,39}
- Increased domestic violence^{40,41}
- Educational deficiencies and inequities⁴²
- Perpetuation of health inequities⁴³
- Inability to physically distance or work from home^{36,44}
- Loss of employment (highly correlated with poor health)^{45,46}
- Harm due to excessive hygiene by some^{36,47,48} and lack of access to soap and clean water by others⁴⁹
- The environmental impact of increased use of single-use materials^{50,51}

Tolle totum — Consider the Whole

Technological “solutions” are manifestations of square systems thinking. These have only been needed for survival since the agricultural revolution radically shifted the relationship between the human species and the natural environment.⁵² The (temporarily) successful attempt to control nature has for millennia reinforced the faulty worldview that we are capable of doing so. Rachel Carson ardently cautioned of this nearly sixty years ago,⁵³ yet our efforts and their catastrophic impacts have only accelerated since that time.⁵⁴ Technological strategies that preserve human life and support a growing population lead to further imbalance in the biosphere, and thus the need for more technological solutions.⁵² A litany of inventions and technologies have aimed to improve quality of life, address hunger or reduce waste, but have ultimately created harm on a systemic scale. For example, the invention of the internal combustion engine has led to anthropogenic climate change, artificial introduction of predator species has led to greater imbalances in ecosystems, and genetic modification of foods has led to loss of food sovereignty. Techno-scientific solutions typically complicate the problem by failing to consider the whole picture.

A Circular Systems View

The academic discipline of “systems science” emerged in the 20th century, born from Eurocentric scientists who questioned the limits of reductionism⁵⁵. Albert Einstein’s theories on relativity revolutionized science: they revealed the fundamental nature of reality to not be made up of independent parts, but of inseparable energy-mass systems in constant flux and relative relationship.⁸ This fundamental shift in worldview gave rise to systems thinking which aligns more with a circular worldview as we are using the term here.

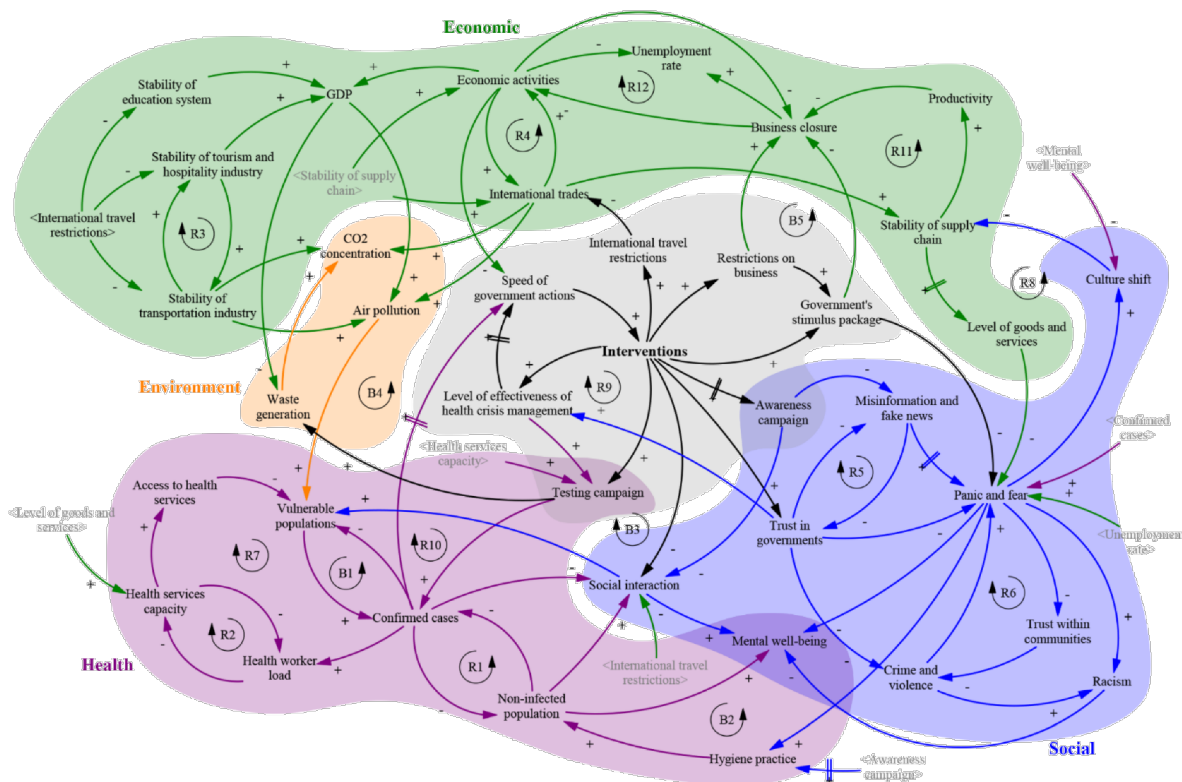
What we call “parts” are, themselves, coherent sets of relationships.⁵⁶ Life is composed of systems embedded within systems, embedded within systems. When we peer deeper into any one part of life, we see more systems of relationships:⁸ an organism is made up of a system of organs. An organ is made up of a system of cells. A cell is made up of a system of organelles. An organelle is made up of a system of molecules, and so on, down to the atom and its inner system of parts. Living systems, from cellular systems to organisms to ecosystems are made of parts in relationship with one another. The whole system is always more than the sum of parts, where the “more” is an emergent property of the relationships within the system. These patterns and principles of organization are not linear, and give rise to systems that are referred to, here, as circular systems.

Circular systems are characterized by reinforcing and balancing loops; a shift in one part of a complex system inherently will result in reverberations throughout the system. This is the crux of chaos theory - commonly appreciated as the butterfly wing effect.⁵⁷ It is impossible to attempt to correct one component without considering the entire system. As Sahin et al. attempt to illustrate in figure 1 with respect to the complex factors that resulted in the emergence of COVID-19, “feedback loops illustrate reciprocal relationships between actions and consequences in the system. Reinforcing loops (R) create exponential growth or decay. Balancing loops (B) stabilize a system until equilibrium is achieved. There is an excess of reinforcing loops in the current systems, creating erosion, failure, and near-collapse.”³ Unless we perceive the complex, messy whole, and approach this pandemic from a circular holistic perspective (rather than a square reductionist one), we will continue to propel the planetary system towards that predicted collapse.

The Circular Nature of an Indigenous Worldview

The “discoveries” by systems scientists in the 20th century were actually a realization of Indigenous knowledge systems that are and have always been circular. Indigenous worldviews have been described as holistic, circular, land-informed, place-based, relational, perceptive of interconnectedness and constant flux, and integrative of spiritual knowledge.^{58,59,60} These knowledge systems were oppressed during colonial imperialism when the invasion of dominant Eurocentric worldviews spread across the globe.

Dr. Sandra Styres, author and scholar of North American Indigenous knowledge, writes: “Themes of relationality, circularity, spirituality,

FIGURE 1: Balancing and Reinforcing Loops in the Complexity of the COVID Pandemic

Sahin O, Salim H, Suprun E, Richards R, MacAskill S, Heilgeist S, Rutherford S, Stewart RA, Beal CD. Developing a Preliminary Causal Loop Diagram for Understanding the Wicked Complexity of the COVID-19 Pandemic. *Systems*. 2020; 8(2):20.

and consciousness of Land provide the unifying context of shared world views among Indigenous people throughout Turtle Island and indeed across the great waters. The notion of a singular world view is steeped in dominant Eurocentric imperial and colonial ideologies and is framed within discourse based on privilege and power.”⁶⁰ Dr. Gloria Emeagwali, author and scholar of African Indigenous knowledge or AIK, identifies the epistemological foundations of AIK systems as recognizing “the holistic, organic, and multidimensional interconnections of body, mind, soul, and spirit, as well as the interface of society, culture, and nature,”... “and a methodological approach to knowledge inquiry that emphasizes principles of circularity, association with the Land and environments, and the integrative nature of social facts.”⁶¹

Indigenous knowledge systems, through the ways and resilience of the circle, are (re)emerging and (re)membering their way back into the knowledge systems of the world (figure 2).

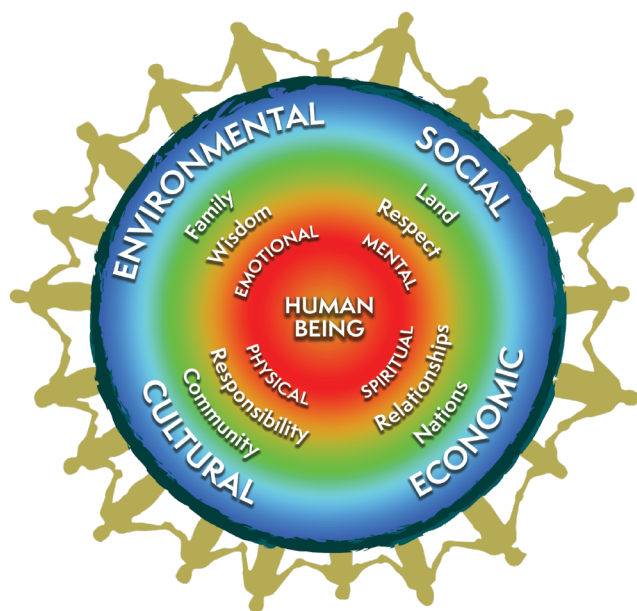
Naturopathic Circular Thinking

In contrast to the above search for “solutions” to square systems thinking, naturopathic doctors are trained to support patients with the whole person (and their environment) in mind—a perspective that more closely resembles a circular systems approach to health. A square systems approach to metabolic syndrome might be to

prescribe statins and hypotensive medications that may cause unpleasant or harmful side effects, but would otherwise allow the patient to continue living their life without altering habits or lifestyle. A naturopathic approach, however, would seek to address a patient’s underlying systemic weaknesses, such as dysbiosis or a proinflammatory phenotype.⁶³ This approach requires the patient to shift their lifestyle, worldview, and habits in order to address the underlying cause of their afflictions. Ultimately, the naturopathic approach requires the patient to acknowledge that an unhealthy lifestyle is manifesting itself through physical symptoms and to truly reverse those symptoms, the most harmful elements of their lifestyle must be altered. Planetary healing depends on a parallel perspective. In order to radically (from the Latin *radix*, or root) and sustainably address this crisis and those that will inevitably follow, we must consider this pandemic as a symptom of deeply problematic worldviews.⁶⁴ It is our moral responsibility to see this moment as an opportunity to not just respond to the current crisis, but to expose and connect dots between its complex causes in order to improve the health of our patients and our planet.⁶⁵

Vis medicatrix naturae — COVID-19 is an activation of the Vis

As Hippocrates proposed, and foundational to the practice of naturopathic medicine, is that the body is often able to heal itself

FIGURE 2: First Nations Perspective on Health and Wellness⁶²

Gallagher, J. (2019). Indigenous approaches to health and wellness leadership: A BC First Nations perspective. *Healthcare Management Forum*, 32(1), 5–10. <https://doi.org/10.1177/0840470418788090>

if conditions are optimal. Physical bodies follow circular systems in which symptoms of poor health are evidence of the *vis* responding to suboptimal circumstances. Just as a naturopathic doctor uses signs and symptoms of poor health to guide a correction in the body system, we can view the emergence of COVID-19 (along with increasingly severe weather patterns and collapsing ecosystems) as an expression of the Earth's *vis* to deeply imbalanced and unhealthy planetary system. The COVID-19 pandemic is a predictable and natural response to overpopulation, globalization, and other properties of the Anthropocene, our current geological age.^{17,33,66} All historical pandemics can be framed as a consequence of human beings stepping out of the bounds of natural systems, resulting in the decimation of human populations.^{67,68} As Foster and Suwandi write so succinctly:

“SARS-CoV-2 (COVID-19), like other dangerous pathogens that have emerged or reemerged in recent years, is closely related to a complex set of factors including: (1) the development of global agribusiness with its expanding genetic monocultures that increase susceptibility to the contraction of zoonotic diseases from wild to domestic animals to humans; (2) destruction of wild habitats and disruption of the activities of wild species; and (3) human beings living in closer proximity. There is little doubt that global commodity chains and the kinds of connectivity that they have produced have become vectors for the rapid transmission of disease, throwing this whole globally exploitative pattern of development into question.”⁵

An awareness of the interconnectedness of humans (and the global socioeconomic systems we have created), the environment and

wildlife has led to the interdisciplinary approach referred to as One Health. Proponents of this paradigm advocate that global decision-making prioritizes social and ecological well-being, as opposed to capitalistic trade and wealth concentration in order to mitigate further planetary crises.⁶⁹ If we see these crises as expressions of the Earth's *vis*, we may have an increased capacity to perceive and address the root/route causes.

Addressing the root (route) cause

Human beings have created a complex of intertwined systems that are responsible for COVID-19, the climate catastrophe, and structural oppression. An argument could be made for letting nature take its course - allowing the *vis* to express itself until homeostasis is re-attained. However, we believe this approach is deeply unjust and unethical. We know that we are not “all in this together”.²⁷ Myriad evidence shows the inequitable distribution of the impacts of COVID-19 and our collective response to it due to differences in access to healthcare, the ability to work from home, the space to self-isolate, and the absence of pre-existing risk factors.^{34,70} BIPOC people and communities have suffered the most from this pandemic, just as they do from all global crises.^{5,71} The recent uprisings against police brutality and systemic racism are an attempt to resist the inequitable outcomes of structural privilege that were present before and will be present after COVID-19. The square systems that brought us here and are currently being used to get us out favour the elite--white, global north, wealthy, etc.--whom they were designed by and for.^{30,72,73} Letting nature take its course would further reinforce existing inequity and injustice and is therefore not a viable option.^{67,70,74}

Rather than allowing square responses to this pandemic to further entrench social inequities, we can view COVID-19 as a stark reminder that planetary healing is dependent on a deliberate return to circular, regenerative systems. A key principle of most Indigenous traditions is honouring all sentient beings and the Earth for their worth beyond their economic value to humans. The values of taking only what we need, of leaving enough for others both now and in the future, and of not leaving a mess behind are the essence of the Dish with One Spoon Wampum Belt Covenant into which European settlers were invited in the Great Lakes Region (the territory on which the Canadian College of Naturopathic Medicine sits).⁷⁵ These values also reflect the Seventh Generation Principle common to many Indigenous traditions (considering those who are not yet born, but will inherit the world),⁷⁶ and are an explicit component of the naturopathic oath. Acknowledging the position of the human species within the complex, interdependent web of the biosphere rather than superior to it requires humility.^{17,77} Yet, entering into a reciprocal relationship with the planet and other beings (human and otherwise) that share it, rather than trying to dominate it/them, is the most promising path toward healing.^{6,78}

It would be easier to accept that the COVID-19 pandemic (or global climate degradation, or systemic poverty) could be reduced to a simple problem of contagion with a simple solution. However,

we can't escape the reality that we are all complicit in the systems that have created this complicated crisis; everything we do or don't do either perpetuates or challenges it. Guilt, anxiety and fear are natural responses to this truth, and can be paralyzing - the authors experienced it deeply during the writing of this piece. The human brain is not well-designed to cope with persistent stress, especially when it is novel, and feels beyond our control.⁷⁹ We have a moral obligation to act, but the problems feel overwhelming.⁸⁰ How can we bounce forward to a "better new" when so many systems require simultaneous change, all while attending to immediate needs and suffering?

Fortunately, there is a spectrum of opportunities that individuals and groups can grasp. If nothing else, COVID-19 has deeply exposed the cracks in the systems, highlighting the impacts of wealth concentration, austerity measures, social polarization, oppression and unearned privilege.^{44,81,82} It has also illustrated how rapidly change can occur if a window of opportunity opens.^{6,37,83} The pandemic has resulted in a number of radical shifts that had previously been deemed impossible, such as grounding of unnecessary air travel, and recognition of the importance of effective social healthcare by typically conservative political leaders.⁸³ Given a temporary break from the plague of humanity, natural environments have provided a taste of what a healthy future can look like if we fundamentally shift our relationship with the planet.⁸⁴ Previous pandemics have dramatically shaped the course of social progression; COVID-19 too presents a global opportunity to evolve.^{34,69}

Taking loving action is one of the most optimistic and radical things any of us can do, and is a powerful antidote to fear and guilt. The diffusion of innovation theory describes that only a few innovative thinkers will initially take on leadership, with a group of early adopters following closely behind.⁸⁵ Naturopathic doctors are inherently innovative. We are used to thinking in systems, challenging the status quo, and seeking radical - or root - solutions to problems.

Primum non nocere - Do no harm

Any radical action must begin with examining our values.⁶⁴ To which worldview do we ascribe? How do we view our own position in relation to the Earth and the other beings with whom we share our home? Nora Bateson demonstrates in her warm data labs that a deeply human response to complexity is possible when we tend to relationships,⁸⁶ just as tending to soil nurtures resilient trees. We must tend to the relationships that build fertile and resilient bodies, ecologies, and communities/societies, all of which are interrelated and interdependent. From this perspective, the ill-health of our beings (COVID and the pre-existing health crisis), the environment (ecological breakdown) and society (white supremacy and widening social inequity) are all the result of a breakdown in relationships. Feeling our way into a deeper relationship with self, other, and nature is at the heart of what is needed to heal. The solutions will not come from hard data-driven mind maps connecting the dots and then deriving a set of "calls to action" for each of our siloed systems. Radical, relationship based actions can address all crises

simultaneously. The most simple example is planting a garden. Proximally, you are nourishing your relationship with the earth and capturing the carbon that is warming our environment; eating a salad made from these foods nourishes the cellular relationships within your biological being and establishes food sovereignty; sharing this meal or the land on which your garden grows with a neighbour nourishes relationships within your community. Once we have taken the time to reflect and critically examine our values and relations to others, we can seek opportunities for personally meaningful and sustainable action that challenges the existing systems.

Action can occur at many levels (often described as a micro/meso/macro framework;⁸⁷ see figure 3 for more ideas and examples). The most intimate is at the level of interpersonal relationships and individual choices. This could range from seeking to understand what determinants of your patients' health have been exposed by this pandemic, to seeking to understand the systems that have resulted in this wicked situation. It could include choosing to challenge the systems through personal decisions around food, waste production, and financial investment. We can seek opportunities to contribute to our immediate communities; during COVID, groups with the mandate of mobilizing grassroots community support for individuals in need have blossomed.⁸⁸

Social and ecological determinants of health have the greatest influence on wellbeing; unfortunately, very few can be changed in the clinic room or with individual action. How can we use our privilege to influence the communities and institutions of which we are a part?^{89,90} As our worldview shifts and as the bigger picture comes into focus, we can begin by sharing that perspective with others. It is deeply impactful to have hard conversations about values and worldviews with those in our circles; we must embrace productive, compassionate conflict in order to mobilize change.^{91,92} We can advocate for changes that address flawed and unjust systems. Professional groups such as Naturopathic Doctors for Environmental and Social Trust (NEST)⁹³ was created to further opportunities for the naturopathic profession to engage in this work.

Ultimately, systems do what they are designed to do. Can we "leap forward into the past"⁹⁴ when children were raised by communities, work was shared, and relationships were prioritized? Are we able to cultivate communities that recreate the environment within which our species initially evolved and thrived?^{52,95} The catastrophically harmful systems our planet is resisting must be deconstructed and redesigned; this can only occur at a global level. Individuals and organizations must demand change. At the very least, we need to *vote--and* critique the design of our electoral and governance systems.^{6,34} COVID-19 has seen an increase in calls for not just temporary economic relief to individuals and families impacted by the economic consequences of the pandemic response, but for a full adoption of universal basic income.⁹⁶ Some cities are re-examining the values by which they define their economy.⁹⁷ Advocacy movements continue to mobilize, pivoting to different strategies of direct action;⁹⁸ on Turtle Island, the movement for Black Lives and Indigenous resistance have surged as the inequity of the effects of COVID-19 stirs the hot coals of centuries of Eurocentric supremacy, oppression and genocide.^{99,100}



FIGURE 3: Non-exhaustive ideas for advocacy



Bouncing Forward

Resilience is often described as the capacity to bounce back from adversity.¹⁰¹ This approach, however, reinforces the increasingly untenable status quo and does little to address the root causes that make the planet vulnerable to increasingly frequent and severe disruptions. We cannot strive to “go back to normal”. The square systems that created both the COVID-19 pandemic and are guiding the global response to it must be critically examined, deconstructed and collaboratively redesigned if we have any hope of mitigating the worst of the avalanche of crises that will inevitably follow.¹⁰² We must seek ways of bouncing forward¹⁰³ which not only address immediate shock events, but leverage disruptions to support a radical transition to a more sustainable and just future.^{3,104} This will require active hope, loving compassion, participatory democracy - and embracing circular thinking.^{29,105} 🍌

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