The long-term impacts of COVID-19 on confirmed cases at least 12 months post-infection in Wellington, New Zealand: an observational, cross-sectional study

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ABSTRACT

AIM: To explore the prevalence of ongoing symptoms and laboratory abnormalities in confirmed cases of COVID-19 from the first wave within the Greater Wellington Region, after at least 12 months post infection.

METHOD: COVID-19 cases were obtained from EpiSurv. Eligible participants electronically completed questionnaires (Overall Health Survey, Patient Health Questionnaire-9 [PHQ-9], Generalised Anxiety Disorder-7 [GAD-7], Pittsburgh Sleep Quality Index, EuroQol 5 Dimension 5 Level [EQ-5D-5L], Fatigue Severity Scale [FSS], WHO Symptom Questionnaire, Modified Medical Research Council Dyspnoea Scale [mMRC Dyspnoea Scale]). Blood samples were analysed for cardiac, endocrine, haematological, liver, antibody, and inflammatory markers.

RESULTS: Forty-two of 88 eligible cases undertook the study. Participants were enrolled at a median 628.5 days from symptom onset. Fifty-two point four percent felt that their current overall health was worse than it was prior to contracting COVID-19. Ninety percent of participants reported at least two ongoing symptoms since their acute illness. Between 45–72% of participants reported each of anxiety, depression, dyspnoea, pain/discomfort, and sleep difficulties, assessed using the GAD-7, PHQ-9, mMRC Dyspnoea Scale, EQ-5D-5L and FSS questionnaires respectively. There were minimal laboratory abnormalities.

CONCLUSION: There is a high prevalence of ongoing symptoms following the first wave of COVID-19 infection in Aotearoa New Zealand. At a median of 1.7 years post infection, there is a wide spectrum of symptoms and symptom severity, although as an observational, cross-sectional study a causal relationship between symptoms or their severity and COVID-19 infection cannot be firmly established.

"Long COVID", "post COVID-19 syndrome", "long haulers", "post-COVID conditions", "post-acute sequelae of SARS CoV-2 infection" and "chronic COVID" are terms used to categorise and describe persisting health impairments following an acute COVID-19 infection.[1,2] There is no internationally agreed definition of long COVID, with various institutions such as the World Health Organization[3] (WHO) and Centers for Disease Control and Prevention[2] (CDC) having different definitions, albeit with fundamental similarities. The joint guideline created by the National Institute for Health and Care Excellence (NICE), the Scottish Intercollegiate Guidelines Network (SIGN) and the Royal College of General Practitioners (RCGP)[4] define "Acute COVID-19" as signs and symptoms for up to 4 weeks, "Ongoing symptomatic COVID-19" as signs and symptoms of COVID-19 from 4 weeks up to 12 weeks, and "Post-COVID-19 syndrome" as signs and symptoms that develop during or after an infection consistent with COVID-19, continue for more than 12 weeks and are not explained by an alternative diagnosis. Aotearoa New Zealand guidelines follow the same definition, with the exception that "Post-COVID-19 syndrome" is named long COVID.

There is a large variation in international prevalence estimates of long COVID. Variation in estimated prevalence is likely due to multiple factors including differences between hospitalised and non-hospitalised patients, lack of a consistent definition of "long COVID", differences in follow-up periods, inclusion or exclusion of symptomatic patients with negative tests, and response and non-response biases. In those admitted to hospital, 50–89%

report experiencing at least one symptom after two months,[5] and 76% report at least one symptom at six months.[6] In a study examining a largely non-hospitalised population (96.6% of cases were non-hospitalised), 33.8% of COVID-19 positive cases had at least one ongoing symptom at 60 days and 24.1% at 90 days.[7] At a 1 year follow-up, fatigue (28%), dyspnoea (18%) and arthromyalgia (26%) were the most prevalent symptoms.[8] However, over 60 physical and psychological signs and symptoms with wide prevalence estimates are reported in the literature.[9]

To further understand the long-term characteristics and burden of long COVID, we undertook an observational study to explore the prevalence of ongoing symptoms and persisting laboratory test abnormalities in confirmed cases of COVID-19 from the first wave within the Greater Wellington Region, after at least 12 months post-infection.

Methods

Study design and participants

This was an observational, cross-sectional study conducted remotely by the Medical Research Institute of New Zealand (MRINZ) in partnership with Regional Public Health (RPH), now known as the National Public Health Service, Capital, Coast, Hutt Valley, and Wairarapa. This study was run in accordance with the declaration of Helsinki and was approved by the Southern Health and Disability Ethics Committee (21/STH/111) and registered with the Australian and New Zealand Clinical Trials Registry (ACTRN 12621000524897p). The decision to run the study remotely was taken due to the active community cases of COVID-19 at the time of the study and to mitigate the risks to the study, participants, and staff.

Participants were considered eligible if they were aged 18 years and above, had laboratory PCR confirmed SARS-CoV2 infection during the first wave (28 February 2020 to 1 August 2020) and at least 12 months had elapsed since the first onset of COVID-19 symptoms. Participants were excluded if during the two weeks prior they had symptoms of an acute infection, had been asked to self-isolate, quarantine or stay at home by Public Health officials, or had any other condition which, at the investigator's discretion, was believed to present a risk or impact the feasibility of the study or the study results.

Study procedures

Confirmed COVID-19 cases were identified from Aotearoa New Zealand's national notifiable disease surveillance database, EpiSurv. All eligible cases were contacted by RPH and provided with a participant information sheet. Cases who expressed interest in taking part in the study were referred to the MRINZ. Investigators from the MRINZ contacted potential participants to further explain the study and obtain informed consent. Consent was obtained remotely in all participants via REDCap, a secure, United States Health Insurance Portability and Accountability Act 1996 (HIPAA) compliant web-based application hosted and supported by the MRINZ.[10] Participant-reported data relating to demographics and medical history were entered into REDCap directly by the investigator. Participants were then sent a link to the questionnaires (Table 1) via REDCap. Participants were also asked whether "Apart from getting COVID-19, has anything significant happened in your life that could affect the above responses?" following the PHQ-9, GAD-7, PSQI and FSS questionnaires. Laboratory blood test request forms were mailed to participants, and they were able to provide a blood specimen in a participating blood collection centre across Aotearoa New Zealand.

The primary outcome was patient-perceived overall health status, determined using a study specific Overall health questionnaire (Table 1). Secondary outcome measures included patient-reported symptom questionnaires on mental health, quality of life, dyspnoea, fatigue, sleep quality, ongoing symptoms, and laboratory tests.

Statistical methods

Continuous data are summarised by mean and standard deviation (SD), median and inter-quartile range (IQR), and minimum to maximum. Categorical data are summarised by counts and proportions expressed as percentages. SAS version 9.4 was used.

Results

There were 96 confirmed COVID-19 cases of whom 88 were eligible for the study. Forty-four participants consented to the study and 37 completed both the questionnaires and gave a blood sample. Five participants only completed either the questionnaires or blood sampling (Figure 1) and 42 participants were included in the analysis. The median time from onset of COVID-19 symptoms to enrolment was 628.5 days (IQR 599 to 687).

Baseline characteristics

The mean (SD) age of cases was 45.5 (15.5), 54.5% were male and the majority were recorded as being of European ethnicity (90.9%) (Table 2). Eighty-nine percent of cases had received at least two doses of a COVID-19 vaccine at time of enrolment.

Patient reported outcomes

Overall health rating

For the primary outcome, the majority of participants (52.4%, N=22) felt that their current overall health was worse than it was prior to contracting COVID-19 (Table 3). Thirty-eight percent (N=16) of participants reported that their health status was the same as it was before.

Mental health

The majority of participants (54.8%, N=23) scored 5 or above in the PHQ-9, indicating some level of depression. Of those who had a positive screen for symptoms of depression, approximately one third (N=14) had symptoms of mild depression. Thirteen of the participants with symptoms of depression (31% of all respondents) did not identify a significant event in their life (apart from COVID-19) that could have affected their responses. The GAD-7 questionnaire identified 45.2% (N=19) of participants as showing symptoms of anxiety with scores greater than or equal to 5. Eleven of the participants with symptoms of anxiety (26.2% of all respondents) did not identify a significant event in their life (apart from COVID-19) that could have affected their responses. Figure 2 illustrates the number of participants in each severity group for anxiety and depression.

Quality of life

The median (IQR) EQ-5D-5L VAS was 75.5 (56 to 85). The dimension of quality of life most commonly affected was pain/discomfort (54.8%, N=23) and anxiety/depression (54.8%, N=23). One participant reported having issues with self-care, while 33.3% (N=14) and 16.7% (N=7) participants reported having issues with conducting usual activities and mobility, respectively (Figure 2). A breakdown of participants reporting each level of severity within the five dimensions of EQ-5D-5L is shown in Appendix Table 2.

Dyspnoea

The majority of participants (57.1%, N=24) reported having some degree of breathlessness. Eighteen participants (42.9%) indicated Grade 0 on the scale, i.e., no abnormal dyspnoea (only feeling breathless with strenuous exercise). Figure 2 illustrates the number of participants within each grade.

Fatigue

The median (IQR) FSS score was 3.9 (2.7 to 4.8). Half of the participants reported a score >4.0 and were classified as being fatigued. Fourteen of the participants with symptoms of fatigue (33.3% of all respondents) did not identify a significant event in their life (apart from COVID-19) that could have affected their responses.

Sleep quality

The median (IQR) PSQI score was 6.5 (6 to 8). Scores greater than 5 are associated with poor sleep quality and were seen in 76.2% (N=32) of participants. Twenty-five of the participants with symptoms of fatigue (59.5% of all respondents) did not identify a significant event in their life (apart from COVID-19) that could have affected their responses.

Ongoing symptoms

Almost all participants (92.9%, N=39) reported having at least one ongoing symptom while 90.5% (N=38) reported having two or more ongoing symptoms. The most common symptoms were persistent fatigue (64.3%, N=27), followed by dizziness/light-headedness, forgetfulness, post-exercise malaise, and trouble in concentrating, reported by 23 (54.8%) of participants for each symptom. Appendix Table 3 details the frequency of all symptoms.

Laboratory tests

Table 4 summarises the results from blood tests conducted. None of the participants had abnormalities in cardiac markers. One participant had lymphopaenia and three participants had raised ferritin. There were no abnormalities in estimated glomerular filtration rate, and one participant had hyponatraemia. Sixteen point two percent (N=6) participants had abnormal thyroid function tests, while 13.5% (N=5) participants had abnormal liver function enzymes. One participant had very mildly raised CRP (9mg/L). All participants were reactive to SARS-CoV-2 IgG Spike Ab test, while 70% were reactive to the SARS-CoV-2 IgG+IgM (N protein) test. Two unvaccinated participants were reactive to both antibody tests, while the third had no reactivity to SARS-CoV-2 IgG+IgM (N protein) test.

Table 1: Description of symptom questionnaires.

Patient-reported symptom questionnaires	
Overall health questionnaire	Compares overall health prior to getting COVID-19 with current overall health using the following question and response options: *compared to your overall health before getting COVID-19, how would you rate your overall health now?* • My overall health is much better than it was before getting COVID-19. • My overall health is a little better than it was before getting COVID-19. • My overall health is the same as it was before getting COVID-19. • My overall health is a little worse than it was before getting COVID-19. • My overall health is much worse than it was before getting COVID-19.
Modified Medical Research Council Dyspnoea Scale (mMRC Dyspnoea Scale)[11]	Consists of five statements about perceived breathlessness from Grade 0, "I only get breathless with strenuous exercise" to Grade 4, "I am too breathless to leave the house, or I am breathless when dressing or undressing".
Patient Health Questionnaire-9 (PHQ9)[12]	Nine item instrument for detection of depression. Participants are asked how often they were bothered by 9 problems over the preceding 2 weeks and required to select one of "not at all", "several days," "more than half the days," and "nearly every day".
Generalised Anxiety Disorder-7 (GAD7)[13]	Seven item instrument that uses some of the DSM-V criteria for GAD to identify probable cases of GAD along with measuring anxiety symptom severity. Participants are asked how often they were bothered by 7 problems over the preceding 2 weeks and are required to select one of "not at all," "several days," "more than half the days," and "nearly every day".
Pittsburgh Sleep Quality Index (PSQI)[14]	Self-rated questionnaire which assesses sleep quality and disturbances over a 1-month time interval.
EQ-5D-5L[15]	Patient reported questionnaire comprising of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has 5 levels: no problems, slight problems, moderate problems, severe problems, and extreme problems.
EQ-5D-5L VAS[15]	The EQ-5D-5L Visual Analogue Scale is a patient reported questionnaire recording the patient's self-rated health "today".
Fatigue Severity Scale (FSS)[16]	Nine item instrument on fatigue, its severity and how it affects certain activities. The items are scored on a 7-point scale with 1=strongly disagree and 7=strongly agree.
WHO Symptom Questionnaire[17]	Section 2.6 of the WHO's Global COVID-19 Clinical Platform Case Report Form for Post COVID condition (Post COVID-19 CRF).

Figure 1: Flow diagram of participants.

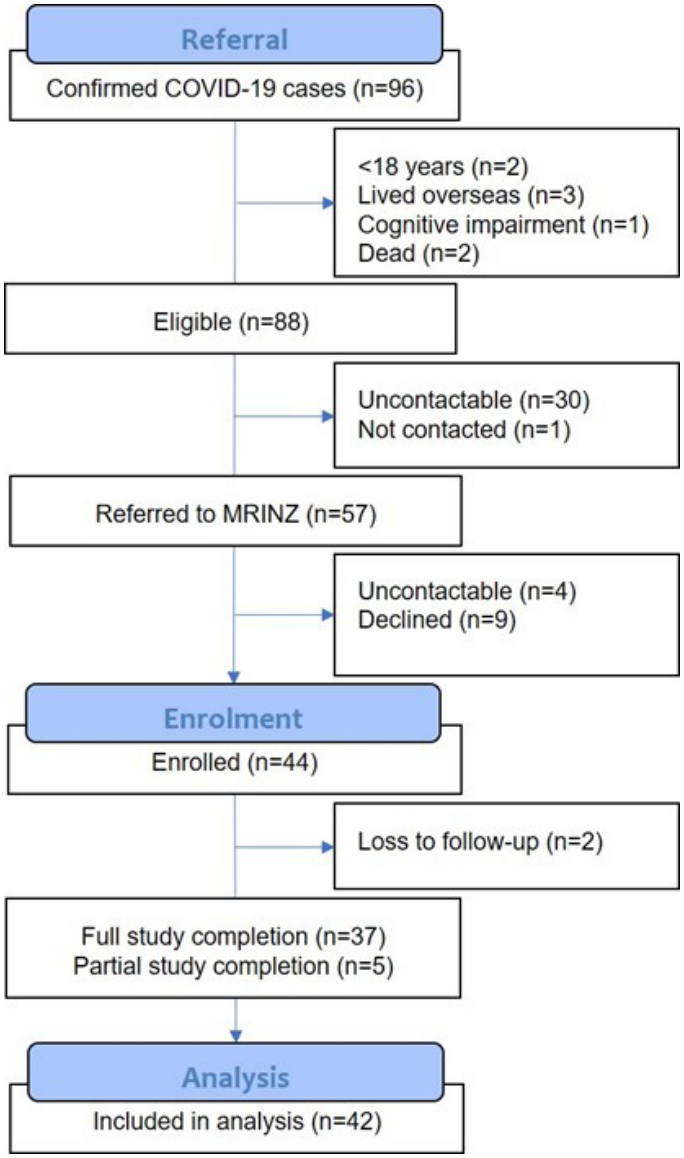

Table 2: Baseline characteristics of participants.

Characteristic	N=44
Age; mean years (SD)	45.5 (15.4)
Sex (%)	
Female	19 (45.2)
Ethnicity[a] (%)	
Māori	3 (7.1)
Asian	1 (2.4)
European	38 (90.5)
Smoking (%)	
Never	31 (73.8)
Ex-smoker	8 (19.1)
Current	3 (7.1)
Chronic disease[b] (%)	
Yes	26 (61.9)
COVID-19 vaccination status[e]	
Unvaccinated	3 (6.8)
Partially vaccinated	1 (2.4)
Fully vaccinated[c]	38 (90.5)
Hospital admission[d]	
Yes	2 (4.5)
[a]Prioritised ethnicity using Level 1 codes[18] [b]See Appendix Table 1 for list of included chronic diseases [c]Defined as having received two doses of a COVID-19 vaccine at time of enrolment [d]Defined as hospitalisation for at least four hours [e]The participants were a vaccine-naïve population during infection in 2020 and were vaccinated once the roll-out commenced in 2021.	

Table 3: Results for primary outcome.

Overall health rating	N/42 (%)
Much better	2 (4.8)
A little better	2 (4.8)
The same	16 (38.1)
A little worse	20 (47.6)
Much worse	2 (4.8)

Figure 2: Patient reported outcomes: Modified Borg Dyspnoea Scale score, PHQ-9-Patient Health Questionnaire-9, GAD-7- Generalised Anxiety Disorder-7, EQ-5D-5L-Quality of Life questionnaire.

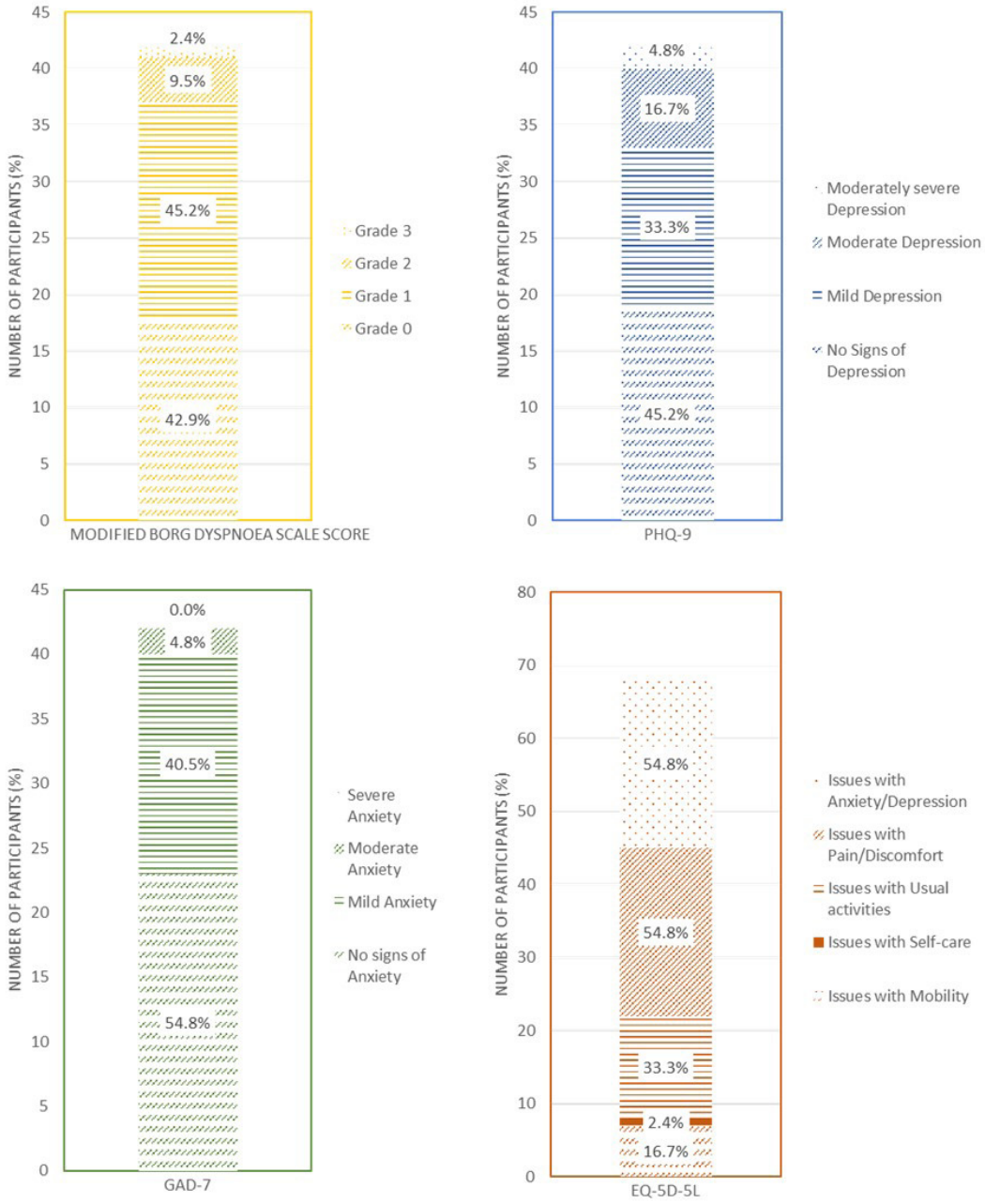

Table 4: Results of laboratory tests.

Laboratory test	N/37[a] (%)
Anaemia	0 (0)
Lymphopaenia	1 (2.7)
Serum Sodium out of range	1 (2.7)
Serum Potassium out of range	0 (0)
eGFR <60 mL/min per 1·73 m^2	0 (0) N=35
HbA1c> 41 mmol/mol	0 (0)
Hs-Troponin T 14ng/L	0 (0)
NT ProBNP>35 pmol/L	0 (0)
Free T3 out of range	2 (5.4)
Free T4 out of range	2 (5.4)
TSH out of range	3 (8.1)
AST > upper limit of normal reference range	1 (2.8) N=36
ALT > upper limit of normal reference range	1 (2.7)
GGT > upper limit of normal reference range	3 (8.1)
Bilirubin > upper limit of normal reference range	2 (5.4)
CRP>6 mg/L	1 (2.7)
ESR>30 mm/hr	0 (0) N=36
Ferritin >500 ug/L	3 (8.3) N=36
SARS-CoV-2 IgG+IgM (N protein)	
Reactive	26 (70.3)
Non-reactive	11 (29.7)
SARS-CoV-2 IgG Spike Ab	
Reactive	37 (100)
Non-reactive	0 (0)
[a]Unless otherwise specified	

Discussion

In this study we explored the prevalence of ongoing symptoms at a median 1.7 years (628.5 days) following the first onset of COVID-19 symptoms in cases from the first alpha/beta wave in a vaccine-naïve population in the Greater Wellington Region. COVID-19 vaccines were first available in December 2020, so none of the study participants were vaccinated prior to their COVID-19 illness. Over half of the participants felt that their current overall health was worse than it was prior to contracting COVID-19. A vast majority (90%) of participants reported at least two ongoing symptoms since their first acute COVID-19 illness. Between 45–72% of participants reported each of anxiety, depression, dyspnoea, pain/discomfort, and sleep difficulties assessed using the GAD-7, PHQ-9, mMRC Dyspnoea Scale, EQ-5D-5L, and FSS questionnaires, respectively.

There are important limitations to our study. This study is an observational, cross-sectional study with a very small sample size intended for a descriptive analysis, so a causal relationship between symptoms and COVID-19 infection cannot be established. It is challenging to distinguish long COVID symptoms from symptoms that participants may have had prior to infection with COVID-19 or symptoms that occur post-infection but for a different reason. The lack of a baseline (pre-COVID-19) assessment, or a control group for comparison, also mean that any symptoms or laboratory abnormality observed in our study group cannot be definitively attributed to COVID-19. We asked participants to identify whether their answers to anxiety, depression, fatigue, and sleep quality questionnaires could have been affected by something other than COVID-19, to only consider symptoms experienced after the acute episode of COVID-19 in the WHO Symptom Questionnaire, and to compare overall health to before getting COVID-19. However, the responses depended on accurate recall, which could have introduced a degree of measurement error.

There may be a non-response bias where the outcomes in those that declined participation or were uncontactable differ from those that did take part. As our study included eight questionnaires, misclassification bias due to respondent fatigue is also a possibility, as participants may not have provided consistent responses to reduce the burden of answering questions. Participants were, however, able to leave and return to the online questionnaires at a later time, which was a feature designed to mitigate survey fatigue. Given the lack of a confirmatory test or syndromic definition for the diagnosis of long COVID, surveys were chosen based on a review of the international literature available at the time of study design. As long COVID encompasses a wide range of symptoms, it is likely that the surveys do not capture all the potential features of long COVID.

It is also possible that participant reported outcomes were affected by poor recall, particularly in questionnaires where participants had to reflect on their health status prior to getting COVID-19 (Overall Health Questionnaire and WHO Symptom Questionnaire). This is, however, unlikely to be an issue with the FSS, GAD-7/PHQ-9 and PSQI, as they ascertain symptoms related to the previous 1, 2, and 4 weeks, respectively. Additionally, the findings of this study have limited generalisability to all individuals with COVID-19 infections, given the occurrence of newer variants since the initial alpha/beta variants in our study population.

A systematic review and meta-analysis[8] published in November 2021 synthesised evidence from 18 papers on post-COVID symptoms persisting for at least 12 months in both hospitalised and non-hospitalised populations. It identified a pooled prevalence of 18% (95% CI: 13–24) at 1-year follow-up for dyspnoea. A New Zealand case control study[19] that included largely non-hospitalised cases who tested positive in March–June 2020 showed that dyspnoea persisted in 27% of cases compared to 6% in controls ($p<0.001$), at a mean of 306 days post COVID-19 testing. Another New Zealand cross-sectional study[20] surveyed 990 participants who had tested positive for COVID-19 or were a probable case between 2020 and 30 Nov 2021 (which includes the Delta wave and participants who were only 7 months post positive test/probable case). Of the 405 participants who answered the survey on long COVID, they found that over 50% of tāngata whenua and tāngata Tiriti experienced shortness of breath, which is in keeping with our findings where 57.1% reported having some degree of breathlessness using the mMRC Dyspnoea Scale and 50% using the WHO Symptom Questionnaire.

Similarly, our study had a higher prevalence of sleep difficulties, which were seen in 59.5% of participants compared to the pooled prevalence of 12% (95% CI: 7–17) in the meta-analysis.[8]

The screening questionnaires for mental health symptoms identified symptoms of depression in 31% and anxiety in 26.2% of participants that were not subjectively attributed to another cause. This is similar to the pooled prevalence found at least at 12 months of 23% (95% CI: 12–34) for depression and 26.2% (95% CI: 15–29) for anxiety,[8] and the prevalence of approximately one third for symptoms of anxiety and depression in the New Zealand cross-sectional study.[20] One third of our participants also reported experiencing fatigue, which is similar to the pooled prevalence of 28% (95% CI: 18–39) at least at 12 months,[8] but less than the prevalence of 60–77% seen in the New Zealand studies.[19,20]

The reported prevalence for depression and fatigue using the WHO Symptom Questionnaire was higher than that of the PHQ-9 and FSS, respectively. We believe the prevalence identified through the latter two questionnaires are likely to be closer to the true estimate, as these questionnaires are screening questionnaires designed to explore different presentations of the same problem. For example, the PHQ-9 asks nine questions on symptoms related to depression such as trouble in concentrating, feeling low or having little energy to elicit, whether the respondent is showing signs of depression. An average score with pre-determined cut-offs is then calculated for none, mild, moderate, and severe depression. The WHO Symptom Questionnaire, on the other hand, only has one question related to each of anxiety, depression, and fatigue, which can be answered "yes" by participants if they subjectively think they suffer from the condition. The high prevalence of anxiety and depression was also seen in the EQ-5D-5L, where 54.8% of respondents reported feeling slightly/moderately anxious or depressed when directly asked to identify the degree of anxiety or depression they felt.

A high proportion (>90%) of our participants reported having at least one ongoing symptom, as well as experiencing two or more symptoms. This is higher than the prevalence identified in a non-hospitalised study population of 304 in Italy, where only 53.0% of patients reported at least one symptoms at 12 months after onset of illness.[21] The study, however, used the Acute Respiratory Tract Infection Questionnaire to ascertain symptoms, which is less comprehensive than the WHO Symptom Questionnaire. A Faroese study[22] of a largely non-hospitalised sample of 180 participants also showed that only 53.2% had at least one ongoing symptom. However, the mean follow-up period for this study was only 125 days and the symptoms questionnaire that was used largely focused on acute symptoms. The New Zealand case control study[19] had a prevalence of 75.6% in cases experiencing any symptoms, although a modified community-acquired pneumonia questionnaire was used to assess the persistence of only five symptoms.

The impact of these symptoms on quality of life was measured using the EQ-5D-5L. The dimension of quality of life most commonly affected was pain/discomfort (54.8%, N=23) and anxiety/depression (54.8%, N=23) in our study. The higher degree of impact seen on pain/discomfort and anxiety/depression domains compared to the other domains is similar to that seen in an English study of non-hospitalised cases at 6 months.[23] In our study, moderate to severe symptoms were only seen in six (14.3%) participants in the usual activities, pain/discomfort, and anxiety/depression domains. This contrasts with the much higher prevalence of moderate, severe, and extreme symptoms seen in the walking, self-care, usual activities, and pain/discomfort domains of the New Zealand cross-sectional study.[20] They showed that between 3–42% of tāngata whenua and 5–48% of tāngata Tiriti experienced moderate to extreme symptoms in these domains, with impact on usual activities being the most affected area, irrespective of ethnicity. The authors acknowledge, however, that there may be a selection bias in these estimates depending on whether those who did not answer the long COVID survey had symptoms or not.

There were minimal laboratory abnormalities in our study sample, despite extensive screening for cardiac, endocrine, haematological, liver, antibody, and inflammatory markers. This is unsurprising, as in a study of hospitalised COVID-19 patients, blood test results had returned to normal after a median of 54 days, despite significant abnormalities at discharge.[24] In another cohort study of non-hospitalised participants, there was no difference in blood test results between COVID-19 patients and controls at a 6 months follow up.[25]

Comparison of our study with other studies of long COVID is challenging given the variety of methods used, the heterogeneity in questionnaires, differences in patient populations and infected variants, description of symptoms, and disparities in follow-up lengths. Since infection

with alpha and beta variants in our study population, bigger waves of transmission with Delta and Omicron variants have occurred in Aotearoa New Zealand, with evidence pointing to a possibly lower risk of long COVID with the Omicron variant compared to the Delta variant.[26] This variability in available evidence illustrates why the diagnosis of long COVID can be challenging. This is compounded by the lack of distinct laboratory or radiological features to aid diagnosis. The clinical spectrum of patients with long COVID means that patients may need input from a variety of healthcare providers with individualised assessment, management, and treatment goals, a further addition to already stretched health systems.[27]

This study found that over half of the study participants (who had COVID during the first wave of infection) reported their current overall health as being worse compared to pre-COVID, with 90% reporting at least two ongoing symptoms 1.7 years later. With 37% of New Zealand's population (as of 22 November 2022) now having had COVID, long COVID presents a real issue to the health of New Zealanders and its impacts on the health system. This will, however, require further careful investigation, particularly of a large number of people who have had infection with the Delta and Omicron variants.

COMPETING INTERESTS
This study was supported by Health Research Council of New Zealand Independent Research Organisation grant IRO [18/002].

DATA STATEMENT
Individual participant data that underlie the results reported in this article, after de-identification (text, tables, figures, and appendices) will be available one year after publication until a minimum of 5 years after publication. It will be available to researchers who provide a methodologically sound proposal that has been approved by the study steering committee to achieve the aims outlined in the approved proposal. Data can be obtained through a signed data access agreement. The agreement can be obtained by emailing the MRINZ Director: richard.beasley@mrinz.ac.nz.

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Appendices

Appendix Table 1: Frequency of self-reported chronic disorders by system.

Disorder	N
Psychiatric disorders	6
Allergy	7
Blood and lymphatic system disorders	1
Malignancy	3
Cardiovascular disorders	9
Ear and labyrinth disorders	4
Endocrine disorders	3
Eye disorders	1
Gastrointestinal disorders	5
Chronic infection	1
Metabolic disorder	2
Musculoskeletal and connective tissue disorders	6
Nervous system disorders	5
Reproductive system and breast disorders	2
Respiratory disorders	7

Individual disorders are not published due to disorders with counts less than 1 being potentially identifiable.
Some participants reported multiple disorders.

Appendix Table 2: Frequency of responses in each domain of EQ-5D-5L.

Variable	N/42 (%)
Mobility	
I have no problems in walking about	35 (83.3)
I have slight problems in walking about	4 (9.5)
I have moderate problems in walking about	3 (7.1)
I have severe problems in walking about	0 (0)
I am unable to walk about	0 (0)
Self-care	
I have no problems washing or dressing myself	41 (97.6)
I have slight problems washing or dressing myself	1 (2.4)
I have moderate problems washing or dressing myself	0 (0)
I have severe problems washing or dressing myself	0 (0)
I am unable to wash or dress myself	0 (0)
Usual activities	
I have no problems doing my usual activities	28 (66.7)
I have slight problems doing my usual activities	8 (19.0)
I have moderate problems doing my usual activities	6 (14.3)
I have severe problems doing my usual activities	0 (0)
I am unable to do my usual activities	0 (0)
Pain/discomfort	
I have no pain or discomfort	19 (45.2)
I have slight pain or discomfort	17 (40.5)
I have moderate pain or discomfort	5 (11.9)
I have severe pain or discomfort	1 (2.4)
I have extreme pain or discomfort	0 (0)
Anxiety/depression	
I am not anxious or depressed	19 (45.2)
I am slightly anxious or depressed	17 (40.5)
I am moderately anxious or depressed	6 (14.3)
I am severely anxious or depressed	0 (0)
I am extremely anxious or depressed	0 (0)

Appendix Table 3: Frequency of ongoing symptoms.

Symptom	N/42(%)
Anxiety	17 (40.5)
Behaviour change	16 (38.1)
Can't move and/or feel one side of body or face	3 (7.1)
Chest pain	14 (33.3)
Constipation	7 (16.7)
Depressed mood	21 (50.0)
Diarrhoea	11 (26.2)
Dysmenorrhoea	7 (33.3)*
Dizziness/light headedness	23 (54.8)
Fainting/blackouts	4 (9.5)
Fever	5 (11.9)
Forgetfulness	23 (54.8)
Jerking of limbs	12 (28.6)
Joint pain/swelling	16 (38.1)
Loss of appetite	16 (38.1)
Loss of interest/pleasure	22 (52.4)
Lumpy lesions	0 (0)
Nausea/vomiting	8 (19.0)
Numbness or tingling	14 (33.3)
Pain on breathing	12 (28.6)
Palpitations	16 (38.1)
Persistent dry cough	12 (28.6)
Persistent fatigue	27 (64.3)
Problems hearing	12 (28.6)
Persistent headache	19 (45.2)
Persistent muscle pain	16 (38.1)
Post-exercise malaise	23 (54.8)
Problems passing urine	3 (7.1)
Problems seeing	14 (33.3)

Appendix Table 3 (continued): Frequency of ongoing symptoms.

Symptom	N/42(%)
Problems swallowing	2 (4.8)
Problems with balance	10 (23.8)
Problems with gait/falls	3 (7.1)
Reduced smell	17 (40.5)
Reduced taste	13 (31.0)
Ringing in ears	11 (26.2)
Seizures	1 (2.4)
Shortness of breath	21 (50.0)
Skin rash	3 (7.1)
Slowness of movement	6 (14.3)
Sleeping less	18 (42.9)
Sleeping more	17 (40.5)
Stiffness of muscles	18 (42.9)
Stomach pain	9 (21.4)
Swollen ankles	3 (7.1)
Tremors	5 (11.9)
Trouble in concentrating	23 (54.8)
Weakness in limbs	12 (28.6)
Weight loss	8 (19.0)
Erectile dysfunction	5 (20.8)[$]
Hallucinations	1 (2.4)
[*]Female sex N=20, [$]Male sex N=24	