The long-term impact of the COVID-19 pandemic on mental health and quality of life: a retrospective cohort study in northern Vietnam

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Informed consent: the participants were informed about the study objectives and their right to withdraw at any moment without giving a reason. Written informed consent was obtained before data collection. Their responses were anonymous and kept confidential.

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ABSTRACT

The objective of this study was to investigate the mental disturbances among COVID-19 survivors while also examining their quality of life. A retrospective cohort study was conducted among COVID-19 survivors in Northern Vietnam. Anxiety, depression, insomnia, cognitive impairment, and quality of life were assessed using the Patient Health Questionnaire-9, Generalized Anxiety Disorder-7, Pittsburgh Sleep Quality Index, Mini-Cog, and Short Form-8 (SF-8), respectively. Information regarding COVID and post-COVID conditions was retrospectively collected through direct interviews. Ordinal logistic regression was employed to identify factors associated with the severity of depression and anxiety; binary logistic regression was used to identify factors associated with the presence of sleep disturbance and cognitive impairment, and linear regression was utilized to identify factors associated with the mental and physical components of the SF-8. A total of 1596 participants were included in this study, with the prevalence of depression, anxiety, sleep disturbance, and cognitive impairment being 8.7%, 16.9%, 23.4%, and 5.6%, respectively. Experiencing discrimination during COVID-19 infection and post-COVID syndrome were both linked to long-term outcomes of depression, anxiety, and insomnia and were also related to a decline in the quality of life. Our study provided initial insights into the mental outcomes and quality of life among COVID-19 survivors over an extended period, with stigmatization and post-COVID syndrome identified as the primary associated factors. A longitudinal study with random sampling, a control group, and measures to better control recall bias is recommended.

Introduction

COVID-19 is a pandemic caused by the SARS-CoV-2 virus and its variants, which continue to circulate globally.[1] Originating in late December 2019 with the first outbreak in the city of Wuhan, China, by January 30, 2020, the World Health Organization (WHO) declared this pandemic a public health emergency.[2] The profound impact of the pandemic, characterized by immense loss of human lives, health, and assets, alongside extensive economic repercussions at both societal and personal levels, has significantly affected the mental well-being of countless individuals. Prior studies have demon-

strated a notable rise in the incidence of mental health conditions including depression (14.6% to 48.3%), anxiety (6.3% to 50.9%), and stress (8.1% to 81.9%) across numerous nations.[3] In a 2020 systematic review comprising 19 studies with a total of 93,569 participants from general populations, the results revealed relatively high rates of anxiety symptoms (6.33% to 50.9%), depression (14.6% to 48.3%), post-traumatic stress disorder (PTSD) (7% to 53.8%), psychological distress (34.43% to 38%), and stress (8.1% to 81.9%) during the COVID-19 pandemic in various countries including China, Spain, Italy, Iran, the United States of America, Turkey, Nepal, and Denmark.[4]

On May 5th, 2023, the WHO declared that the COVID-19 pandemic was no longer a public health emergency of international concern.[5] The global spread of the COVID-19 pandemic over the past 4 years has brought about significant changes in the lives of people across continents, and while this pandemic was eventually contained, there are concerns that its profound consequences may leave long-lasting effects, particularly on mental health. Evidence from previous pandemics has demonstrated that other strains of coronaviruses, such as MERS (Middle Eastern Respiratory Syndrome caused by MERS-CoV) and SARS (Severe Acute Respiratory Syndrome caused by SARS-CoV-1), had the potential to inflict prolonged negative impacts on mental health. In a prospective nationwide cohort study conducted 12 months after the MERS outbreak at multiple centers throughout Korea, results revealed that 42.9% of survivors reported symptoms of PTSD, while 27.0% reported depression.[6] Similarly, a study in Taiwan in 2020, which included 285 patients with SARS and 2850 controls without SARS, found that the SARS cohort exhibited elevated risks of anxiety, depression, sleep disorders, PTSD/acute stress disorder, and suicide.[7] However, in another systematic review comprising 33 studies with a total of 6743 COVID survivors, the long-term effects of COVID-19 have been associated with either no or mild symptoms, and the prevalence of anxiety, depression, PTSD, and sleep disturbances among COVID-19 survivors appears to be similar to those observed in the general population.[8]

The long-term effects following COVID-19 infection are currently a topic of significant interest, with numerous reports indicating that these lasting consequences could manifest in nearly all organ systems, including the respiratory, cardiovascular, gastrointestinal, psychiatric, neurological, and dermatological systems, collectively referred to as post-COVID syndrome.[9] Evidence from recent studies indicated that post-COVID syndrome was a common condition among COVID-19 survivors,[10] and was associated with a decline in their quality of life.[11-14] With the hallmark of persistent, long-lasting symptoms, the impact of post-COVID syndrome on quality of life could be even more pronounced, as shown in a 2023 cross-sectional study conducted on 3754 patients referred to post-COVID clinics in England and Wales, which found their quality of life to be worse than that of patients with metastatic cancers.[15]

Aim

To date, in Vietnam, the pandemic has been adequately controlled and considered an endemic, with all aspects of socio-economic life returned to normal.[16] However, data on the long-term impacts of COVID-19 remain limited. To address this gap, our study aimed to investigate the mental disturbances among COVID-19 survivors as the primary focus, while also examining their quality of life as a secondary objective.

Materials and Methods

Ethical consideration

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of Hanoi Medical University under decision No. 701/GCN-HĐĐĐNCYSH-ĐHYHN dated March 13th, 2023. The participants were informed about the study objectives and their right to withdraw at any moment without giving a reason. Written informed consent was obtained before data collection. Their responses were anonymous and kept confidential.

Study design

A retrospective cohort study was conducted among 1596 COVID-19 survivors in Hanoi, Bac Giang, and Lao Cai. These regions were selected to represent three distinct economic territories in the northern part of the country: the Northwest region, the Northeast region, and the Red River Delta. The selection of these three provinces ensures a comprehensive representation of the northern region of Vietnam. Hanoi's urban and well-resourced environment, Bac Giang's industrial landscape, and Lao Cai's rural and ethnically diverse population offer a wide range of contexts for understanding the long-term effects of COVID-19.[17]

Participants

Eligible participants were individuals previously diagnosed with COVID-19, confirmed through real-time polymerase chain reaction (PCR) and/or rapid testing.

Study outcomes

Mental disturbances were the primary outcomes of this study, including anxiety, depression, insomnia, and cognitive impairment. Depression was measured by the Patient Health Questionnaire-9 (PHQ-9). It consists of nine questions, each corresponding to one of the Diagnostic and Statistical Manual of Mental Disorders-5 diagnostic criteria for major depressive disorder. Participants rate the frequency of their symptoms over the past 2 weeks on a scale ranging from 0 (not at all) to 3 (nearly every day). The total score ranges from 0 to 27, and based on the overall PHQ-9 score, the participant can be classified as having no/minimal depressive symptoms (0-9), mild depressive symptoms (10-14), moderately depressive symptoms (15-19), and severe depressive symptoms (20-27).[18] In this study, patients were considered to have screened positive for depression when their total PHQ-9 score was 10 or higher. Evidence from previous studies has demonstrated that the PHQ-9 is a reliable and valid screening instrument for identifying depression across various populations.[19-22]

The Generalized Anxiety Disorder-7 (GAD-7) is a self-report questionnaire used to assess the severity of generalized anxiety disorder symptoms. It consists of seven questions, each addressing a specific symptom experienced over the past 2 weeks. Participants rate the frequency of each symptom on

a scale ranging from 0 (not at all) to 3 (nearly every day), item scores were then summed to the overall score (range 0-21). Based on the overall GAD-7 score, the participant can be classified as having minimal anxiety (0-4), mild anxiety (5-9), moderate anxiety (10-14), and severe anxiety (≥15).[23] In this study, a total GAD-7 score ≥5 was considered a positive clinical screening for generalized anxiety disorder. GAD-7 has been tested for reliability and validity, confirming its excellent reliability, internal consistency and convergent validity.[24,25]

Pittsburgh Sleep Quality Index (PSQI) is a self-reported questionnaire used to assess sleep quality and disturbances over a 1-month time interval. The instrument consists of nineteen items, which generate seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Higher scores indicate poorer sleep quality, with a global PSQI score ranging from 0 to 21. In our study, a participant with an overall score of 5 or higher was considered to have had a sleep disturbance.[26] The PSQI has been tested for reliability and validity, confirming its strong internal consistency, test-retest reliability, and moderate criterion validity.[27-29]

The Mini-Cog is a brief cognitive screening tool used to detect cognitive impairment in older adults. The instrument consists of two tasks: a three-word recall test and a clock drawing test. The three-word recall test requires the patient to remember and later recall three unrelated words, while the clock drawing test involves drawing a clock showing a specific time. The scoring system allocates up to three points for correctly recalling the words and two points for an accurate clock drawing, with a total score ranging from 0 to 5.[30] In our study, a participant with a score of 2 or lower was considered to have potential cognitive impairment. Evidence from previous studies has demonstrated the high sensitivity and specificity of this quick and freely available screening tool for detecting cognitive impairment across various populations.[31]

Quality of life was the secondary outcome of this study and was measured using the Short Form-8 (SF-8). The SF-8 is a concise, self-reported questionnaire designed to assess overall health-related quality of life, consisting of 8 items that correspond to domains from the SF-36 health survey. Each item is scored on a 5- or 6-point Likert scale and then transformed to a 0-100 scale, with higher scores indicating better health status. The scoring process involves assigning mean SF-36 v2 scale scores to each SF-8 response category, followed by weighting the items using regression weights to compute the Physical Component Summary and Mental Component Summary scores. These summary scores are then normalized to achieve means of 50 and standard deviations of 10, aligning with the general US population.[32] Previous studies have indicated that the SF-8 is a reliable and valid tool for assessing health-related quality of life across diverse populations and conditions.[33-35]

Sample size and sampling

The sample size was calculated based on the prevalence of overall prevalence of depression in a previous systematic review.[8] Assuming a prevalence of depression of 20% among COVID survivors, a margin of error of 2.5%, and a confidence level of 95%, the minimum sample size was 1021 participants. Accounting for the non-participate rate of 20%, we planned to recruit 1200 participants. Using conventional sampling, all patients with a confirmed history of COVID diagnosis and had evidence of recovery (*via* negative PCR and/or rapid test results) at least 6 months prior to the recruitment (as provided by local authorities) were included in this study.

Data collection

Before proceeding with data collection, we contacted the local authorities where the study was to be conducted to discuss specific details regarding the purpose, participant interviewing procedures, and data to be collected. Upon receiving approval from the local authorities, we requested them to provide a list of patients who had previously been diagnosed with COVID-19 through PCR/rapid test and also sought their assistance in disseminating information about the mental health assessments and data collection to be conducted. The timing and location of the implementation were arranged by the local authorities. The study was conducted during the period from April to December 2023.

Participants underwent interviews to collect demographic data and medical history. COVID-related information was gathered retrospectively at the onset of illness, including the number of COVID-19 vaccine doses received, occurrences of COVID-19 infections, hospital admissions due to COVID-19 and types of COVID-19 treatments received. COVID-19 symptoms were also surveyed retrospectively and categorized into three main groups: COVID respiratory symptoms (including cough, sputum, sore throat, nasal discharge, stuffy nose, chest pain, chest discomfort, and shortness of breath), COVID general symptoms (including fever, chills, loss of taste, headache, muscle pain, joint pain, and weakness), and COVID gastrointestinal symptoms (including loss of appetite, gastric pain, nausea, vomiting, abdominal pain, diarrhea, and constipation). Participants were asked to recall symptoms at onset and self-assess symptom severity using a Visual Analog Scale ranging from 0 to 10. The composite score for each symptom group was calculated by summing the total scores of symptoms within the group and dividing by the number of symptoms. Patients were also requested to self-assess the severity of their COVID-19 condition and classify it as mild, moderate, severe, or life-threatening.

The level of stigma experienced by patients was also assessed retrospectively at the time of disease onset using the 8-item version of the Stigma Scale for Chronic Illnesses (SSCI-8), which consists of eight items designed to assess perceived stigma experienced by individuals during their COVID-19-infected period, with eight items including discomfort from others, avoidance behaviors, feelings of abandonment, mistreatment, avoidance of eye contact, feelings of shame about the illness and physical limitations, and attributing blame to oneself for the illness. Respondents rate each item on a scale from 0 to 4, indicating the frequency of stigma-related experiences ranging from 0 (never) to 4 (always). In a previous study involving 587 participants from eight academic medical centers across the USA, the findings indicated that the SSCI-8 demonstrated satisfactory internal consistency, reliability, and validity.[36]

In this study, the post-COVID condition was defined according to the WHO definition as the continuation or development of new symptoms 3 months after the initial SARS-CoV-2 infection.[37] Due to difficulties in assessing COVID-19 history from medical records, the presence of post-COVID syndrome was determined through self-report-

ing. Patients were identified as having post-COVID syndrome if they answered "yes" to the question "after recovering from COVID, did you continue to experience symptoms or develop new symptoms?" and if these symptoms lasted more than 12 weeks in response to the question, "how long did these symptoms last after recovering from COVID?".

Statistical analysis

Variables were presented as frequency and percentage for categorical variables and as mean (standard deviation) or median (interquartile range, Q1-Q3) for continuous variables. Stacked bar charts were used to illustrate the distribution of responses regarding the SSCI-8. Ordinal logistic regression was employed to identify factors associated with the severity of depression and anxiety, binary logistic regression was used to identify factors associated with the presence of sleep disturbance and cognitive impairment, and linear regression was utilized to identify factors associated with the mental and physical components of the SF-8 quality of life. Candidates for the regression models were selected based on a theoretical framework derived from a literature review and clinical experience (Figure 1). All analyses were performed using R version 4.3.2. An analysis with p-values of less than 0.05 was considered statistically significant.

Results

A total of 1596 participants were included in this study, with a mean age of 46.7±14.4 years. Most of them were female (60.1%) and currently married (89.5%), two-fifths did not complete high school, approximately one-third had an income below 6 million Vietnam Dong per month, and around 40% lost their income due to the COVID-19 pandemic. The prevalence of individuals with previous physical and mental health conditions in the study was 19.9% and 3.1%, respectively. The majority of participants reported receiving at least three doses of the COVID-19 vaccine (94.9%), had only one episode of COVID-19 infection (96.1%), and self-assessed their illness severity as mild to moderate (95.9%). Only 1.8% of participants required hospitalization due to COVID-19. The prevalence of self-reported post-COVID syndrome in this study was 50.3% (Table 1).

Most participants did not agree with the negative statements on the SSCI-8 scale, indicating that they did not experience discrimination when they had COVID-19 (Figure 2).

The prevalence of depression, anxiety, sleep disturbance, and cognitive impairment among the participants in this study was 8.7%, 16.9%, 23.4%, and 5.6%, respectively. Most participants experienced these mental health disturbances at a mild level (Table 2).

In the multivariable logistic regression analysis, older age and female gender were significantly associated with the majority of mental health outcomes. A history of mental health conditions was linked to anxiety and insomnia, while more severe general COVID-19 symptoms were associated with anxiety, depression, and cognitive impairment. Experiencing discrimination during COVID-19 infection and post-COVID syndrome were both linked to long-term outcomes of depression, anxiety, and insomnia (Table 3). These two factors were also related to a decline in the quality of life among COVID-19 survivors, affecting both physical and mental health components (Table 4).

Discussion

In this study, we examined the prevalence of mental health outcomes among COVID-19 survivors. The observed prevalences of depression, anxiety, insomnia, and cognitive impairment in our study appear to be slightly higher than, or comparable to, the prevalences of these mental disturbances in the general population.[38-42] Our prevalences also

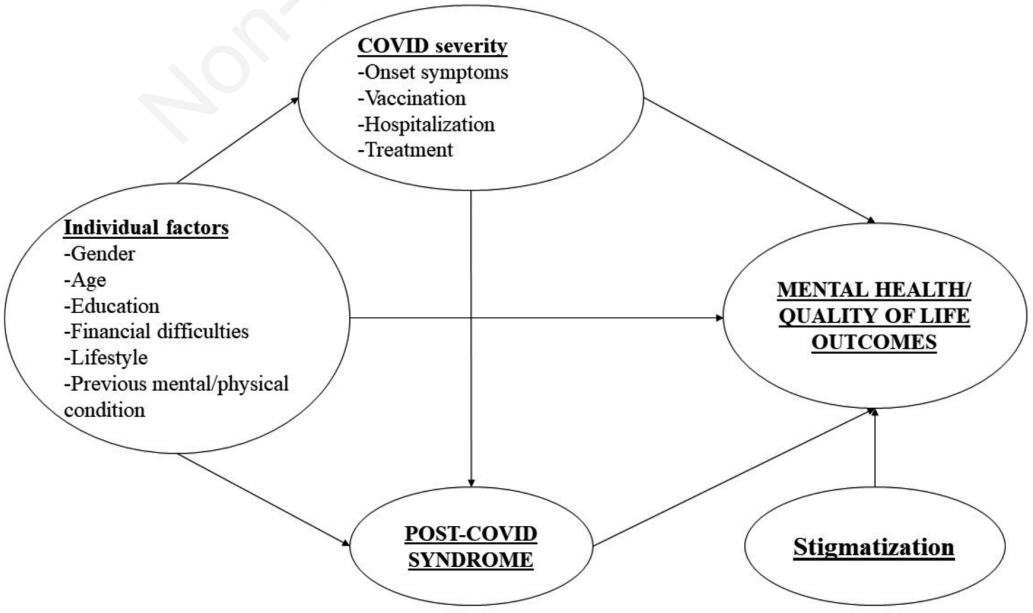

Figure 1. Conceptual framework of factors related to the mental health outcomes among COVID-19 survivors.

appeared to be lower than those reported in previous studies conducted during the peak of the pandemic in Vietnam.[43,44] This comparison suggests that the impact of COVID-19 primarily manifests in the short term, attributed to factors such as fear of infection, social isolation, financial uncertainty, and disruptions to daily routines,[45,46] while long-term effects on mental health appear to be absent or minimal. Similar to our study's results, findings from a systematic review involving 33 studies with a total of 6743 COVID survivors suggest that the long-term effects of COVID-19 have been associated with either minimal or no mental health consequences, and the prevalence rates of anxiety, depression, PTSD, and sleep disturbances among COVID-19 survivors seem to mirror those observed in the general population.[8] Evidence from another study also appeared to contradict the notion of the long-term impact of COVID-19 on mental health. In a 2021 study conducted on a population of 413,148 individuals, including 26,998 individuals who had previously contracted COVID-19, the results revealed no significant difference between the group with prior infection and the group without COVID-19 history. Additionally, the association between SARS-CoV-2 infection and anxiety and depression appeared to be more pronounced in individuals with recent infection (within <30 days) compared to those with more distant infection (>120 days), indicating a short-term effect.[47]

In our study, greater perceived stigma while infected with COVID-19 was significantly associated with worsened mental outcomes and quality of life in the long term. In a 2023 systematic review that included 76 studies assessing stigma towards COVID-19 patients, the study results indicated an association between stigma and adverse mental health outcomes, including anxiety, depression, PTSD, and sleep disorders.[48] Additionally, evidence from previous studies indicates that stigma has been linked to psychological distress and PTSD among individuals infected with various diseases, including SARS, H1N1, MERS, Ebola, and COVID-19.[6,49-51] During pandemic outbreaks, infected individuals are often stigmatized as potential vectors of disease transmission, leading to their isolation from society, and this perception may persist even after the outbreak subsides.[52] Stigmatization can result in discrimination and social exclusion, which significantly impacts the mental well-being and social relationships of affected individuals. This stigma may also have lasting ef-

Table 1. General and COVID-19 characteristics of the participants (n=1596).

Characteristic	Results
Age (years), mean±SD	46.7±14.4
Gender female, n (%)	959 (60.1)
Ethnicity Kinh, n (%)	1506 (94.4)
No religion, n (%)	1563 (97.9)
Currently married, n (%)	1428 (89.5)
Currently living with family/caregiver, n (%)	1573 (98.6)
Location of residence, n (%)	
Urban	803 (50.3)
Rural	581 (36.4)
Mountainous region	212 (13.3)
Educational level, n (%)	
High school and below	583 (36.5)
College and above	1013 (63.5)
Occupational, n (%)	
Government employee	653 (40.9)
Other occupation	943 (59.1)
Individual income, n (%)	
Under 6 million VND per month	1124 (70.4)
Above 6 million VND per month	472 (29.6)
Income lost due to COVID-19, n (%)	613 (38.4)
Smoker, n (%)	192 (12.0)
Alcohol use, n (%)	288 (18.0)
Substance use, n (%)	3 (0.2)
Engage in physical activity	839 (52.6)
Medical history, n (%)	
Physical conditions	317 (19.9)
Mental conditions	49 (3.1)
Medication use	223 (14.0)
Number of COVID-19 vaccine doses received, n (%)	
0	2 (0.1)
1	9 (0.6)
2	70 (4.4)
3	724 (45.4)
4	770 (48.2)
5	21 (1.3)
Number of COVID-19 infections, n (%)	
1	1534 (96.1)
2	59 (3.7)
3	3 (0.2)
Self-assessment of COVID-19 severity, n (%)	
Mild	1028 (64.4)
Moderate	502 (31.5)
Severe	66 (4.1)
Hospitalization due to COVID-19, n (%)	28 (1.8)
COVID-19 treatment	
Oxygen	8 (0.5)
Antiviral medication	227 (14.2)
Corticosteroid	123 (7.7)
Had post-COVID syndrome, n (%)	803 (50.3)

VND, Vietnam Dong; VAS, Visual Analog Scale; SD, standard deviation; IQR, interquartile range.

Table 2. Mental health and quality of life outcomes among study participants (n=1596).

Mental health outcomes	Results
Depression levels, n (%)	
None	1457 (91.3)
Mild	105 (6.6)
Moderate	29 (1.8)
Severe	5 (0.3)
Anxiety levels, n (%)	
None	1326 (83.1)
Mild	125 (7.8)
Moderate	121 (7.6)
Severe	24 (1.5)
Had sleep disturbance, n (%)	373 (23.4)
Cognitive impairment, n (%)	89 (5.6)
Quality of Life Outcomes	**Results**
PCS-8, mean±SD	49.2±6.3
MCS-8, mean±SD	53.2±7.0

PCS, physical component; MCS, mental component; SD, standard deviation.

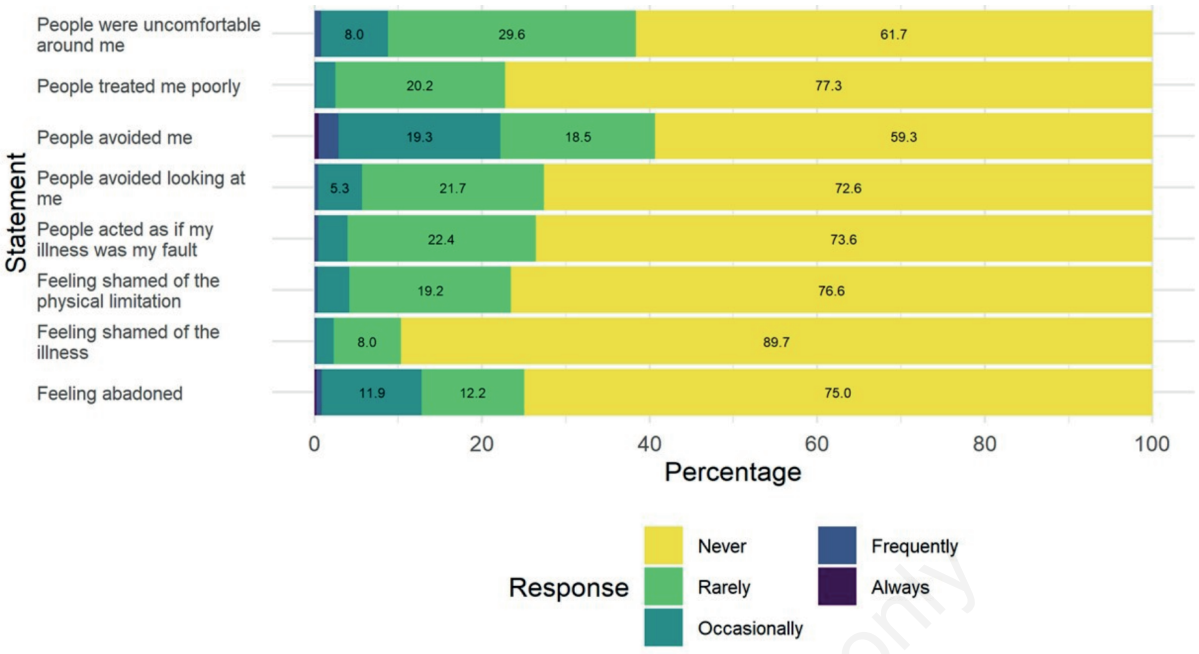

Figure 2. Distribution of the Stigma Scale for Chronic Illnesses responses among participants (n=1596).

Table 3. Multivariable analysis of factors associated with mental health outcomes among the study participants (n=1596).

Characteristic	Anxiety*		Depression*		Cognitive impairment**		Sleep disturbance**	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age	**1.03**	**1.02, 1.04**	**1.05**	**1.04, 1.07**	**1.07**	**1.05, 1.09**	**1.06**	**1.05, 1.07**
Gender female (*versus* male)	**2.72**	**1.84, 4.13**	**3.43**	**1.95, 6.42**	1.19	0.68, 2.14	1.38	1.00, 1.94
Not currently married (*versus* married)	1.01	0.62, 1.60	0.66	0.30, 1.29	**2.40**	**1.25, 4.40**	0.83	0.50, 1.33
Highschool graduated (*versus* not graduated)	0.90	0.66, 1.21	0.97	0.65, 1.46	**0.57**	**0.35, 0.91**	0.98	0.74, 1.31
Income lost due to COVID-19 (yes *versus* no)	1.00	0.74, 1.35	0.99	0.66, 1.49	**1.76**	**1.07, 2.88**	**0.74**	**0.55, 0.99**
Smoker (yes *versus* no)	1.16	0.63, 2.08	0.76	0.28, 1.82	0.75	0.27, 1.84	1.08	0.65, 1.76
Alcohol use (yes *versus* no)	0.83	0.47, 1.45	1.07	0.46, 2.40	0.85	0.35, 1.93	0.78	0.49, 1.23
Had previous physical conditions (yes *versus* no)	1.24	0.88, 1.74	1.20	0.76, 1.86	1.30	0.78, 2.14	**1.48**	**1.08, 2.03**
Had previous mental conditions (yes *versus* no)	**2.39**	**1.32, 4.28**	2.05	0.98, 4.09	0.66	0.18, 1.82	**5.44**	**2.71, 11.6**
Number of COVID-19 infections	1.31	0.70, 2.32	0.79	0.29, 1.78	0.90	0.20, 2.58	0.90	0.47, 1.63
COVID respiratory symptoms score	1.13	0.97, 1.32	1.03	0.84, 1.26	1.02	0.78, 1.33	1.14	0.98, 1.33
COVID general symptoms score	**1.11**	**1.01, 1.22**	**1.17**	**1.03, 1.32**	**1.20**	**1.02, 1.41**	1.08	0.98, 1.18
COVID gastrointestinal symptoms score	0.86	0.70, 1.05	1.00	0.77, 1.28	0.97	0.68, 1.34	0.96	0.79, 1.17
SSCI-8 score	**1.09**	**1.05, 1.12**	**1.09**	**1.04, 1.14**	0.93	0.87, 1.00	1.07	1.03, 1.10
Had post COVID syndrome (yes *versus* no)	**2.21**	**1.65, 2.99**	**2.49**	**1.66, 3.78**	1.51	0.94, 2.47	2.31	1.76, 3.05

OR, odds ratio; CI, confidence interval; SSCI-8; Stigma Scale For Chronic Illnesses 8-item version. Variables in bold were statistically significant. *Ordinal logistic regression was employed in the multivariable regression analysis of the anxiety and depression outcomes; **binary logistic regression was employed in the multivariable regression analysis of the cognitive impairment and sleep disturbance outcomes.

fects on various aspects of an individual's life, including housing, employment, and access to healthcare services.[53] Therefore, in future pandemics, reducing stigma represents a crucial strategy for mitigating both short-term and long-term mental health consequences.

One of the key findings of our study was the detrimental impact of post-COVID syndrome on mental health and quality of life outcomes. Previous research has also demonstrated the adverse effects of post-COVID syndrome, spanning from mild to severe COVID-19 cases requiring hospitalization.[11-14] Participants experiencing persistent symptoms reported significant impairments in both physical and mental aspects of their quality-of-life assessments. Physical manifestations such as fatigue, shortness of breath, and muscle weakness not only imposed functional limitations but also affected the emotional and social dimensions of life. Mental

Table 4. Multivariable analysis of factors associated with quality of life among the study participants (n=1596).

Characteristic	PCS		MCS	
	β	95% CI	β	95% CI
Age (years)	-0.16	-0.18, -0.14	-0.09	-0.11, -0.06
Sex (female *versus* male)	-0.41	-1.1, 0.26	-0.99	-1.8, -0.21
Single/divorced/widowed (*versus* married)	-0.34	-1.2, 0.56	0.59	-0.48, 1.6
Highschool graduated (*versus* not graduated)	0.04	-0.57, 0.65	-0.36	-1.1, 0.35
Income lost due to COVID-19 (yes *versus* no)	0.24	-0.35, 0.84	0.30	-0.39, 1.0
Smoker (yes *versus* no)	-0.07	-1.1, 0.92	-0.30	-1.5, 0.87
Alcohol use (yes *versus* no)	0.59	-0.32, 1.5	0.97	-0.10, 2.0
Had previous physical conditions (yes *versus* no)	-0.04	-0.77, 0.69	-0.25	-1.1, 0.60
Had previous mental conditions (yes *versus* no)	-2.4	-4.1, -0.83	-1.9	-3.8, 0.01
Number of COVID-19 infections	-0.17	-1.5, 1.2	-0.39	-1.9, 1.2
COVID respiratory symptoms score	-0.79	-1.1, -0.47	-0.46	-0.83, -0.09
COVID general symptoms score	-0.04	-0.24, 0.15	0.13	-0.10, 0.36
COVID gastrointestinal symptoms score	0.05	-0.36, 0.46	-0.86	-1.3, -0.37
SSCI-8 score	-0.30	-0.37, -0.23	-0.40	-0.48, -0.31
Had post COVID syndrome (yes *versus* no)	-1.1	-1.6, -0.51	-1.1	-1.7, -0.40

CI, confidence interval; PCS, physical component; MCS, mental component; SSCI-8; Stigma Scale for Chronic Illnesses 8-item version. Variables in bold were statistically significant.

health sequelae associated with post-COVID syndrome, including anxiety and depression, further exacerbated these impairments, contributing to an overall diminished quality of life among affected individuals. With a relatively high self-reported prevalence of post-COVID syndrome in our study (approximately half of the participants), it was evident that this condition is common and significantly impacts mental health and quality of life. The findings in this study supported changes in clinical practice toward the screening and early management of post-COVID syndrome in the population of COVID-19 survivors.

There were several limitations to consider in this study. Firstly, the lack of a control group without COVID-19 infection precludes us from making any definitive conclusions regarding the association between COVID-19 and the long-term mental health and quality of life outcomes in the study. Secondly, the majority of information regarding both COVID and post-COVID conditions relied on self-reported recollections of COVID status since initial infection. However, many participants may have contracted COVID several years prior to the study, introducing potential recall bias that could lead to inaccuracies in measurement and classification, particularly in distinguishing participants with post-COVID conditions from those without.

Conclusions

Our study provided initial insights into the mental health outcomes and quality of life among COVID-19 survivors over an extended period, with stigmatization and post-COVID syndrome identified as the primary associated factors. A longitudinal study with random sampling, control group, and measures to better control recall bias is recommended to clarify the long-term effects of COVID-19 on mental health and quality of life, thereby laying the groundwork for appropriate policy changes.

References

1. Borges do Nascimento IJ, O'Mathúna DP, von Groote TC, et al. Coronavirus disease (COVID-19) pandemic: an overview of systematic reviews. BMC Infect Dis 2021; 21:525.
2. Zhu H, Wei L, Niu P. The novel coronavirus outbreak in Wuhan, China. Glob Health Res Policy 2020;5:6.
3. Wu T, Jia X, Shi H, et al. Prevalence of mental health problems during the COVID-19 pandemic: a systematic review and meta-analysis. J Affect Disord 2021;281:91-8.
4. Xiong J, Lipsitz O, Nasri F, et al. Impact of COVID-19 pandemic on mental health in the general population: a systematic review. J Affect Disord 2020;277:55-64.
5. WHO. Statement on the fifteenth meeting of the IHR (2005) Emergency Committee on the COVID-19 pandemic. 2023. Available from: https://www.who.int/news/item/05-05-2023-statement-on-the-fifteenth-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-coronavirus-disease-(covid-19)-pandemic.
6. Park HY, Park WB, Lee SH, et al. Posttraumatic stress disorder and depression of survivors 12 months after the outbreak of Middle East respiratory syndrome in South Korea. BMC Public Health 2020;20:605.
7. Tzeng NS, Chung CH, Chang CC, et al. What could we learn from SARS when facing the mental health issues related to the COVID-19 outbreak? A nationwide cohort study in Taiwan. Transl Psychiatry 2020;10:339.
8. Bourmistrova NW, Solomon T, Braude P, et al. Long-term effects of COVID-19 on mental health: a systematic review. J Affect Disord 2022;299:118-25.
9. Lopez-Leon S, Wegman-Ostrosky T, Perelman C, et al. More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. medRixv 2021;30:2021.01.27.21250617.
10. Sk Abd Razak R, Ismail A, Abdul Aziz AF, et al. Post-

COVID syndrome prevalence: a systematic review and meta-analysis. BMC Public Health 2024;24:1785.
11. Kim Y, Bae S, Chang HH, Kim SW. Long COVID prevalence and impact on quality of life 2 years after acute COVID-19. Sci Rep 2023;13:11207.
12. Román-Montes CM, Flores-Soto Y, Guaracha-Basañez GA, et al. Post-COVID-19 syndrome and quality of life impairment in severe COVID-19 Mexican patients. Front Public Health 2023;11:1155951.
13. Malesevic S, Sievi NA, Baumgartner P, et al. Impaired health-related quality of life in long-COVID syndrome after mild to moderate COVID-19. Sci Rep 2023;13:7717.
14. Carlile O, Briggs A, Henderson AD, et al. Impact of long COVID on health-related quality-of-life: an OpenSAFELY population cohort study using patient-reported outcome measures (OpenPROMPT). Lancet Reg Health Eur 2024;40:100908.
15. Walker S, Goodfellow H, Pookarnjanamorakot P, et al. Impact of fatigue as the primary determinant of functional limitations among patients with post-COVID-19 syndrome: a cross-sectional observational study. BMJ Open 2023;13:e069217.
16. Hoang V. The COVID-19 pandemic in Vietnam - success, crisis, and endemic: key thresholds and lessons. J Glob Health 2022;12:03065.
17. Ma W. Northern Vietnam: a magnet for foreign investment. 2020. Available from: https://research.hktdc.com/en/article/MzgwMjM2NTI0.
18. Kroenke K, Spitzer RL, Williams JB. The PHQ-9: validity of a brief depression severity measure. J Gen Intern Med 2001;16:606-13.
19. Rahman MA, Dhira TA, Sarker AR, Mehareen J. Validity and reliability of the Patient Health Questionnaire scale (PHQ-9) among university students of Bangladesh. PLoS One 2022;17:e0269634.
20. Summaka M, Zein H, Abbas LA, et al. Validity and reliability of the Arabic patient health questionnaire-9 in patients with spinal cord injury in Lebanon. World Neurosurg 2019;125:e1016-22.
21. Sun Y, Fu Z, Bo Q, et al. The reliability and validity of PHQ-9 in patients with major depressive disorder in psychiatric hospital. BMC Psychiatry 2020;20:474.
22. Molebatsi K, Motlhatlhedi K, Wambua GN. The validity and reliability of the Patient Health Questionnaire-9 for screening depression in primary health care patients in Botswana. BMC Psychiatry 2020;20:295.
23. Spitzer RL, Kroenke K, Williams JBW, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med 2006;166:1092-7.
24. Johnson SU, Ulvenes PG, Øktedalen T, Hoffart A. Psychometric properties of the general anxiety disorder 7-item (GAD-7) scale in a heterogeneous psychiatric sample. Front Psychol 2019;10:1713.
25. Dhira TA, Rahman MA, Sarker AR, Mehareen J. Validity and reliability of the generalized anxiety disorder-7 (GAD-7) among university students of Bangladesh. PLoS One 2021;16:e0261590.
26. Buysse DJ, Hall ML, Strollo PJ, et al. Relationships between the Pittsburgh sleep quality index (PSQI), Epworth sleepiness scale (ESS), and clinical/polysomnographic measures in a community sample. J Clin Sleep Med 2008;4:563-71.
27. Backhaus J, Junghanns K, Broocks A, et al. Test-retest reliability and validity of the Pittsburgh sleep quality index in primary insomnia. J Psychosom Res 2002;53:737-40.
28. Beaudreau SA, Spira AP, Stewart A, et al. Validation of the Pittsburgh sleep quality index and the Epworth sleepiness scale in older black and white women. Sleep Med 2012;13:36-42.
29. Salahuddin M, Maru TT, Kumalo A, et al. Validation of the Pittsburgh sleep quality index in community dwelling Ethiopian adults. Health Qual Life Outcomes 2017;15:58.
30. Limpawattana P, Manjavong M. The Mini-Cog, clock drawing test, and three-item recall test: rapid cognitive screening tools with comparable performance in detecting mild NCD in older patients. Geriatrics 2021;6:91.
31. Abayomi SN, Sritharan P, Yan E, et al. The diagnostic accuracy of the Mini-Cog screening tool for the detection of cognitive impairment—a systematic review and meta-analysis. PLoS One 2024;19:e0298686.
32. Yiengprugsawan V, Kelly M, Tawatsupa B. SF-8TM health survey. In: Michalos AC, ed. Encyclopedia of quality of life and well-being research. Dordrecht, Netherlands: Springer Netherlands; 2014. pp. 5940-2.
33. Namjoo S, Mirzaei M, Foroughan M, Ghaedamini Harouni G. Psychometric properties of the short form-8 health survey (SF-8) among diabetes and non-diabetes Iranian older people. Health Promot Perspect 2021;11:337-43.
34. Pestillo De Oliveira L, Malheiros Caruzzo N, Sakita F, et al. Cross-cultural adaptation and psychometric properties of the SF-8 questionnaire in Tanzanian Swahili for injury population. Disabilities 2022;2:428-38.
35. Lang L, Zhang L, Zhang P, et al. Evaluating the reliability and validity of SF-8 with a large representative sample of urban Chinese. Health Qual Life Outcomes 2018;16:55.
36. Molina Y, Choi SW, Cella D, Rao D. The stigma scale for chronic illnesses 8-item version (SSCI-8): development, validation and use across neurological conditions. Int J Behav Med 2013;20:450-60.
37. WHO. Post COVID-19 condition (Long COVID). 2022. Available from: https://www.who.int/europe/news-room/fact-sheets/item/post-covid-19-condition.
38. Bandelow B, Michaelis S. Epidemiology of anxiety disorders in the 21st century. Dialogues Clin Neurosci 2015;17:327-35.
39. Alqahtani IM, Al-Garni AM, Abumelha MS, et al. Prevalence of depression, anxiety, and stress among the general population during COVID-19 pandemic: a systematic review. J Fam Med Prim Care 2023;12:1030-7.
40. Morin CM, Jarrin DC. Epidemiology of insomnia: prevalence, course, risk factors, and public health burden. Sleep Med Clin 2022;17:173-91.
41. Pais R, Ruano L, P Carvalho O, Barros H. Global cognitive impairment prevalence and incidence in community dwelling older adults-a systematic review. Geriatrics 2020;5:84.
42. WHO. Depressive disorder (depression). 2023. Available from: https://www.who.int/news-room/fact-sheets/detail/depression.
43. Tran QD, Vu TQC, Phan NQ. Depression prevalence in Vietnam during the Covid-19 pandemic: a systematic review and meta-analysis. Ethics Med Public Health 2022;23:100806.
44. Hung DV, Thao PN, Lang HN, et al. Mental health impact

on patients with COVID-19 in the community under a long period of full lockdown in Vietnam. J Int Med Res 2024;52:3000605231221087.
45. Aljaberi MA, Al-Sharafi MA, Uzir MUH, et al. Psychological toll of the COVID-19 pandemic: an in-depth exploration of anxiety, depression, and insomnia and the influence of quarantine measures on daily life. Healthcare 2023;11:2418.
46. Kindred R, Bates GW. The influence of the COVID-19 pandemic on social anxiety: a systematic review. Int J Environ Res Public Health 2023;20:2362.
47. Klaser K, Thompson EJ, Nguyen LH, et al. Anxiety and depression symptoms after COVID-19 infection: results from the COVID Symptom Study app. J Neurol Neurosurg Psychiatry 2021;92:1254-8.
48. SeyedAlinaghi S, Afsahi AM, Shahidi R, et al. Social stigma during COVID-19: a systematic review. SAGE Open Med 2023;11:20503121231208273.
49. Yuan K, Gong YM, Liu L, et al. Prevalence of posttraumatic stress disorder after infectious disease pandemics in the twenty-first century, including COVID-19: a meta-analysis and systematic review. Mol Psychiatry 2021;26:4982-98.
50. Marbán-Castro E, Villén-Gonzalvo A, Enguita-Fernàndez C, et al. Uncertainties, fear and stigma: perceptions of zika virus among pregnant women in Spain. Int J Environ Res Public Health 2020;17:6643.
51. Gregorio ER, Medina JRC, Lomboy MFTC, et al. Knowledge, attitudes, and practices of public secondary school teachers on zika virus disease: a basis for the development of evidence-based Zika educational materials for schools in the Philippines. PLoS One 2019;14:e0214515.
52. Siu JY man. The SARS-associated stigma of SARS victims in the post-SARS era of Hong Kong. Qual Health Res 2008;18:729-38.
53. Lee S, Chan LYY, Chau AMY, et al. The experience of SARS-related stigma at Amoy Gardens. Soc Sci Med 2005;61:2038-46.