

Post-traumatic stress disorder, anxiety, depression and related factors among COVID-19 patients during the fourth wave of the pandemic in Vietnam

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Background: This study investigated post-traumatic stress disorder (PTSD), anxiety, depression and their related factors among coronavirus disease 2019 (COVID-19) patients during the fourth wave of the pandemic in Vietnam.

Methods: Vietnamese-fluent confirmed COVID-19 patients for at least 3 d were recruited in this online cross-sectional study to answer a three-part questionnaire including participants' sociodemographic characteristics, PTSD (Impact of Event Scale-Revised) and anxiety and depression (Hospital Anxiety and Depression Scale). Associated factors were determined using multivariable binary logistic regression models.

Results: Of 1544 responses, the majority were female (53.0%), ages 18–39 y (74.8%) and were isolated and treated at field hospitals (72.2%). Family or friends were the greatest sources of mental support (68.2%), followed by healthcare providers (51.1%). The overall prevalence rates of PTSD, anxiety and depression among COVID-19 patients were 22.9%, 11.2% and 17.4%, respectively. Risk factors included older age, higher education, getting infected from the public, knowing someone who died from COVID-19 and high perception of life threat. Meanwhile, mental assistance from family or friends, a greater number of supporters, living with someone not vulnerable and higher salaries were significantly protective factors.

Conclusions: The psychological responses associated with some sociodemographic details. Family or friends should be the first line of mental interventions for COVID-19 patients.

Keywords: anxiety, COVID-19, depression, mental health, post-traumatic stress disorder, psychological impact.

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has created public health, economic and social crises, severely affecting the lives, health and work of people around the world.¹ Facing waves of the pandemic, while communities were experiencing economic hardship due to job loss or fears of infection,² coronavirus-infected individuals, besides physical problems, were

more likely to suffer from mental health disorders such as anxiety, depression and post-traumatic stress disorder (PTSD).^{3–6} This might come from their exceptional fear of unstable clinical conditions after infection, isolation from family and friends, discrimination, death and possible stigma.³

In a meta-analysis of 13 studies among COVID-19 survivors, the pooled proportion of PTSD was 16% (95% confidence interval [CI] 9 to 23).⁷ A previous study found that 18.66% (95% CI

11.98 to 25.34) of COVID-19 survivors displayed symptoms of PTSD.⁸ Highly similar prevalences of PTSD among COVID-19 patients, healthcare workers and the general population were also reported in other systematic reviews.^{9,10} Besides the high rate of PTSD, COVID-19 patients presented a considerable proportion of depression, anxiety, distress and sleep disturbances.^{11,12} In another systematic review including 46 studies, while the overall prevalence of depression was 26% (95% CI 20 to 33), people diagnosed with COVID-19 were at the greatest risk for this disorder compared with healthcare workers or the general population.¹³ Also in this work, the anxiety rate was highest in the COVID-19 patient group, followed by the public and healthcare providers. Similar trends in the prevalence rates of sleep disturbances and other stress symptoms were also observed. Moreover, gender, age, oxygen saturation, having an infected family member, having more than two physical symptoms or low social support were found to be associated with anxiety among COVID-19 patients.^{14,15}

Since the first confirmed case on 23 January 2020, Vietnam has experienced four waves of COVID-19, with increasing levels of destruction and severity.^{16,17} During the first nationwide lockdown to curtail the spread of COVID-19, negative experiences in work, life and health were reported by healthcare workers.^{13,18–25} The Vietnamese government and Ministry of Health implemented many policies and directives to control COVID-19,¹⁷ changing the habits, culture and lifestyles of the country, partly affecting mental health. The changes in the living environment, the received information and social relationships, along with the strict isolation policy when infected with COVID-19 may also disrupt the patient's mental state or exacerbate their psychiatric symptoms.^{4,26,27} This evidence further confirms the considerable impact of the pandemic on the mental health of COVID-19 patients. If these conditions are not treated in time, the recovery of COVID-19 patient may be deficient. More seriously, they may be at increased risk of prolonged disabling mental disorders.⁴ However, health professionals and researchers in Vietnam seemed to focus only on psychological disorders during the pandemic in the general population, not directly on COVID-19-infected individuals.^{28,29} Surveys on such conditions in Vietnamese COVID-19 patients are lacking and no studies on this topic have been found. Understanding the psychological responses of this most vulnerable population, as well as related factors, will allow authorities to provide suitable measures to support psychological treatment and restore the community's quality of life,^{30,31} ensuring and maintaining national labour resources in the new post-crisis period. Therefore this study was conducted to measure the prevalence rates of mental problems, including PTSD, anxiety, depression and related factors, among COVID-19 patients in Vietnam.

Methods

Design, participants and procedure

A cross-sectional study was conducted when the worst wave of COVID-19 took place from July to October 2021, with a national mortality rate at 2.1%.³² Individuals ≥ 18 y of age, diagnosed with COVID-19 for ≥ 3 d and fluent in Vietnamese were eligible to participate. Patients having physical or mental health issues who were unable to complete the survey (e.g. unconsciousness,

cognitive impairment, psychotic disorders etc.), did not use a mobile device or declined to participate were not included. Based on the formula for prevalence estimation,³³ with a type I error value of 5%, an assumed prevalence of 42% obtained from another study¹³ and precision of 3%, the sample size was estimated to be 1040. Due to the nature of the study, a dropout rate of 10% was predicted, resulting in a required sample size of at least 1144 participants.

Due to strict social distancing regulations, questionnaires were distributed online to possible participants through the most user-friendly social media channels in Vietnam (Zalo, Facebook, Skype, Viber) from the researchers' network. To maximize the coverage of the study sample to broadly represent the general population, a message was attached at the end of the questionnaire encouraging participants to send the link to all of their contacts.

Study instrument

To collect data, a three-part anonymous questionnaire was developed. Typical demographic characteristics were surveyed in part 1. This included information related to their COVID-19 infection, such as the source of infection, infection duration, place of treatment, mental support, knowing someone who died from COVID-19 and perception of life threat to broadly examine the relationship of this process to outcome variables. To measure PTSD during active COVID-19 infection, part 2 used the validated Impact of Event Scale-Revised (IES-R), which was first developed by Horowitz^{34–36} and has been widely used in previous studies^{6,28,29,37,38} and has good internal consistency. The internal consistency of the Vietnamese version of the IES-R has been reported 0.96 (with Cronbach's α).³⁹ The cumulative total score of 22 questions with a 5-point Likert scale from 0 (not at all) to 4 (extremely) was classified nominally as normal (≤ 23), clinical concern (24–32), moderate (33–36) and severe symptoms (≥ 37).^{36,39,41} The result was also presented under three subscales as continuous measures: intrusion (8 items), avoidance (8 items) and hyperarousal (6 items). A patient was considered to have PTSD when their symptoms were at a moderate or severe level.

In part 3, the Hospital Anxiety and Depression Scale (HADS),⁴² which has also been extensively used in previous studies,^{14,37,38,42–44} was employed to investigate anxiety and depressive symptoms in COVID-19 patients. The scale was interpreted with two dimensions: including anxiety as HADS-A (7 items) and including depression as HADS-D (7 items). The scale was translated and used for the Vietnamese population with Cronbach's α for the HADS-A of 0.85 and for the HADS-D of 0.80.⁴² With four response values (0–3) for each item, thresholds of 8, 11 and 15 points were selected to distinguish between normal (≤ 7), mild (8–10), moderate (11–14) and extreme anxiety or depression (≥ 15).^{42,43,45–50} Anxiety or depression as a primary outcome was considered as moderate or extreme symptoms.

Data analysis

Statistical descriptors were used to summarize the results, including mean and standard deviation (SD) for normally distributed continuous variables, median and interquartile range (IQR) for non-normally distributed ones and frequency and proportion for categorical variables. Three multivariable binary

logistic regression analyses with odds ratios (ORs) and 95% confidence intervals (95% CIs) were run separately to determine the factors associated with PTSD, anxiety and depression and their strength of association. The raw data were refined in Excel 2016 (Microsoft, Redmond, WA, USA) before being imported into SPSS Statistics for Windows version 26.0 (IBM, Armonk, NY, USA) for all the statistical operations. A p -value <0.05 was considered statistically significant.

Ethical approval

The study was submitted to the Medical Ethics Committee of University Medical Center, Ho Chi Minh City, Vietnam for ethical approval (approval 87/GCN-HDDD-UMC, 31/8/2021). The respondents' voluntary participation was shown by answering a question in the introductory section of the questionnaire. They were also informed that no personal information was gathered and the data were only for research purposes.

Results

Sociodemographic characteristics

Table 1 presents the sociodemographic details of the participants. Of 1740 individuals taking the survey, 1544 fully responded, with more than four-fifths of the subjects from the public (84.0%). Overall, the majority were 18–39 y of age (74.8%), were less educated (high school or below; 58.9%) and had low monthly incomes of around 5–10 million Vietnamese dong (VND) (44.0%). The number of subjects living with clinically vulnerable people ($n=628/1544$) was relatively equal to those living with others ($n=645/1544$). Those treated at field hospitals accounted for 72.2% of the sample and the mean treatment duration was 5 d (IQR 3–10). While 30.4% and 21.0% reported they were infected by community or friends and colleagues, respectively, 370/1544 (24.0%) were blind to their infection's origin. Their family or friends were their greatest sources of mental support during treatment (68.2%), followed by healthcare providers (51.1%). Additionally the participants' perception of life-threatening severity was 1.10 (SD 1.04, range 0–4), in which 34.3% rated the life-threatening level due to COVID-19 acquisition as a little bit and 33.7% rated it as threat-free.

Prevalence of PTSD, anxiety and depression in COVID-19 patients

The participants' mental health during COVID-19 is presented in Table 2. The overall mean score of IES-R parameters was 20.67 (SD 15.17). Although the majority (62.2%) was considered normal, more than one-fifth reported psychological stress with moderate (5.5%) or severe symptoms (17.4%). Concerning three specific dimensions of this scale, the mean scores of both intrusion and avoidance symptoms were >7 (range 0–32) whereas hyperarousal symptoms scored 5.25 (SD 4.67, range 0–24).

With regard to the HADS, the overall prevalence of anxiety and depression was 11.2% and 17.4%, respectively. In terms of anxiety, 71.8% of respondents reported no symptoms, 17.1% were mild, 6.7% were moderate and 4.5% were severe. For the depres-

sion evaluation, nearly 15% of the subjects rated mild intensity, slightly more than 10% experienced moderate depression and 6.3% were extremely depressed.

Factors related to PTSD, anxiety and depression in COVID-19 patients

The results for factors associated with psychological impairment are displayed in Table 3. Regarding PTSD as measured by the IES-R, the multivariable logistic regression found that the age groups 40–59 y and >60 y, education backgrounds of vocational school/college and university and infection acquisition from the public were positively correlated with more serious distress symptoms (all p -values <0.05). For factors related to anxiety, the risk of more anxiety was higher among those infected from the public (OR 2.04 [95% CI 1.15 to 3.62]) and lower in those with an income of 5–10 million VND/month (OR 0.61 [95% CI 0.40 to 0.91]) as well as those with more mental support (OR 0.97 [95% CI 0.94 to 0.99]). In terms of the depression dimension, those living with an invulnerable spouse, earning 5–10 million VND/month, receiving support from family or friends and having more mental support sources were less likely to have depression. In contrast, belonging to the 40–50 y age strata and getting mental counselling increased the odds of depression ($p<0.05$). Additionally, knowing someone who died from COVID-19 and perceptions of a more serious life threat during infection were associated with higher probabilities of PTSD, anxiety and depression ($p<0.05$) among COVID-19 patients.

Discussion

Although mental health issues in different population groups have attracted much attention from scholars, studies on patients suffering from COVID-19 are still lacking, especially in the Vietnamese. This study was the first visible snapshot of a psychological crisis, including stress, anxiety and depression, among COVID-19 patients in Vietnam.

Our study included a sample of Vietnamese COVID-19 patients, with an age distribution consistent with other studies in Vietnam^{51,52} as well as the first confirmed cases during the pandemic.^{53,54} Similar gender ratios were also observed in studies by Long et al.⁵² and Nguyen et al.⁵³

While this study recruited patients from all treatment locations in Vietnam, with the highest percentage from field hospitals (72.2%), Long et al.'s study⁵² included only 13.2% of such patients and no confirmed patients who were isolated at home. In response to the pandemic, field hospitals were the main locations responsible for quarantine and treatment in Vietnam.⁵⁵ However, given that the COVID-19 pandemic was at its worst when this study was conducted, there was a serious shortage of facilities and healthcare personnel. Therefore, intending to ease the overload at hospitals, the Vietnamese Ministry of Health prioritized cases requiring close medical treatment and monitoring and allowed asymptomatic COVID-19 patients with low cycle thresholds to self-quarantine and self-treat at home under close supervision.^{56–58}

This research revealed that 22.9% of the subjects had PTSD during their COVID-19 infection. This was higher than in previous

Table 1. Sociodemographic and background characteristics of COVID-19 patients (N=1544)

Characteristics	Values
Age (years), mean (SD) [range]	33.96 (11.24) [18–80]
18–39	1155 (74.8)
40–59	335 (21.7)
≥60	54 (3.5)
Gender, n (%)	
Male	725 (47.0)
Female	819 (53.0)
Education level, n (%)	
≤High school	910 (58.9)
Vocational school/college	298 (19.3)
University	270 (17.5)
≥Post-graduate	66 (4.3)
Living status, n (%)	
Alone	271 (17.6)
With clinically vulnerable people	628 (40.7)
With others	645 (41.8)
Monthly income (million VND), n (%)	
<5	524 (33.9)
5–10	679 (44.0)
10–15	201 (13.0)
15–20	89 (5.8)
>20	51 (3.3)
Subject, n (%)	
Public	1297 (84.0)
Healthcare worker	247 (16.0)
Infection duration (days), median (IQR)	11 (7–15)
Place of quarantine and treatment, n (%)	
At home	196 (12.7)
Field hospital	1114 (72.2)
COVID-19 hospital	184 (11.9)
COVID-19 resuscitation centre	50 (3.2)
Source of infection, n (%)	
Family	230 (14.9)
Friends, colleagues, acquaintances	324 (21.0)
Public	469 (30.4)
Care or treatment for FO	84 (5.4)
Other COVID-19 prevention performance	45 (2.9)
Others	22 (1.4)
Unknown	370 (24.0)
Know someone who died from COVID-19, n (%)	
No	1233 (79.9)
Yes	311 (20.1)
Source of mental support during infection, n (%)	
Family, friends, acquaintances	
Healthcare providers	1053 (68.2)
Psychotherapist	789 (51.1)
Others	28 (1.8)
None	100 (6.5)
	122 (7.9)
Number of people mentally supporting during infection, median (IQR)	5 (3–10)

Table 1. Continued.

Characteristics	Values
Perceived life-threat level during infection, median (SD) [range], n (%)	1.10 (1.04) [0–4]
Not at all	521 (33.7)
A little bit	530 (34.3)
Moderately	351 (22.7)
Quite a bit	96 (6.2)
Extremely	46 (3.0)

Table 2. Prevalence of PTSD, anxiety and depression among COVID-19 patients (N=1544)

Item	n (%)	Mean (SD)
IES-R		
Normal	961 (62.2)	
Clinical concern	230 (14.9)	
Moderate	85 (5.5)	
Severe	268 (17.4)	
Intrusion symptoms		7.63 (6.01)
Avoidance symptoms		7.79 (6.16)
Hyperarousal symptoms		5.25 (4.67)
HADS		
Anxiety		
Normal	1108 (71.8)	
Mild	264 (17.1)	
Moderate	103 (6.7)	
Extreme	69 (4.5)	
Depression		
Normal	1047 (67.8)	
Mild	229 (14.8)	
Moderate	171 (11.1)	
Extreme	97 (6.3)	

studies, with 11.7% and 10.7%²⁹ suffering psychological effects during the pandemic, using the same IES-R instrument. Since the referred studies were conducted on the general population before the worst fourth wave of the pandemic in Vietnam,¹⁷ the severity of psychological influence on this community seemed to be attributable to their uncertainty and concerns or fears about issues such as job loss, economic burden (evidenced by Le et al.²⁸) or the restrictions of unprecedented prevention policies. In contrast, in the current study, the participants were actually battling with the virus in their bodies. The psychological disturbances they faced were not only limited to common concerns, but also fears of death, serious complications or even transmission to their loved ones, which explained their significantly high rates of psychological distress compared with other studies on the general population related to COVID-19.

For anxiety and depression, our work presented significantly higher rates compared with Le et al.'s study,²⁸ in which 4.9% and

7% of participants suffered from moderate to severe symptoms of anxiety and depression, respectively, based on the 21-item Depression Anxiety Stress Scale. Despite different scales, the significant difference in outcomes between these two studies demonstrates the severity of disorders in the mental health of COVID-19 patients compared with the general population related to this pandemic. Nevertheless, the findings in this work were lower than those among hospitalized COVID-19 patients in the study by Kong et al.,¹⁴ using the same HADS checklist. While this study considered those who presented moderate or extreme symptoms of anxiety or depression, the variables of anxiety and depression also included the mild level. In a more detailed breakdown with the same grouping method, despite a lower prevalence of anxiety, our study found a greater prevalence of depression compared with 14.59% in Kong et al. As a result, during the COVID-19 pandemic, the threat of the virus and the implementation of shielding programs confounded the daily life of the community and affected their mental health. Compared with the general population, COVID-19 sufferers seemed to experience worrisome mental health disorders that needed more attention. While strict quarantine patterns at home or in field hospitals made infected people feel lonely, facing an unprecedented devastating physical health threat put them in even greater fear.

Regarding factors associated with psychological stress disorders in COVID-19 patients, this study found that older age was associated with a higher probability of PTSD and depression. This key result was consistent with findings in Chinese hospitalized COVID-19 patients¹⁴ and the general Vietnamese population.²⁹ During previous severe acute respiratory syndrome and Middle East respiratory syndrome epidemics, older age was confirmed as factor for a risk of death among several demographic characteristics of patients.^{59,60} Given that the immune system of middle-aged and elderly persons gradually becomes weaker due to the nature of aging, accompanied by underlying chronic illness, individuals in this population are at a higher risk of negative outcomes.²⁹ Current evidence shows that COVID-19 infection is more likely to pose an increased probability of critical illness and fatality in the elderly,^{14,61,62} inducing their higher death anxiety.⁶³ This partially explains the reason why elder subjects experienced a greater fear during infection compared with younger groups.

Considering the education background, those holding diplomas or bachelor's degrees had higher odds of PTSD related to COVID-19 infection than those with an education level of high school or below. Understandably, less-educated persons might

Table 3. Factors related to PTSD, anxiety and depression among COVID-19 patients (N=1544)

Characteristics	IES-R		HADS-Anxiety		HADS-Depression	
	OR (95% CI)	p-Value	OR (95% CI)	p-Value	OR (95% CI)	p-Value
Age (years)						
18–39	1		1		1	
40–59	1.52 (1.08 to 2.12)	0.015 ^a	1.21 (0.80 to 1.82)	0.377	1.42 (1.02 to 1.98)	0.040 ^a
≥60	3.13 (1.51 to 6.48)	0.002 ^a	1.01 (0.40 to 2.58)	0.983	1.55 (0.75 to 3.19)	0.235
Gender						
Male	1		1		1	
Female	1.04 (0.78 to 1.39)	0.785	1.13 (0.79 to 1.61)	0.521	0.91 (0.69 to 1.22)	0.536
Education level						
≤High school	1		1		1	
Vocational school/college	1.57 (1.07 to 2.30)	0.021 ^a	0.69 (0.40 to 1.17)	0.166	0.88 (0.52 to 1.32)	0.530
University	1.88 (1.21 to 2.93)	0.005 ^a	1.41 (0.81 to 2.45)	0.221	1.06 (0.66 to 1.71)	0.809
≥Post-graduate	1.24 (0.58 to 2.63)	0.583	0.96 (0.36 to 2.56)	0.941	1.46 (0.70 to 3.03)	0.312
Living status						
Alone	1		1		1	
With clinically vulnerable people	1.14 (0.74 to 1.77)	0.553	0.90 (0.53 to 1.52)	0.692	0.71 (0.48 to 1.07)	0.102
With others	1.34 (0.88 to 2.05)	0.171	0.81 (0.49 to 1.35)	0.422	0.56 (0.38 to 0.84)	0.005 ^a
Monthly income (million VND)						
<5	1		1		1	
5–10	1.20 (0.86 to 1.68)	0.286	0.61 (0.40 to 0.91)	0.016 ^a	0.60 (0.43 to 0.83)	0.002 ^a
10–15	0.99 (0.61 to 1.61)	0.965	0.60 (0.33 to 1.12)	0.107	0.61 (0.37 to 1.01)	0.057
15–20	1.45 (0.76 to 2.75)	0.256	0.54 (0.23 to 1.24)	0.147	0.55 (0.27 to 1.15)	0.111
>20	1.01 (0.44 to 2.32)	0.990	0.41 (0.14 to 1.27)	0.123	0.50 (0.20 to 1.24)	0.134
Subject						
Public	1		1		1	
Healthcare worker	1.08 (0.68 to 1.73)	0.745	2.07 (1.18 to 3.63)	0.012 ^a	1.12 (0.68 to 1.84)	0.667
Infection duration	1.01 (0.99 to 1.02)	0.267	1.01 (0.99 to 1.03)	0.400	1.00 (0.99 to 1.02)	0.727
Place of quarantine and treatment						
At home	1		1		1	
Field hospital	0.99 (0.62 to 1.56)	0.948	0.88 (0.50 to 1.55)	0.649	0.97 (0.59 to 1.59)	0.895
COVID-19 hospital	0.92 (0.50 to 1.69)	0.790	0.73 (0.34 to 1.58)	0.430	0.89 (0.47 to 1.67)	0.710
COVID-19 resuscitation centre	0.41 (0.16 to 1.05)	0.062	0.89 (0.31 to 2.58)	0.825	1.40 (0.60 to 3.26)	0.436
Source of infection						
Family	1		1		1	
Friends, colleagues, acquaintances	1.20 (0.72 to 2.00)	0.478	1.12 (0.62 to 2.23)	0.618	0.74 (0.44 to 1.24)	0.247
Public	1.80 (1.12 to 2.89)	0.014 ^a	2.04 (1.15 to 3.62)	0.015 ^a	1.56 (0.99 to 2.44)	0.053
Care or treatment for FO	1.60 (0.77 to 3.34)	0.207	0.66 (0.25 to 1.74)	0.395	0.91 (0.42 to 2.00)	0.815
Other COVID-19 prevention performance	1.07 (0.40 to 2.90)	0.896	1.05 (0.32 to 3.38)	0.941	0.38 (0.10 to 1.39)	0.145
Others	1.47 (0.90 to 2.34)	0.132	0.76 (0.40 to 1.44)	0.405	0.85 (0.52 to 1.38)	0.504
Unknown						
Know someone who died from COVID-19						
No	1		1		1	
Yes	1.45 (1.03 to 2.06)	0.036 ^a	1.72 (1.12 to 2.64)	0.012 ^a	1.76 (1.23 to 2.52)	0.002 ^a

have negative psychological reactions towards COVID-19 as a result of lacking knowledge. However, in this less-educated group, they might also have less chance to access a wide range of information sources and channels, and often passively approach only available channels from the government, television or radio, which might benefit them with only approved and reliable news.

In contrast, knowledgeable and highly educated people seemed to be easily bewildered by the abundant information from both reliable and unreliable sources, which might contribute to their higher levels of PTSD and also other negative responses.⁶⁴ This also highlighted the role of the government and related authorities in broadcasting credible information. Additionally, the

Table 3. Continued.

Characteristics	IES-R		HADS-Anxiety		HADS-Depression	
	OR (95% CI)	p-Value	OR (95% CI)	p-Value	OR (95% CI)	p-Value
Source of mental support during infection						<0.001 ^a
Family, friends	0.98 (0.68 to 1.42)	0.927	0.65 (0.41 to 1.03)	0.067	0.51 (0.35 to 0.74)	0.055
Healthcare providers	1.32 (0.95 to 1.83)	0.097	0.96 (0.63 to 1.46)	0.851	0.71 (0.50 to 1.01)	0.004 ^a
Psychotherapist	0.63 (0.22 to 1.81)	0.392	0.83 (0.22 to 3.12)	0.779	3.90 (1.55 to 9.81)	0.976
Others	1.11 (0.64 to 1.90)	0.714	1.74 (0.94 to 3.22)	0.076	0.99 (0.57 to 1.72)	0.055
None	1.35 (0.69 to 2.61)	0.380	0.91 (0.42 to 1.98)	0.819	0.53 (0.28 to 1.01)	
Number of people mentally supporting during infection	0.99 (0.98 to 1.00)	0.120	0.97 (0.94 to 0.99)	0.013 ^a	0.98 (0.97 to 0.99)	0.038 ^a
Perceived life-threat level during infection						
Not at all	1		1		1	
A little bit	2.72 (1.71 to 4.30)	<0.001 ^a	3.49 (1.87 to 6.50)	<0.001 ^a	2.25 (1.53 to 3.33)	<0.001 ^a
Moderately	13.91 (8.86 to 21.82)	<0.001 ^a	8.02 (4.33 to 14.85)	<0.001 ^a	2.59 (1.71 to 3.91)	<0.001 ^a
Quite a bit	27.26 (15.03 to 49.44)	<0.001 ^a	14.05 (6.63 to 29.78)	<0.001 ^a	3.65 (2.03 to 6.54)	<0.001 ^a
Extremely	23.49 (11.25 to 49.03)	<0.001 ^a	26.62 (11.22 to 63.18)	<0.001 ^a	6.60 (3.22 to 13.52)	<0.001 ^a

^aSignificant at $p < 0.05$.

IES-R: moderate and extreme stress (score ≥ 33); HADS-A and HADS-D: moderate and severe anxiety or depression (score ≥ 11).

economic downturn following the pandemic has been serious.⁶⁵ One study pointed out the negative impact of higher academic background on mental health among people during the nationwide lockdown due to COVID-19.¹⁸ This finding agrees with a previous study among quarantined COVID-19 patients where those with a better education expressed a higher likelihood of distress.⁶⁶

Compared with people living alone, those residing with others showed a lower likelihood of depression, probably due to their confidence in these individuals' healthier physical conditions. In addition, living with others might be considered a source of emotional support that is familiar and important to them. Similarly, although the subjects with an income of 5–10 million VND/month might still face economic burdens during the pandemic, their earnings allowed them to better deal with difficulties than those making less, explaining the lower odds of anxiety and depression during their infection.

As regards the infection source, those reporting a community-induced infection were more likely to experience PTSD and anxiety. This might be because the patients acquiring COVID-19 from the community were not aware of the transmission source, leaving them confused and worried about the possibility of disease transmission.⁶⁷ Moreover, community transmission usually comes with uncertain sources of disease acquisition. This situation may drive people to be concerned about the safety of their surroundings, thereby exacerbating psychological experiences.⁶⁴ In addition, while the chain of infection could be easily curtailed if it originated in a localized space such as the family or workplace, the pathogens existing in the community are more likely to pose a major challenge for tracing, somewhat aggravating the patient's psychological stress and anxiety.

This study found that knowing someone who died as a consequence of COVID-19 infection was an important risk factor associated with all COVID-19-induced psychological problems in this study, with a range of ORs from 1.45 to 1.76 ($p < 0.05$). During the psychological crisis caused by COVID-19, especially in the early stages of the pandemic, fear of death was an observable consequence in most communities, including uninfected ones.⁶⁸ More death anxiety in people who were directly carrying the virus in their body is understandable. By witnessing more deaths of people with similar infections, it is not surprising that COVID-19 patients expressed more negative psychological conditions, including a fear of death. And as a predictable result, negative awareness related to death from COVID-19 caused anxiety or powerful fear.^{68,69} These people were prone to serious perceptions about their life threat levels. This increased the probability of all events of stress, anxiety and depression, with all ORs > 1 ($p < 0.05$). In addition, the pain of losing a loved one to COVID-19 during their time fighting the disease also contributed to their psychological experience.

No statistically significant association was observed between isolation and treatment sites for the three main psychological outcomes in this study. While a previous study using HADS found that depression in the at-home COVID-19 patients (69.7%) was significantly higher than in the in-hospital group (32.6%),⁷⁰ in some other reports, symptoms of anxiety and depression were more noticeable in infected individuals hospitalized for COVID-19 treatment.^{14,71} It is believed that the strict procedures and the change of environment in the isolation wards in the field or COVID-19 hospitals could directly alter the psychological reactions of the patients. In contrast, given the lack of immediate

medical response or on-site interventions performed by health-care professionals, unsurprisingly, people treated at home exhibited more depression. However, the Vietnamese government and healthcare authorities have evenly distributed medical management and caring to all confirmed COVID-19 patients, regardless of their different treatment sites, with constant medical teleconsultation, monitoring and supportive packages equipped with free medication bags delivered for at-home isolated patients.⁵⁸ These policies partly explained why there was no difference or correlation between psychological symptoms and place of treatment in the current study.

Additionally, while family and friends were reported as a significant source of healing for depression in patients with COVID-19 (OR 0.51 [95% CI 0.35 to 0.74], $p < 0.001$), those receiving assistance from psychologists experienced a higher likelihood of depression (OR 3.90 [95% CI 1.55 to 9.81], $p = 0.004$). Several previous studies emphasized the role and psychological healing ability of relatives and families in patients' recovery.⁷²⁻⁷⁴ For COVID-19 patients, during their process of strict isolation, their psychological support needs might be even higher, especially from family and loved ones. Because of the special relationship between family members and the patients, these psychological influences were considered a particularly useful therapeutic source to patients.⁷⁵ These relatives, besides fully understanding the patients' personal circumstances, were special potential spiritual resources to provide unlimited support that other sources from outside assistance could not replace. These people had a strong and intense love for each other that can become powerful spiritual support to highly motivate and strengthen the mental condition of patients. This was also consistent with our study result that more sources of emotional support lowered the depression and anxiety outcomes of COVID-19 patients.

Psychological counselling provided by psychologists is yet to be common in Vietnam. Furthermore, in the context of this health emergency, vital medical interventions took precedence over other aspects of supportive care.^{76,77} Once psychological intervention was indicated for a patient, their mental health might have already become serious. Given that psychotherapeutic services are not yet popular in developing countries like Vietnam,⁷⁸⁻⁸¹ it is unusual for patients to access or rely on a psychologist unless their conditions are indeed serious or they are unable to overcome it with other available healing resources. These people are likely to suffer pre-existing psychological problems with COVID-19, explaining why this group's OR for depression was significantly high. This again suggested that psychological interventions should be initiated at the onset of a suspected or confirmed COVID-19-positive diagnosis. The closest available psychological support resources should be prioritized to achieve the fastest and most effective results.

Strengths

One of several strengths in this study was the large sample size. Moreover, the COVID-19 patients' psychological responses in this study were collected during their active infection, which eliminated recall bias. In addition, by conducting the study during the most serious wave of COVID-19, the participants' responses were real experiences influenced by wide variety of factors. Dif-

ferent from previous works in Vietnam, which only focused on the general population in the COVID-19 pandemic, this study could be considered the first report on the psychiatric problems of Vietnamese COVID-19 sufferers. Furthermore, our work combined two well-validated international instruments that have been proven to have high applicability in both clinical and scientific fields.

Limitations

Given the nature of the self-completed online questionnaire, some information bias was unavoidable. Furthermore, by using a web-based platform to disseminate the survey, certain groups of the population were unable to be approached, including those unconnected to the internet or digital devices. Since this was an online survey delivered to patients, we could not access their health records to obtain information related to the severity of COVID-19, which contributed to another limitation. Finally, this indirect sampling method somewhat precluded face-to-face interpretation for potential participants about the questionnaire. However, these people were offered the opportunity to contact the researchers for more information.

Conclusions

In conclusion, COVID-19 patients experienced mental problems of PTSD, anxiety and depression of varying degrees. In reference to other population groups, the prevalence rates of these disorders in the population diagnosed with COVID-19 appeared to be high. Associated factors found to exacerbate these problems included older age, high educational background, community transmission, knowing someone who died of COVID-19 or perceived high levels of life threat. As more sources providing emotional support can reduce the risk of psychological disorders for COVID-19 patients, mental interventions should be implemented as soon as a suspected or confirmed diagnosis is given. It was suggested that besides intensive medical monitoring and interventions provided in organized quarantine facilities, comprehensive supporting programs for at-home COVID-19 patients should also receive adequate attention to ensure the patients' safety and reassure them during self-treatment. Interventions to holistically heal the COVID-19 patients' physical and mental health should be scaled up accordingly. Furthermore, psychological intervention programs should prioritize the inclusion of loved ones to facilitate the intervention effects.

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