





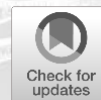


Factors related to the mental health of nursing students during the fourth wave of COVID-19 in Vietnam

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Abstract

Background: During the COVID-19 pandemic, all health workforces, including nursing students, were mobilized to prevent the spread of the disease. The physical and mental health of frontline healthcare workers has been shown to have several adverse effects during the COVID-19 outbreak. However, few studies analyzed the mental health of nursing students participating in COVID-19 prevention, especially in Vietnam.

Objective: The study was to identify and analyze the mental health of students and its related factors during the fourth wave of COVID-19 in Vietnam.

Methods: A cross-sectional survey was conducted among 672 nursing students participating in COVID-19 in Ho Chi Minh City, Vietnam, from September to October 2021. Self-administered and online-based surveys were used to collect data using Generalized Anxiety Disorder (GAD-7), Patient Health Questionnaire (PHQ-9), and the Insomnia Severity Index. Descriptive statistics and logistic regression were done for data analysis using R 3.6.0 software.

Results: Among our participants, the proportion of depression symptoms, anxiety symptoms, and insomnia were 2.88%, 5.1%, and 4.33%, respectively.

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Students who had physical activity habits before involvement in COVID-19 and maintained physical activity while participating in the epidemic had lower symptoms of anxiety, depression, and the risk of sleep disturbances. Furthermore, students with healthy diet status had fewer negative consequences on their mental health.

Conclusions: Our findings provided evidence for organizations strategizing to preserve the emotional health of nursing students while engaging in the COVID-19 campaign.

Keywords

mental health; nursing students; COVID-19; psychological distress; Vietnam

Background

COVID-19, the infectious disease caused by the novel coronavirus (SARS-CoV-2), first broke out in Wuhan and has spread throughout China and the world. Until September 2021, the disease has infected more than 200 million people and recorded more than 4 million deaths worldwide ([World Health Organization, n.d.](#)).

The COVID-19 epidemic is highly complicated and unpredictable and has caused many serious health consequences. Medical staff across the country participated in the fight against the epidemic, especially the hard work and sacrifices of the frontline medical forces. Therefore, the physical health and mental health of healthcare workers are at risk of being affected ([Pappa et al., 2020](#)). A cross-sectional study of 1000 medical staff in China involved in the COVID-19 outbreak showed that 50.4% suffered from depression/anxiety disorder and 34% suffered from insomnia ([Liu et al., 2020](#)). A meta-analysis of 13 studies with a total of 33062 healthcare workers showed that 23.2% had an anxiety disorder and 22.8% had symptoms of depression during flare-ups COVID-19 epidemic ([Salari et al., 2020](#)).

All health workforces have been mobilized to prevent the spread of the COVID-19 epidemic ([Nazliansyah & Gunawan, 2022](#)), while nursing students participate in the screening and care of patients with mild symptoms ([Miller et al., 2020](#)). But, with the explosion of a large number of infection cases, nursing students also face pressure, overwork, and the constant risk of infection, mainly due to lacking practical experience that could make them exhausted, physically and mentally ([Freitas et al., 2021](#)). However, few studies analyzed the mental health of nursing students participating in epidemic prevention.

In Vietnam, the 4th wave of COVID-19 occurred on April 27, 2021, but it was considered fiercer than the previous three outbreaks. The cause was the Delta

variant of the SARS-CoV-2 virus, which can spread quickly and appear in many places, including in Ho Chi Minh city. The Ministry of Health of Vietnam called for undergraduate nursing students to face the pandemic in Ho Chi Minh city. Almost all nursing students were assigned to sampling and screening tasks and distributed to multiple mobile sampling teams.

In the context of the pandemic, previous studies have shown that depression, insomnia, and anxiety disorders among healthcare workers and students involved in COVID-19 increased (Aebischer et al., 2020; Guillasper et al., 2021; Pogoy & Cutamora, 2021; Rony et al., 2021). However, lack of research discussing the mental health of healthcare workers and nursing students' involvement in Vietnam (Tran et al., 2020a). Therefore, in this study, we aimed to identify the factors related to the mental health of students participating in the fight against the COVID-19 epidemic in Ho Chi Minh City, Vietnam.

Methods

Study Design

A cross-sectional study was conducted to describe and explore the factors influencing the mental health of nursing students involved in COVID-19. The study was conducted in ten districts and 110 wards in Ho Chi Minh City during the fourth wave of COVID-19.

Samples/Participants

The participants of this study were students at Bach Mai Medical College who volunteered to participate in the epidemic prevention of COVID-19 in Ho Chi Minh City from September 2021 to October 2021. Convenience sampling was used to select participants if they participated in the epidemic prevention of COVID-19 during the study period and agreed to join the survey. Students who had been infected with COVID-19 did not participate in our research. A total of 762 students participated in our study.

Instruments

The self-administered questionnaires were used and completed by asking the following two parts.

Part 1: Characteristics of the survey participants

Characteristics of the survey participants include participants' gender (male/female), courses (the first year/ second year/ third year), and training major (nursing/radiology/rehabilitation/laboratory). At the time of the study, the Vietnamese government started the COVID-19 vaccination program that prioritized areas with high prevalence. Therefore, when participating in

epidemic prevention, students would be surveyed about their vaccination status by getting two doses of the COVID-19 vaccine.

We collected information on the physical health problems of participants during the involved COVID-19. Physical health problems were defined as health abnormalities that had started during participating in COVID-19. To evaluate physical activities before and during the involvement of COVID-19 participants, we added questions related to the frequency of maintaining physical activities for one week that were ranked from 0 = never, 1 = seldom, 2 = normal, 3 = often, and 4 = always. We expected our students to do physical activities at least more frequently than 50%. Therefore, we recorded less than normal as “no” and numbers above 3 as “yes” to distinguish the frequency of physical activities.

Our participants were assigned to screen and vaccinate people in ten districts and 110 wards in Ho Chi Minh city. Therefore, diet and accommodation status deepened in the locations that were evaluated by the satisfaction of participants ranging from 0 = very dissatisfied; 1 = dissatisfied; 2 = neutral; 3 = satisfied; 4 = very satisfied. We expected our students to have a healthy diet and good accommodation, and participants had at least more satisfaction than 2. We then categorized responses into two groups for analysis: very dissatisfied/dissatisfied/ neutral as “no”; satisfied/ very satisfied as “yes”.

Part 2: Mental health

Anxiety was assessed using the Generalized Anxiety Disorder (GAD-7), an efficient screening and assessment tool that has been validated in Vietnam (Pollack et al., 2016). Students were asked how often they had seven core symptoms in the previous two weeks, with 0 = ‘not at all’, 1 = ‘several days’, 2 = ‘more than half the days’, and 3 = ‘nearly every day’. As total GAD-7 scores range from 0 to 21, a GAD-7 score of ≥ 8 is considered the optimal cut-off point for identifying anxiety disorder (Plummer et al., 2016).

Depression was assessed using a patient health questionnaire (PHQ)-9, which has been validated and used in Vietnam (Nguyen et al., 2016). Students were asked how often they had been bothered by night symptoms during the previous two weeks on the same as anxiety above; with total PHQ-9 scores ranging from 0 to 27, a score of ≥ 10 is classified as depression (Levis et al., 2019).

Insomnia disorder among participants was assessed by Insomnia Severity Index (ISI). Students were asked seven questions that evaluated the presence of insomnia, with total ISI scores ranging from 0 to 28. Respondents were considered clinical insomnia if they reported an ISI score ≥ 15 (Morin et al., 2011). The Vietnamese version of ISI scales was translated from English to Vietnam by a discussion between professional mental health and English expert to have the most common and precise phrases in Vietnam.

In this research, the internal consistency of the measurements was tested by a pilot study with 30 samples with the same characteristics as the actual sample. The Cronbach's alpha of GAD - 7, PHQ - 9, and ISI questionnaire was 0.94, 0.94, and 0.77, respectively.

Data Collection

The online survey link was sent via email to our participants. Because all questionnaires were marked as mandatory fields on the online survey to ensure all questions were answered, thus, there were no missing data. Responses were coded, cleaned, and analyzed by researchers confidentially.

Data Analysis

Descriptive analysis was used to describe the study's variables. For categorical data, frequency counts and percentages were presented. Second, the univariable and multivariable analyses were used to examine the determinants of anxiety, depression, and insomnia disorder. The univariable and multivariable logistic regression models were used for categorical variables (anxiety, depression, and insomnia). Factors that showed associations with anxiety, depression, and insomnia at $p < 0.05$ in the univariable model were selected for the multivariable model. All statistical analyses used R 3.6.0 software. The significant level was set at p -value < 0.05 .

Ethical Considerations

Our research was approved by the Research Ethical Committee at Bach Mai hospital in Hanoi, Vietnam (Approval No 2731/QĐ-BVBM). The research conforms to the provisions of the Declaration of Helsinki, and all participants gave informed consent before participating in the study. To minimize the response bias, the questionnaire was anonymous. The recruitment of participants was fully informed of the content and aim of this survey through face-to-face interviews. Only those willing to participate voluntarily and who signed the informed consent form were considered our final respondents in the survey.

Results

Participant's Characteristics

The majority of students participating in the study were female, accounting for 72.05%. The percentage of female students with anxiety, depression, and insomnia was higher than that of male students. The third-year students who participated in COVID-19 accounted for 39.90%. The number of students with

anxiety and depression was the highest among the second-year students, with the rate of 41.03% and 50%, respectively. The proportion of students participating in the study was relatively evenly distributed by training major. 86.88% of participants were nursing students, accounting for the highest percentage. There 80.31% of study subjects were fully vaccinated with two doses. Most students had a habit of physical exercise before being involved in COVID-19 (96.06%), but this rate decreased during the time of involvement students (89.24%). Most of the students were satisfied with the healthy diet (89.89%) and accommodation status when participating in COVID-19 (97.38%) (Table 1).

Table 1 Participants' characteristics and anxiety, depression, and insomnia

Variables	Total	GAD 7		PHQ9		ISI	
	(n = 762)	GAD ≥ 8	GAD < 8	PHQ9 ≥ 10	PHQ9 < 10	ISI ≥ 15	ISI < 15
	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)	Frequency (%)
Gender							
Female	549 (72.05)	27 (69.23)	522 (72.20)	13 (59.09)	536 (72.43)	26 (78.79)	523 (71.74)
Male	213 (27.95)	12 (30.77)	201 (27.80)	9 (40.91)	204 (27.57)	7 (21.21)	206 (28.26)
Training course							
First-year	188 (24.67)	10 (25.64)	178 (24.62)	4 (18.18)	184 (24.86)	8 (24.24)	180 (24.69)
Second-year	270 (35.43)	16 (41.03)	254 (35.13)	11 (50.00)	259 (35.00)	12 (36.36)	258 (35.39)
Third-year	304 (39.90)	13 (33.33)	291 (40.25)	7 (31.82)	297 (40.14)	13 (39.40)	291 (39.92)
Training major							
Nursing	662 (86.88)	30 (76.92)	632 (87.41)	17 (77.27)	645 (87.16)	27 (81.82)	635 (87.11)
Radiology	41 (5.38)	4 (10.26)	37 (5.12)	3 (13.64)	38 (5.14)	2 (6.06)	39 (5.35)
Rehabilitation	29 (3.81)	1 (2.56)	28 (3.87)	1 (31.03)	28 (3.78)	1 (3.03)	28 (3.84)
Laboratory	30 (3.94)	4 (10.26)	26 (3.60)	1 (4.55)	29 (3.92)	3 (9.09)	27 (2.70)
COVID-19 vaccination status							
< 2 doses	150 (19.69)	6 (15.38)	144 (19.92)	4 (18.18)	146 (19.73)	6 (18.18)	144 (19.75)
≥ 2 doses	612 (80.31)	33 (84.62)	579 (80.08)	18 (81.82)	594 (80.27)	27 (81.82)	585 (80.25)
Physical activity before being involved in COVID-19							
No	30 (3.94)	7 (17.95)	23 (3.18)	3 (13.64)	27 (3.65)	6 (18.18)	24 (3.29)
Yes	732 (96.06)	32 (82.05)	700 (96.82)	19 (86.36)	713 (96.35)	27 (81.82)	705 (96.71)
Physical activity during involved in COVID-19							
No	82 (10.76)	9 (23.08)	73 (10.10)	5 (22.73)	77 (10.41)	12 (36.36)	70 (9.60)
Yes	680 (89.24)	30 (76.92)	650 (89.90)	17 (77.27)	663 (89.59)	21 (63.64)	659 (90.40)
Physical health problems during involved in COVID-19							
No	691 (90.68)	33 (84.62)	658 (91.01)	21 (95.45)	670 (90.54)	25 (75.76)	666 (91.36)
Yes	71 (9.32)	6 (15.38)	65 (8.99)	1 (4.55)	70 (9.46)	8 (24.24)	63 (8.64)
Healthy diet status							
No	77 (10.11)	9 (23.08)	68 (9.41)	6 (27.27)	71 (9.54)	8 (24.24)	69 (9.47)
Yes	685 (89.89)	30 (76.92)	655 (90.59)	16 (72.73)	669 (90.41)	25 (75.76)	660 (90.53)
Accommodation status							
No	20 (2.62)	3 (7.69)	17 (2.35)	1 (4.55)	19 (2.57)	1 (3.03)	19 (2.61)
Yes	742 (97.38)	36 (92.31)	706 (97.65)	21 (95.45)	721 (97.43)	32 (96.97)	710 (97.39)

Participants' Anxiety, Depression, and Insomnia

The proportion of anxiety (GAD ≥ 8), depression (PHQ ≥ 10), and insomnia (ISI ≥ 15) were 5.1%, 2.88%, and 4.33%, respectively (Table 2).

Table 2 Participants' anxiety, depression, and insomnia

Variables	Categories	Frequency (%)
GAD-7	GAD ≥ 8	39 (5.1%)
	GAD < 8	723 (94.9%)
PHQ-9	PHQ-9 ≥ 10	22 (2.88%)
	PHQ-9 < 10	740 (97.12%)
ISI	ISI ≥ 15	33 (4.33%)
	ISI < 15	729 (95.67%)

Abbreviations: GAD: Generalized Anxiety Disorder; PHQ: Patient Health Questionnaire; ISI: Insomnia Severity Index

Factors Related to Anxiety, Depression, and Insomnia

As shown in [Table 3](#), the multivariable analysis indicated that the odds of anxiety were statistically significantly smaller among students who had physical activities before being involved in COVID-19 (OR = 0.15; 95%CI 0.05 to 0.48; $p = 0.001$). In addition, the likelihood of anxiety was significantly smaller in students with healthy diet status (OR = 0.32; 95%CI 0.14 to 0.72; $p = 0.005$).

Similarly, the odds of depression were statistically significantly smaller in students who did have the habit of physical activities before involving in COVID-19 (OR = 0.2; 95%CI 0.05 to 0.74; $p = 0.02$). The likelihood of depression was significantly smaller in students with healthy diet status (OR = 0.25; 95%CI 0.09 to 0.68; $p = 0.01$). In addition, the odds of insomnia were statistically significantly smaller in students who had physical activities before (OR = 0.29; 95%CI 0.09 to 0.95; $p = 0.041$) and during involvement in COVID-19 (OR = 0.32; 95%CI 0.13 to 0.79; $p = 0.013$). The likelihood of insomnia was significantly greater in students who had physical health problems during participation (OR = 2.88; 95%CI 1.2 to 6.9; $p = 0.018$). The likelihood of insomnia was significantly smaller in students with healthy diet status (OR = 0.31; 95%CI 0.13 to 0.73; $p = 0.008$) ([Table 3](#)).

Discussion

Our research was first conducted to assess the mental health of nursing students involved in COVID-19 in Vietnam. Our results have shown that the proportion of students involved in the epidemic had the potential to affect their mental health was 5.11% of students have anxiety (GAD ≥ 8), 2.88% of students have depression (PHQ ≥ 10), and 4.33% of students have insomnia symptoms (ISI ≥ 15). The results of our study on the percentage of students with anxiety and depression were lower than that of [Tran et al. \(2020b\)](#) conducted a mental health study among frontline healthcare workers working at 15 hospitals and four health centers across Vietnam with anxiety and depression were 6.6% and 7.9%, respectively. Related to insomnia, our results were also lower than a study by [Than et al. \(2020\)](#) among frontline healthcare workers during the peak of the outbreak in Vietnam showed that 20.2% of healthcare workers have sleeping disorders.

Table 3 Determinants of anxiety, depression, and insomnia among nursing students

Variable	GAD ≥ 7				PHQ ≥ 10				ISI > 15			
	Univariate		Multivariate		Univariate		Multivariate		Univariate		Multivariate	
	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
Gender												
Female	1				1				1			
Male	1.15 (0.57-2.32)	0.69			1.82 (0.77-4.32)	0.18			0.68 (0.29-1.6)	0.38		
Training course												
First-year	1				1				1			
Second-year	1.12 (0.50-2.53)	0.78			1.95 (0.61-6.23)	0.26			1.05 (0.42-2.61)	0.92		
Third-year	0.79 (0.34-1.85)	0.59			1.08 (0.31-3.75)	0.90			1.01 (0.41-2.47)	0.99		
Training major												
Nursing	1		1		1				1			
Radiology	2.28 (0.76-6.81)	0.14	2.29 (0.74-7.04)	0.15	2.99 (0.84-10.67)	0.09			1.21 (0.28-5.26)	0.80		
Rehabilitation	0.75 (0.10-5.72)	0.78	0.79 (0.10-6.18)	0.82	1.36 (0.17-10.55)	0.77			0.84 (0.11-6.41)	0.86		
Laboratory	3.24 (1.06-9.88)	0.04	2.56 (0.79-8.25)	0.11	1.31 (0.17-10.17)	0.80			2.61 (0.75-9.15)	0.13		
COVID-19 vaccination status												
< 2 doses	1				1				1			
≥ 2 doses	1.37 (0.56-3.33)	0.49			1.11 (0.37-3.32)	0.85			1.11 (0.45-2.73)	0.82		
Physically active before being involved in COVID-19												
No	1		1		1		1		1		1	
Yes	0.15 (0.06-0.38)	<0.001	0.15 (0.05-0.48)	0.001	0.24 (0.07-0.86)	0.03	0.2 (0.05-0.74)	0.02	0.15 (0.06-0.41)	0.001	0.29 (0.09-0.95)	0.04
Physically active during involvement in COVID-19												
No	1		1		1				1		1	
Yes	0.37 (0.17-0.82)	0.014	0.86 (0.31-2.38)	0.77	0.39 (0.14-1.1)	0.07			0.19 (0.09-0.39)	0.001	0.32 (0.13-0.79)	0.01
Physical health problems during involved in COVID-19												
No	1				1				1		1	
Yes	1.84 (0.74-4.56)	0.18			0.46 (0.06-3.44)	0.44			3.38 (1.46-7.81)	0.004	2.88 (1.2-6.9)	0.018
Healthy diet status												
No	1		1		1		1		1		1	
Yes	0.35 (0.16-0.76)	0.008	0.32 (0.14-0.72)	0.005	0.28 (0.11-0.75)	0.01	0.25 (0.09-0.68)	0.01	0.33 (0.14-0.75)	0.01	0.31 (0.13-0.73)	0.01
Accommodation status												
No	1				1				1			
Yes	0.29 (0.08-1.03)	0.06			0.55 (0.07-4.33)	0.57			0.86 (0.11-6.6)	0.88		

This difference could be explained by the fact that the missions of our students involved in COVID-19 were assigned to screening people in the community while healthcare workers on the frontline directly took care of COVID-19 patients at hospitals. Healthcare workers who cared for and had direct contact with COVID patients at hospitals would be at high risk of infection and face a large number of patients and high work pressure. As a result, healthcare workers have suffered more in mental health. Furthermore, most of our students who participated in COVID-19 were volunteers, ensuring their physical and emotional well-being. Major determinants included youth, enthusiasm, and a desire to participate in pandemic efforts, which insulated students' mental health from the negative consequences of the pandemic ([Aebischer et al., 2020](#)).

On the other hand, the proportion of mental health problems among nursing students involved in COVID-19 in our findings was lower than their non-involved peers. [Diep \(2021\)](#) conducted research to measure the psychological distress among nursing students non-involved in COVID-19 during quarantined social in 2021 at Bach Mai Medical College, in which 488 nursing students non-involved in COVID-19 reported depression and anxiety symptoms was 8.2%, 10.1%, respectively ([Diep, 2021](#)). Interestingly, student involvement in COVID-19 with higher risks related to physical and psychological health; however, the mental health of students involved in COVID-19 was lower than those not involved. The increased levels of negative mental health symptoms in non-involved students could be explained by difficulty adapting to online learning and anxieties about exam success. In addition, there may be issues if students and professors are unfamiliar with online education methods.

Additionally, students may be uncomfortable due to delays in learning about infectious diseases ([Cao et al., 2020](#)). Furthermore, students involved had numerous options for a wonderful educational experience. Indeed, the inclusion of students could increase the work capacity of the healthcare system, as idealized by the public notice itself, and provide students with a unique opportunity for clinical learning during the crisis ([Halbert et al., 2020](#)). The student had preserved PPE, adequate support, and information that was the key protective factor against adverse psychological during involvement with COVID-19 ([Aebischer et al., 2020](#)).

Our results have shown that students' physical activity habits and a healthy diet were protective factors for their mental health. Physical activity and a healthy diet had a positive association with anxiety and depression. Students who had habits of physical activity before involving COVID-19 and maintained physical activity while participating in the epidemic have fewer symptoms of anxiety, depression, and risk of sleep disturbances. A comprehensive systematic

review of prospective studies was conducted based on many sources of databases and found that the majority of these studies were of high methodologic quality, providing consistent evidence that physical activities may prevent future depression ([Mammen & Faulkner, 2013](#)). There was a negative association between physical activity and depression, which was concluded by previous research. People who are more frequently active and exercise showed lower levels of depression; people with occasionally active showed higher levels of depression, and individuals who reported as inactive showed the highest level of depression ([Goodwin, 2003](#)). Physical activity may increase the production of endogenous opioid peptides in the brain, which relieve pain and induce euphoria, lowering anxiety and depression levels ([Grisel et al., 2008](#)).

Moreover, appropriate physical and intensive exercises can help improve sleep quality and physical and mental health. Exercises like yoga and Tai Chi are recommended for reducing psychological stress and improving sleep quality. In addition, exercise prescriptions for aerobic rehabilitation can improve cardiopulmonary function and bodily health, ease mental stress, and give physical protection for sound sleep ([Wu & Wei, 2020](#)). This suggests policymakers should pay more attention to and develop appropriate physical exercise programs for healthcare workers and nursing student involvement during COVID-19.

Our research also showed that students with healthy diets tend to have fewer adverse effects on mental health. Diet and nutrition have a strong association with mental health. Nutrition was a necessary factor that influenced the risk of mental disorders ([Sarris et al., 2015](#)). In addition, mental health was positively affected by a healthy and quality diet. Several mechanisms for the impacts of nutrition on the brain's immune system, antioxidant and neurotrophic systems, and diet are linked to metabolic health and reduced depression risk ([Molero et al., 2017](#); [Sarris et al., 2015](#)). One of the management strategies for COVID-19 prevention is to ensure diet and nutrition, which is an important protective factor against SARS-CoV-2 infection ([Zhang & Liu, 2020](#)). As a result, medical personnel and students involved in the epidemic require high-quality meals to ensure proper nutrient intake. A diet high in fish, vegetables, antioxidants, and anti-inflammatory substances, in particular, will lower the risk of depression among healthcare professionals ([Molendijk et al., 2018](#)).

Strengths and Limitations

The inclusion of participants who were vulnerable to COVID-19 infection and the survey used validated measures of mental health were the study's main strengths. Moreover, we used a diverse sample of nursing students as representative of the population. Besides that, our study has some limitations.

Firstly, causality could not be drawn from cross-sectional design. The second limitation consists of health by self-reported reported questionnaires; this might lead to an overestimate of the symptoms.

Implications for Practice

Our study has some implications for practice. Based on our results, medical and nursing school administrators and educators can supply students with resources, including counseling, peer advocacy, and support. Additionally, those who are feeling anxiety, depression, and sleep disorder symptoms should seek professional mental health care. Finally, our findings provided valuable evidence for organizations strategizing to preserve the emotional health of medical students, primarily nursing students, while engaging in the COVID-19 campaign, especially physical activity as well as healthy eating. Further research is required to improve or build standardized exercise as well as a healthy diet for nursing students involved in COVID-19.

Conclusion

Our study showed the proportion of psychological distress among nursing students involved in COVID-19 during the fourth wave of COVID-19 in Vietnam. Conversely, physical activity and a healthy diet were protective factors for mental health among involved students.

Declaration of Conflicting Interest

The authors have declared no conflict of interest.

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Authors' Contributions

All listed authors met the authorship criteria and agreed with the content of the manuscript. TMB, TTTN, TDV, LTHD, TTP, HTTH designed the study. TMB, TTTN, TDV, TTP collected and analyzed the data. TMB, TTTN, LTHD and HTTH prepared the manuscript. All authors approved the final version for submission. All listed authors were accountable in each stage of the study and approved the final version to be published.

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Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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