Rocz Panstw Zakl Hig 2023;74(2):217-230
http://wydawnictwa.pzh.gov.pl/roczniki_pzh/ https://doi.org/10.32394/rpzh.2023.0261

ORIGINAL ARTICLE

PREVALENCE AND PREDICTORS OF DEPRESSION, ANXIETY, AND STRESS AMONG RECOVERED COVID-19 PATIENTS IN VIETNAM

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ABSTRACT

Background. During the COVID-19 pandemic, a high prevalence of mental health distress has been reported among people who have recovered from the disease.

Objectives. To assess the prevalence of depression, anxiety, and stress as well as identify predictors among recovered COVID-19 patients after more than six months of being discharged in Dong Thap Province, Vietnam.

Material and methods. The cross-sectional study was conducted among 549 eligible participants recruited by stratified sampling. Data was collected using the depression, anxiety and stress scale – 21 items had Content Validity Index = 0.9, and Cronbach's alpha for depression, anxiety and stress sub-scales were 0.95, 0.81, and 0.86, respectively. Descriptive statistics were used to measure the prevalence levels and distribution of characteristics of the participant, while factors influencing depression, anxiety, and stress were predicted using binary logistic regression.

Results. The overall prevalence of depression, anxiety, and stress were 24.8% (95% CI: 21.2-28.6), 41.5% (95% CI: 37.4-45.8), and 25.3% (95% CI: 21.7-29.2), respectively. The predictors of depression were living in urban area (OR = 1.97; 95% CI: 1.27-3.08), holding a bachelor's degree (OR:3.51; 95% CI: 1.13-10.8), having a high monthly income (OR: 2.57; 95% CI: 1.03-6.38), diabetes (OR: 2.21; 95% CI: 1.04-4.68), heart disease (OR: 3.83; 95% CI: 1.79-8.17), respiratory disease (OR: 3.49; 95% CI: 1.24-9.84), and diarrhea (OR: 4.07; 95% CI: 1.06-15.6). Living in the urban area (OR: 1.57; 95% CI: 1.07-2.29), having sleep disturbance (OR: 2.32; 95% CI: 1.56-3.46), and fatigue (OR: 1.57; 95% CI: 1.03-2.39) were predictors for anxiety. Having respiratory disease (OR: 3.75; 95% CI: 1.47-9.60) or diarrhea (OR: 4.34; 95% CI: 1.18-15.9) were predictors of stress.

Conclusion. People who have recovered from COVID-19 should be assessed for symptoms of depression, anxiety, and stress. Primary healthcare providers should develop interventions to support their recovery.

Key words: *prevalence, predictor, depression, anxiety, stress, COVID-19*

Abbreviations: DASS-21: The 21-item depression anxiety and stress scale; DAS: Depression, anxiety, and stress; CSS: Current signs and symptoms; UD: underlying disease; COVID-19: Coronavirus disease. VND: Vietnam Dong

INTRODUCTION

The coronavirus disease (COVID-19) has had a devastating impact on global health, with over 663 million confirmed cases and 6.7 million deaths as of December 31st, 2022 [50]. Recent studies have shown that COVID-19 has physical and long-term psychological effects on recovered patients [23, 25, 38]. Studies have shown that COVID-19 patients often experience severe psychological stress during hospitalization, which can continue even after they are discharged [36]. Depression is a common mental illness marked by persistent feelings of sadness and disinterest in previously enjoyable activities, as well as a lack of energy and the inability to carry out everyday activities [2, 33]. Anxiety is an emotional state characterized by a feeling of fear, dread and

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Publisher: National Institute of Public Health NIH - National Research Institute

uneasiness [1, 29, 34], while stress is a feeling of emotional or physical tension [3, 30, 34].

As the number of COVID-19 cases continues to increase, the number of discharged COVID-19 patients is also rising. The COVID-19 pandemic has caused to an increase in depression and anxiety by 27.6% and 25.6% globally, respectively [48]. Hospital-discharged patients, in particular, may experience mental health symptoms due to risk factors such as infection, isolation, lockdown, social factors and job-related factors [6]. Within three months of being discharged, more than half of recovered patients have reported experiencing symptoms that were not present prior to their COVID-19 infection, such as fatigue, cognitive symptoms, and dyspnea [8, 32]. Furthermore, survivors posted a high prevalence of mental health issues after three months up to one year following diagnosis [15, 31, 52], with depression, anxiety, and stress (DAS) scores appearing to be significantly higher in patients infected with COVID-19 than in healthy control groups [16, 27]. Individuals with severe mental illness have a shortened life expectancy, a 10-20 years shorter lifespan than the general population [49], and are at a higher risk for suicide [7]. Studies have shown that at least 90% of suicide cases are related to mental disorders, particularly depression and anxiety [4, 7, 40]. The mental health has been severely impacted due to this crisis [49].

By the end of December 2022, over 11.5 million cases and over 43,000 deaths have been recorded in Vietnam [14]. While the impacts of COVID-19 on psychological have been well-documented [48], recent studies on mental health in Vietnam during the pandemic have primarily focused on the general population [21, 43] and healthcare workers [12, 45]. However, the psychological consequences of COVID-19 on patients discharged from the hospital have not been fully explored. The objectives of this study were to assess the prevalence of DAS and identify factors influencing DAS among recovered COVID-19 patients after more than six months of being discharged in Vietnam. The result is essential to develop effective interventions to support their recovery and improve their overall well-being.

MATERIAL AND METHODS

Study design and population

A cross-sectional study was conducted among people who have recovered from COVID-19 in Dong Thap Province, Vietnam, from August to October 2022. The participants must meet the following criteria: (1) aged 18 or older, (2) have been infected with COVID-19, and (3) have been discharged from the hospital for treatment of COVID-19 for more than six months.

The sample size was calculated based on a standard formula of prevalence [20] where n is the sample size of the study, Z = 1.96 (95% confidence level), p is the estimated proportion of the target population (p = 0.31) [28], and d is desired precision (d = 0.04). In order to obtain reliable data, the researcher has increased the sample size by 10%, accounting for 565 participants.

According to authorities of the Dong Thap Department of Health, participants were recruited by stratified sampling from the database of COVID-19 patients in Dong Thap Province. With a total of 28,638 people discharged from hospitals around the province from January 2022 to June 2022, eligible participants were divided into 12 subgroups based on location (12 districts). The sample size of each subgroup was proportionate to the patient population. In each subgroup, research subjects were selected based on simple random sampling. The data was collected from 1st October to 15th November 2022.

Research instrument

Participants were instructed by well-trained research assistants to complete a structured questionnaire consisting of three parts. Part 1 included 8 items about the sociodemographic characteristics of the respondent, such as gender, age, living area, marital status, education level, monthly income (calculated in Vietnam Dong (VND)), occupation, and having family members who had COVID-19 infection. Part 2 (6 items) gathered disease information. Participants were asked 'yes/no' questions to indicate whether they had any underlying diseases (hypertension, heart disease, cancer, respiratory disease, diabetes, kidney disease) and experienced any current signs and symptoms after the COVID-19 stage (cough, chest pain, headache, shortness of breath, dizziness, fatigue, joint pain, diarrhea, decreased appetite, change in smell, forgetfulness). Types of COVID-19 diagnosis were categorized into 5 levels based on medical record (asymptomatic, mild, moderate, severe, critical) and types of COVID-19 treatment were classified into 2 types, whether required oxygen/ventilator. The length of hospital stay was calculated as the number of days in the hospital for COVID-19 treatment. Sleep disturbance was categorized by the average number of sleeping hours per day, with more than 9 hours or less than 7 hours per day classified as sleep disturbance [18].

In part 3, the 21-item depression anxiety and stress scale (DASS-21) was used to assess DAS symptoms [26], which was validated, reliable, and widely used during the COVID-19 pandemic [9, 17, 46, 51] and also in Vietnam [22, 44]. This self-reported instrument was developed by *Lovibond* and *Lovibond* [26] and consisted of 3 sub-scales, with a total of 21-item questions on negative emotion over the past week, with a 4-point

Likert scale (0 = Did not apply to me at all; 1 = applied to me some degree or some of the time; 2 = applied to me to a considerable degree or a good part of the time; 3 = applied to me very much, or most of the time) [26]. With 7 items for each sub-scale, the total score of each scale was multiplied by 2 to calculate the final score based on the scale manual [26]. The total depression subscale score was categorized as normal (0-9), mild (10-13), moderate (14-20), severe (21-27), and extremely severe (≥28). The total anxiety subscale score was categorized as normal (0-7), mild (8-9), moderate (10-14), severe (15-19), and extremely severe (≥20). The total stress subscale score was classified as normal (0-14), mild (15-18), moderate (19-25), severe (26-33), and extremely severe (≥34) [26]. The content validity of DASS-21 was assessed by three experts through the Content Validity Index to be 0.9. Regarding internal consistency reliability, a pilot study was conducted on a sample of 30 participants to measure Cronbach's alpha. In the present study, Cronbach alpha for DAS sub-scales were 0.95, 0.81, and 0.86, respectively.

Data analysis

Descriptive statistics were used to characterize the study population. Categorical variables were displayed as frequency and percentages. The prevalence of DAS were calculated using percentages. Before running statistical analyses, the *Kolmogorov-Smirnov* test was performed to test for normality of distribution, and the Variance Inflation Factors greater than 10 were applied to detect multicollinearity. The preliminary analysis was assessed using *Chi*-Square or *Fisher* exact test to detect associated factors, as appropriate. Factors with $p<0.05$ were entered into the multivariable analysis. A binary logistic regression model was carried out to identify predictor variables associated with DAS. A statistical significance level of $p<0.05$ was considered for all tests.

Ethical consideration

All processes were carried out in accordance with the principle of the Helsinki Declaration. The study was approved by the Human Research Ethics Committee, Walailak University (Ref: WU-EC-PU-0-214-65). Prior to participating in the survey, all respondents were given a full explanation and agreed to participate by written informed consent. All personal identification information of the participants remained confidential.

RESULTS

Sociodemographic characteristic

There was a total of 549 participants in this study. The age of the respondents ranged from 18 to 79 years old, with a mean and standard deviation of 42.9 and 16.4, respectively. The majority of the respondents were over 40 years old (54.1%), female (56.5%), and married (74%). 56.3% of the participants lived in urban areas, 27.5% had obtained up to primary school education, and a small proportion had achieved a postgraduate degree (2.4%). Most of the respondents (71.4%) had an income of up to 5,000,000 VND, and 39.5% were freelancers. Almost all the study participants had a family member infected with COVID-19 (92.3%). (Table 1).

Disease condition

A vast majority of participants (65.6%) reported no underlying diseases. Additionally, hypertension (20.4%) and diabetes (9.1%) were the most prevalent underlying disease, while cancer was the least common (0.5%). In terms of types of COVID-19 diagnosis, 64.7% and 21.9% of participants experienced mild and moderate levels. Most respondents (91.1%) had medical treatment in the hospital, while 8.9% had oxygen/ventilator support.

Concerning current signs and symptoms, forgetfulness (49.2%), fatigue (34.8%), cough (26.2%), and joint pain (20%) were the most common symptoms of the respondents after discharge. On the other hand, 25.1% of respondents reported not having any signs and symptoms after being infected with COVID-19 (Table 2).

Prevalence of depression, anxiety, and stress among recovered COVID-19 patients

With 549 participants included in this study, the overall prevalence of DAS were 24.8% (95% CI: 21.2-28.6), 41.5% (95% CI: 37.4-45.8) and 25.3% (95% CI: 21.7-29.2), respectively. We found mild depression occurred in 10.9% (95% CI: 8.4-13.8) of participants, followed by moderate depression (8.9%, 95% CI: 6.7-11.6), severe depression (2.9%, 95% CI: 1.7-4.7), and extreme depression (2.0%, 95% CI: 1-3.6). With regard to the level of anxiety, extremely severe anxiety was the least to be experienced (4.7%, 95% CI: 3.1-6.9). By contrast, mild, moderate, and severe levels accounted for 14.8% (95% CI: 11.9-18), 16% (95% CI: 13.1-19.4) and 6% (95% CI: 4.2-8.3), respectively. Last but not least, mild and moderate levels of stress accounted for the majority, 12.2% (95% CI: 9.6-15.2) and 8.2% (95% CI: 6-10.8), respectively. Meanwhile, participants who had severe and extremely severe levels were 4.2% (95% CI: 2.7-6.2) and 0.7% (95% CI: 0.2-1.9) (Figure 1).

Association of characteristic factors with depression, anxiety, and stress among recovered COVID-19 patients

A significant association was observed between types of COVID-19 treatment and sleep disturbance with DAS ($p<0.01$). The living area, monthly income,

Table 1. Sociodemographic characteristics of study participants

Sociodemographic characteristic		Frequency (n=549)	Percentage (%)
Gender	Male	239	43.5
	Female	310	56.5
Age (years)	18- ≤43	282	51.4
	>43	267	48.6
Living area	Urban	309	56.3
	Rural	240	43.7
Education	No schooling completed	35	6.4
	Up to Primary	151	27.5
	Up to Middle school	146	26.6
	Up to High school	126	23
	Bachelor's degrees	78	14.2
	Postgraduate and higher	13	2.4
Marital status	Single	124	22.6
	Married	406	74.0
	Separated/divorced	5	0.9
	Widow/widower	14	2.6
Monthly income (VND)	<50000,000	392	71.4
	5,000,000 – <10,000,000	127	23.1
	10,000,000 and above	30	5.5
Occupation	Employee	119	21.7
	Freelancer	217	39.5
	Housewife	98	17.9
	Unemployed	22	4.0
	Student	53	9.7
	Retired	40	7.3
Family members infected with COVID-19	Yes	507	92.3
	No	42	7.7

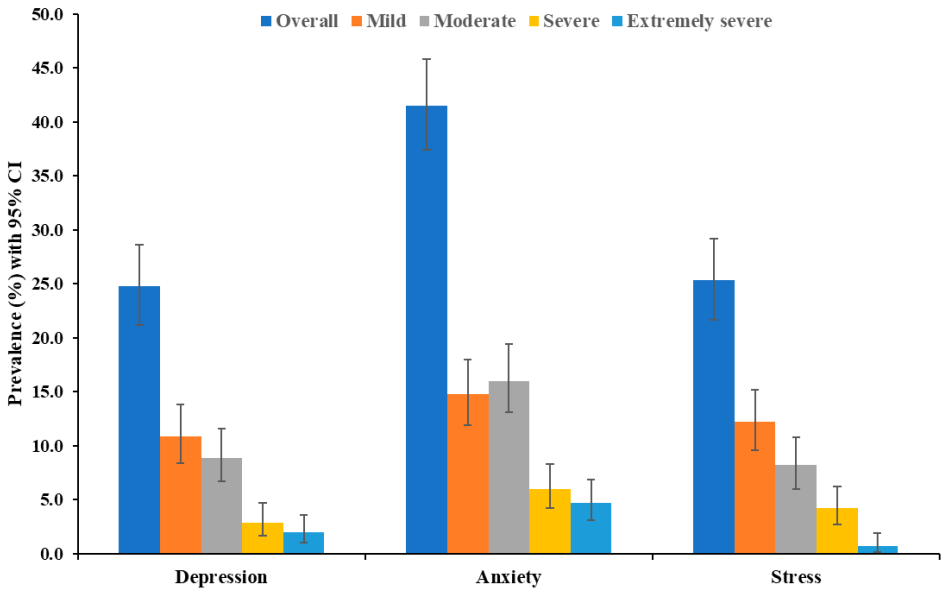

Figure 1. Prevalence of depression, anxiety, and stress among recovered COVID-19 patients

Table 2. Descriptive statistics for underlying disease condition

Characteristic		Frequency (n=549)	Percentage (%)
Underlying diseases	Hypertension	112	20.4
	Heart disease	48	8.7
	Cancer	3	0.5
	Respiratory disease	22	4.0
	Diabetes	50	9.1
	Kidney disease	13	2.4
	Others	30	5.5
Types of COVID-19 diagnosis from medical record	Asymptomatic	36	6.6
	Mild	355	64.7
	Moderate	120	21.9
	Severe	27	4.9
	Critical	11	2.0
Length of hospital stay (days)	≤14	415	75.6
	>14	134	24.4
Types of COVID-19 treatment	Hospital + medicine	500	91.1
	Hospital + medicine + oxygen/ ventilator	49	8.9
Sleep disturbance	Yes	199	36.2
	No	350	63.8
Current signs and symptoms	Cough	144	26.2
	Chest pain	46	8.4
	Headache	103	18.8
	Shortness of breath	72	13.1
	Dizziness	76	13.8
	Fatigue	191	34.8
	Joint pain	110	20.0
	Diarrhea	11	2.0
	Decreased appetite	9	1.6
	Change in smell	11	2.0
	Forgetfulness	270	49.2
	Other symptoms	12	2.2
	No symptoms	138	25.1

and types of COVID-19 diagnosis were associated with depression and anxiety ($p<0.05$). Depression and stress were associated with having family members infected with COVID-19. Education was associated with depression, while age was significantly associated with anxiety (Table 3).

Association of the underlying disease with depression, anxiety, and stress among recovered COVID-19 patients

A significant association were observed between heart disease and cancer with DAS ($p<0.05$). The association between diabetes, respiratory disease, and kidney disease with stress were significant, as well as depression ($p<0.05$). Hypertension was associated with depression and anxiety ($p<0.05$) (Table 4).

Association of current signs and symptoms factors with depression, anxiety, stress among recovered COVID-19 patients

A significant association were observed between fatigue, diarrhea, decreased appetite, and change in smell with DAS ($p<0.05$). Otherwise, chest pain and shortness of breath were associated with anxiety ($p<0.01$) (Table 5).

Table 3. Preliminary analysis of the association between characteristic factors with depression, anxiety, and stress among recovered COVID-19 patients (n=549)

Characteristic factors	Depression			Anxiety			Stress		
	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2
Gender									
Male	64 (26.8)	175 (73.2)	0.91	98 (41.0)	141 (59.0)	0.05	63 (26.4)	176 (73.6)	0.24
Female	72 (23.2)	238 (76.8)		130 (41.9)	180 (58.1)		76 (24.5)	234 (75.5)	
Age									
> 43 years old	72 (27.0)	195 (73.0)	1.34	131 (49.1)	136 (50.9)	12.15***	71 (26.6)	196 (73.4)	0.45
≤ 43 years old	64 (22.7)	218 (77.3)		97 (34.4)	185 (65.6)		68 (24.1)	214 (75.9)	
Living area									
Urban	94 (30.4)	215 (69.6)	12.1**	142 (46.0)	167 (54.0)	5.69*	83 (26.9)	226 (73.1)	0.89
Rural	42 (17.5)	198 (82.5)		86 (35.8)	154 (64.2)		56 (23.3)	184 (76.7)	
Education									
No schooling completed	8 (22.9)	27 (77.1)	23.96***	15 (42.9)	20 (57.1)	3.71	9 (25.7)	26 (74.3)	6.13
Primary school	38 (25.2)	113 (74.8)		70 (46.4)	81 (53.6)		34 (22.5)	117 (77.5)	
Middle school	20 (13.7)	126 (86.3)		55 (37.7)	91 (62.3)		34 (23.3)	112 (76.7)	
High school	32 (25.4)	94 (74.6)		49 (38.9)	77 (61.1)		35 (27.8)	91 (72.2)	
Bachelor's degrees	32 (41.0)	46 (60.0)		35 (44.9)	43 (55.1)		26 (33.3)	52 (66.7)	
Postgraduate and higher	6 (46.2)	7 (53.8)		4 (30.8)	9 (69.2)		1 (7.7)	12 (92.3)	
Marital status									
Single	32 (25.8)	92 (74.2)	3.41	46 (37.1)	78 (62.9)	2.33	30 (24.2)	94 (75.8)	0.47
Married	96 (23.6)	310 (76.4)		176 (43.3)	230 (56.7)		103 (25.4)	303 (74.6)	
Separated/ divorced/ Widow	8 (42.1)	11 (57.9)		6 (31.6)	13 (68.4)		6 (31.6)	13 (68.4)	
Monthly income (VND)									
<5,0000,000	89 (22.7)	303 (77.3)	14.04**	173 (44.1)	219 (55.9)	7.24*	97 (24.7)	295 (75.3)	0.24
5,000,000 – <10,000,000	31 (24.4)	96 (75.6)		40 (31.5)	87 (68.5)		34 (26.8)	93 (73.2)	
10,000,000 and above	16 (53.3)	14 (46.7)		15 (50)	15 (50)		8 (26.7)	22 (73.3)	
Occupation									
Employee	34 (28.6)	85 (71.4)	3.98	52 (43.7)	67 (56.3)	5.53	30 (25.2)	89 (74.8)	3.48
Freelancer	51 (23.5)	166 (76.5)		83 (38.2)	134 (61.8)		57 (26.3)	160 (73.7)	
Housewife	20 (20.4)	78 (79.6)		47 (48.0)	51 (52.0)		21 (21.4)	77 (78.6)	
Unemployed	4 (18.2)	18 (81.8)		8 (36.4)	14 (63.6)		4 (18.2)	18 (81.8)	
Student	14 (26.4)	39 (73.6)		18 (34.0)	35 (66.0)		13 (24.5)	40 (75.5)	
Retired	13 (32.5)	27 (67.5)		20 (50)	20 (50)		14 (35)	26 (65)	
Family members infected with COVID-19									
Yes	119 (23.5)	388 (76.5)	6.01*	207 (40.8)	300 (59.2)	1.34	123 (24.3)	384 (75.7)	3.92*
No	17 (40.5)	25 (59.5)		21 (50)	21 (50)		16 (38.1)	26 (61.9)	

Table 3 cont.

Characteristic factors	Depression			Anxiety			Stress		
	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2
Types of COVID-19 diagnosis from medical record									
Asymptomatic	14 (38.9)	22 (61.1)		15 (41.7)	21 (58.3)		13 (36.1)	23 (63.9)	
Mild	70 (19.7)	285 (80.3)		118 (33.2)	237 (66.8)		81 (22.8)	274 (77.2)	
Moderate	36 (30)	84 (70)	20.45***	70 (58.3)	50 (41.7)	33.52***	30 (25)	90 (75)	9.28
Severe	9 (33.3)	18 (66.7)		17 (63.0)	10 (37.0)		9 (33.3)	18 (66.7)	
Critical	7 (63.6)	4 (36.4)		8 (72.7)	3 (27.3)		6 (54.5)	5 (45.5)	
Length of hospital stay (days)									
>14	32 (23.9)	102 (76.1)	0.08	60 (44.8)	74 (55.2)	0.77	32 (23.9)	102 (76.1)	0.19
≤14	104 (25.1)	311 (74.9)		168 (40.5)	247 (59.5)		107 (25.8)	308 (74.2)	
Types of COVID-19 treatment									
Hospital + medicine + oxygen/ ventilator	21 (42.9)	28 (57.1)	9.44**	32 (65.3)	17 (34.7)	12.5***	20 (40.8)	29 (59.2)	6.83**
Hospital + medicine	115 (23)	385 (77)		196 (39.2)	304 (60.8)		119 (23.8)	381 (76.2)	
Sleep disturbance									
Yes	69 (34.7)	130 (65.3)	16.42***	116 (58.3)	83 (41.7)	36.11***	67 (33.7)	132 (66.3)	11.51**
No	67 (19.1)	283 (80.9)		112 (32)	238 (68)		72 (20.6)	278 (79.4)	

χ2: Chi-square test; * p<0.05; ** p<0.01; ***p<0.001; [a]: Fisher's exact test

Table 4. Preliminary analysis of the association between underlying disease factors and depression, anxiety, and stress among recovered COVID-19 patients (n=549)

UD Factors	Depression			Anxiety			Stress		
	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2
Hypertension									
Yes	36 (32.1)	76 (67.9)	4.10*	56 (50)	56 (50)	4.15*	33 (29.5)	79 (70.5)	1.27
No	100 (22.9)	337 (77.1)		172 (39.4)	265 (60.6)		106 (24.3)	331 (75.7)	
Diabetes									
Yes	21 (42)	29 (58)	8.76**	25 (50)	25 (50)	1.62	20 (40)	30 (60)	6.27*
No	115 (23.0)	384 (77.0)		203 (40.7)	296 (59.3)		119 (23.8)	380 (76.2)	
Heart disease									
Yes	25 (52.1)	23 (47.9)	21.05***	30 (62.5)	18 (37.5)	9.52**	20 (41.7)	28 (58.3)	7.43**
No	111 (22.2)	390 (77.8)		198 (39.5)	303 (60.5)		119 (23.8)	382 (76.2)	
Cancer									
Yes	3 (100)	0 (0)	9.16*[a]	3 (100)	0 (0)	4.24[a]	3 (100)	0 (0)	8.89*[a]
No	133 (24.4)	413 (75.6)		225 (41.2)	321 (58.8)		136 (24.9)	410 (75.1)	
Respiratory disease									
Yes	13 (59.1)	9 (40.9)	14.48***	11 (50)	11 (50)	0.68	13 (59.1)	9 (40.9)	13.82***
No	123 (23.3)	404 (76.7)		217 (41.2)	310 (58.8)		126 (23.9)	401 (76.1)	
Kidney disease									
Yes	4 (30.8)	9 (69.2)	0.26[a]	7 (53.8)	6 (46.2)	0.83	4 (30.8)	9 (69.2)	0.21[a]
No	132 (24.6)	404 (75.4)		221 (41.2)	315 (58.8)		135 (25.2)	401 (74.8)	

UD: Underlying disease; χ2: *Chi*-square test; * p<0.05; ** p<0.01; ***p<0.001; [a] = Fisher's exact test

Table 5. Preliminary analysis of the association between current signs and symptoms factors with depression, anxiety, and stress among recovered COVID-19 patients (n=549)

CSS Factors	Depression			Anxiety			Stress		
	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2	Yes n (%)	No n (%)	χ^2
Fatigue									
Yes	58 (30.4)	133 (69.6)	4.91*	101 (52.9)	90 (47.1)	15.54***	59 (30.9)	132 (69.1)	4.80*
No	78 (21.8)	280 (78.2)		127 (35.5)	231 (64.5)		80 (22.3)	278 (77.7)	
Cough									
Yes	36 (25)	108 (75)	0.005	66 (45.8)	78 (54.2)	1.49	38 (26.4)	106 (73.6)	0.12
No	100 (24.7)	305 (75.3)		162 (40)	243 (60)		101 (24.9)	304 (75.1)	
Chest pain									
Yes	14 (30.4)	32 (69.6)	0.87	29 (63)	17 (37)	9.57**	16 (34.8)	30 (65.2)	2.37
No	122 (24.2)	381 (75.8)		199 (39.6)	304 (60.4)		123 (24.5)	380 (75.5)	
Headache									
Yes	28 (27.2)	75 (72.8)	0.40	48 (46.6)	55 (53.4)	1.35	20 (19.4)	83 (80.6)	2.33
No	108 (24.2)	338 (75.8)		180 (40.4)	266 (59.6)		119 (26.7)	327 (73.3)	
Shortness of breath									
Yes	21 (29.2)	51 (70.8)	0.86	40 (55.6)	32 (44.4)	6.71**	23 (31.9)	49 (68.1)	1.92
No	115 (24.1)	362 (75.9)		188 (39.4)	289 (60.6)		116 (24.3)	361 (75.7)	
Dizziness									
Yes	20 (26.3)	56 (73.7)	0,11	35 (46.1)	41 (53.9)	0.74	18 (23.7)	58 (76.3)	0.13
No	116 (24.5)	357 (75.5)		193 (40.8)	280 (59.2)		121 (25.6)	352 (74.4)	
Joint pain									
Yes	32 (29.1)	78 (70.9)	1.37	54 (49.1)	56 (50.9)	3.29	30 (27.3)	80 (72.7)	0.28
No	104 (23.7)	335 (76.3)		104 (23.7)	335 (76.3)		109 (24.8)	330 (75.2)	
Diarrhea									
Yes	6 (54.5)	5 (45.5)	5.33*[a]	11 (100)	0 (0)	18.80***[a]	7 (63.6)	4 (36.4)	8.71**[a]
No	130 (24.2)	408 (75.8)		217 (40.3)	321 (59.7)		132 (24.5)	406 (75.5)	
Decreased appetite									
Yes	4 (44.4)	5 (55.6)	1.90[a]	6 (66.7)	3 (33.3)	2.38[a]	3 (33.3)	6 (66.7)	0.31[a]
No	132 (24.4)	408 (75.6)		222 (41.1)	318 (58.9)		136 (25.2)	404 (74.8)	
Change in smell									
Yes	5 (45.5)	6 (54.5)	2.57[a]	8 (72.7)	3 (27.3)	4.50[a]	5 (45.5)	6 (54.5)	2.40[a]
No	131 (24.3)	407 (75.7)		220 (40.9)	318 (59.1)		134 (24.9)	404 (75.1)	
Forgetfulness									
Yes	65 (24.1)	205 (75.9)	0.14	108 (40)	162 (60)	0.51	73 (27.0)	197 (73.0)	0.830
No	71 (25.4)	208 (74.6)		120 (43)	159 (57)		66 (23.7)	213 (76.3)	

CSS: Current signs and symptoms; $\chi 2$: *Chi*-square test; * $p<0.05$; ** $p<0.01$; *** $p<0.001$; [a]: Fisher's exact test

Predictors of depression, anxiety, and stress among recovered COVID-19 patients

The binary logistic model analyses showed that living areas were significantly associated with depression and anxiety. Living in urban areas was 1.97 (95% CI: 1.27-3.08) and 1.57 (95% CI: 1.07-2.29) times the risk of depression and anxiety than in rural areas, respectively. People with a bachelor's degree were likely to experience depression 3.51 times more than those who have not completed school (OR = 3.51; 95% CI: 1.13-10.8). Moreover, people were 2.57 times more likely to suffer from depression in the group with an income above 10,000,000 VND compared to the group with an income less than 5,000,000 VND (OR = 2.57; 95% CI: 1.03-6.38). Occurrence of depression increased for people with diabetes (OR = 2.21; 95% CI: 1.04-1.72), heart disease (OR = 3.83; 95% CI: 1.79-8.17), respiratory disease (OR = 3.49; 95% CI: 1.24-9.84) or diarrhea (OR = 1.07; 95% CI: 1.06-15.6), compared to those without. Individuals who sleep

Table 6. Predictors of depression, anxiety, and stress in recovered COVID-19 patients

Predictors	Depression	Anxiety	Stress
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Age			
>43 years old		1.41 (0.93-2.13)	
≤43 years old		1	
Living area			
Urban	1.97 (1.27-3.08)*	1.57 (1.07-2.29)*	
Rural	1	1	
Education			
No schooling completed	1		
Primary school	1.37 (0.49-3.79)		
Middle school	0.77 (0.26-2.31)		
High school	1.99 (0.67-5.91)		
Bachelor's degrees	3.51 (1.13-10.8)*		
Postgraduate and higher	2.89 (0.55-14.9)		
Monthly income (VND)			
<5,0000,000	1	1	
5,000,000 – <10,000,000	1.14 (0.65-1.99)	0.68 (0.43-1.08)	
10,000,000 and above	2.57 (1.03-6.38)*	1.29 (0.57-2.91)	
Family members infected with COVID-19			
Yes	0.64 (0.29-1.43)		0.59 (0.29-1.20)
No	1		1
Types of COVID-19 diagnosis from medical record			
Asymptomatic	1	1	
Mild	0.53 (0.22-1.28)	0.81 (0.38-1.71)	
Moderate	0.75 (0.29-1.93)	1.79 (0.80-4.00)	
Severe	0.38 (0.07-1.88)	1.14 (0.28-4.52)	
Critical	1.39 (0.18-10.2)	1.74 (0.26-11.4)	
Types of COVID-19 treatment			
Hospital + medicine + oxygen/ventilator	1.30 (0.39-4.32)	1.19 (0.42-3.31)	1.15 (0.57-2.31)
Hospital + medicine	1	1	1
Sleep disturbance			
Yes	1.56 (0.97-2.52)	2.32 (1.56-3.46)*	1.48 (0.96-2.27)
No	1	1	1
Hypertension (UD)			
Yes	0.91 (0.48-1.72)	0.78 (0.46-1.32)	
No	1	1	
Diabetes (UD)			
Yes	2.21 (1.04-4.68)*		1.69 (0.88-3.24)
No	1		1
Heart disease (UD)			
Yes	3.83 (1.79-8.17)*	1.28 (0.63-2.60)	1.63 (0.84-3.17)
No	1	1	1
Respiratory disease (UD)			
Yes	3.49 (1.24-9.84)*		3.75 (1.47-9.60)*

Table 6 cont,

Predictors	Depression	Anxiety	Stress
	OR (95% CI)	OR (95% CI)	OR (95% CI)
No	1		1
Fatigue (CSS)			
Yes	1.40 (0.87-2.25)	1.57 (1.03-2.39)*	1.32 (0.86-2.02)
No	1	1	1
Chest pain (CSS)			
Yes		1.62 (0.79-3.30)	
No		1	
Shortness of breath (CSS)			
Yes		1.08 (0.59-1.96)	
No		1	
Diarrhea (CSS)			
Yes	4.07 (1.06-15.6)*		4.34 (1.18-15.9)*
No	1		1

Binary logistic regression statistics; * p<0.05; OR: Odd Ratio; 95% CI: 95% Confidence Interval; UD: Underlying disease; CSS: Current sign and symptoms

more than 9 hours or less than 7 hours were 2.32 times more likely to have anxiety than those who sleep 7-9 hours a day (OR = 2.32; 95% CI: 1.56-3.46). Fatigue after being discharged from the hospital can escalate the risk of anxiety 1.57 times (95% CI: 1.03-2.39). Stress was 3.75 and 4.34 times more likely to occur in individuals with respiratory disease and diarrhea, respectively (Table 6).

DISCUSSION

Our study aims to assess the prevalence of DAS as well as identify predictors of DAS among recovered COVID-19 patients following six months of discharge from the hospital. In the present study, the prevalence of DAS were 24.8%, 41.5%, and 25.3%, respectively. These findings are higher than those from a cohort study conducted in France among COVID-19 patients four months after discharge, which established the prevalence of depression and anxiety were 20.6% and 31.5%, respectively [32]. Another follow-up study in China found 37.5% and 41.7% of COVID-19 patients suffered depression and anxiety one year after discharge, which is higher than our finding [52]. The results showed the prevalence of DAS symptoms were higher compared to earlier studies carried out in Vietnam on different populations during the initial stage of the pandemic, which was notable [11, 13]. For instance, among healthcare workers, the prevalence of DAS were 13.11%, 14.75%, and 4.92%, respectively [11]. Additionally, among the general population, the prevalence of DAS were 23.5%, 14.1%, and 22.3%, respectively [13]. These results indicated that symptoms of DAS occurred more severely among recovered COVID-19 patients and did not end with hospital discharge, highlighting the need for intervention and prevention strategies to support their recovery.

Our study found that certain characteristic factors, such as living area, education level, monthly income, and sleep disturbance, were identified as predictors of DAS. Living in an urban area was a predictor of depression and anxiety, which is in line with previous studies [35, 42]. Individuals who reside in urban areas and have recovered from COVID-19 are more susceptible to depression and anxiety. Urban areas with higher population density result in a greater chance of exposure to the virus and being subjected to quarantine. The sudden halt in work and other professional activities, combined with the possibility of financial losses, can contribute to psychological distress [45]. Furthermore, a previous study has demonstrated that individuals exposed to COVID-19-positive patients or patients with other illnesses were associated with increased DAS symptoms [41]. Our findings concurred with previous studies [24, 42] that individuals holding bachelor's degrees were associated with higher rates of depression. This can be attributed to the fact that higher-educated individuals may have greater access to information about the COVID-19 pandemic and may be more concerned about its long-term health consequences [36]. In addition, people with high education may have higher expectations for their future careers, which may be negatively impacted by the economic downturn caused by the pandemic and the resulting job market prospects [5]. These findings imply that the government should take measures to mitigate the effects of the economic fallout and provide financial support for those affected by the pandemic.

However, our result revealed conflicting patterns between higher monthly income with increased levels of depression, which is in contrast to other studies [18]. Additionally, having a higher income may bring about higher societal expectations and an increased sense of responsibility to perform at a high level. Furthermore, the economic fallout caused by the COVID-19 pandemic may have led to companies reducing the number of employees, causing job pressure among those still employed. A study in Vietnam showed that 37.9% of employees had to work overtime due to the outbreak [21]. This highlights the pressure that individuals may face to maintain their workplace position. Furthermore, our study confirmed the previous finding [18, 19], which indicated that experiencing sleep disturbance increases the risk of anxiety. As per the literature, it has been established that individuals who slept less than 7 hours or more than 9 hours had significantly higher scores on the DASS-21 scale [19]. The results suggest that healthcare providers should pay attention to sleep disturbance and provide education and interventions on the importance of healthy sleep habits.

In terms of disease conditions, the relationship between depression and stress with underlying diseases was also found in our results, which included diabetes, heart disease and respiratory disease. This finding supports previous research that has shown chronic diseases were known as risk factors for increased severity of DAS symptoms [15, 18, 37, 42]. This could be attributed to individuals with poor self-rated health status or a history of chronic disease, which was more vulnerable to the psychological impact of the outbreak and displayed higher levels of DAS [47]. These findings suggested that such people, particularly those with underlying diseases, should receive mental health support after hospital discharge.

Surprisingly, there were no associations between DAS and clinical features during hospital stays, including types of COVID-19 treatment and types of COVID-19 diagnosis. Previous literature on this topic had shown mixed evidence, with a study found an association between mental health outcomes and the severity level of COVID-19 within the first month after hospitalization [24], while others did not find this relationship in follow-up studies conducted three months after hospitalization [15, 38]. This discrepancy could be attributed to the difference in post-discharge assessment time. The existing literature implied no correlation between the frequency of depressive symptoms and the severity of acute COVID-19 for more than 12 weeks following infection [39]. As a result, it is reasonable to expect that the severity of COVID-19 will not result in DAS after patients are discharged for an extended period.

On the other hand, researchers have stated that the greater the number of symptoms after discharge, the higher the level of depression and anxiety [24], as seen in our study, where individuals who experienced fatigue and diarrhea had an increased risk of DAS. Having persistent symptoms such as fatigue and diarrhea can impact mental health as it can limit a person's ability to engage in activities they enjoy, leading to feelings of sadness and loneliness [10]. Studies have shown that individuals who feel they can participate in daily life and regain certain functions experience a reduction in symptoms of depression [10]. Therefore, it is important to address these symptoms in order to improve mental health outcomes for individuals who have recovered from COVID-19.

Limitations

There are some limitations of this study. First, self-reported information about DAS as well as current signs and symptoms, should not be considered a diagnosis. Second, recall bias may be a limitation. Third, a causal association could not be demonstrated since the cross-sectional study design restricted the temporal relationship between exposure and result. The longitudinal design could be conducted to demonstrate a causal relationship between DAS symptoms and predictors as well as minimizing recall bias.

CONCLUSIONS

The prevalence of DAS symptoms were high among COVID-19 patients who recovered for more than six months after hospitalization. Predictors of DAS, including living in an urban area, higher educational level, higher monthly income, diabetes, heart disease, respiratory disease, sleep disturbance, fatigue, and diarrhea, can be utilized to identify populations that are vulnerable to developing DAS following hospital discharge. Our finding provides valuable insight into the mental health needs of recovered COVID-19 patients and highlights the importance of monitoring and addressing potential DAS symptoms of COVID-19 patients after hospitalization. Further interventions are needed to minimize the long-term mental health impact of the pandemic.

Acknowledgements

The authors sincerely thank all participants, the public health officers in the District Health Centers involved in the study for their assistance and support, and the Board of Directors in Dong Thap Department of Health, Vietnam. This work has been supported by Walailak University Master Degree Excellence Scholarships in Thailand (Contract No. ME12/2021), awarded to Le Thanh Thao Trang.

Funding

This research work was financially supported by Walailak University Graduate Research Fund (Contract No. CGS-RF-2022/14).

Conflict of interest

There are no conflicts of interest in regard to this study.

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Received: 14.02.2023
Accepted: 20.04.2023