

Original Article

Prevalence and Associated Factors of Anxiety, Depression and Post-traumatic Stress among Frontline Nurses during COVID-19: A Cross-sectional Study

Aydin Zehra, PhD

Assistant Professor, Fenerbahçe University, Faculty of Health Sciences, Istanbul, Turkey

Pehlivan Tugba, PhD

Assistant Professor, Istinye University, Istanbul, Turkey

Correspondence: Pehlivan Tugba, Asst. Prof., Istinye University, Istanbul, Turkey.
tugba.pehlivan@istinye.edu.tr

The place where the work: A web-based survey was conducted.

Abstract

Background: COVID-19 is a public health emergency and has caused traumatic experiences among nurses worldwide. However, the prevalence of depression, anxiety, and post-traumatic stress symptoms in frontline nurses, and affecting factors such as demographics or working conditions have largely remained unknown.

Objectives: This study aimed to analyze the levels of anxiety, depression, and post-traumatic stress of frontline nurses during the COVID-19 pandemic and related risk factors.

Methodology: A web-based survey was conducted in a cross-sectional design. A total of 244 nurses working with patients diagnosed with COVID-19 were selected using convenience sampling. Multivariable logistic regression was used to identify the predictors of anxiety, depression, and post-traumatic stress.

Results: Of the participants, 48% had anxiety levels higher than the cut-off value, 68% had high depression levels, and 51.2% had high post-traumatic stress levels. The inadequate organizational support was determined as a predictor of anxiety and of depression. For each one point increase in working hours per week, there was a 1 % increase in depression. Two predictors of post-traumatic stress were the unit where nurses worked and having had colleagues diagnosed with COVID-19.

Conclusions: This study found that during the COVID-19 pandemic nurses had high levels of anxiety, depression, and post-traumatic stress. It was concluded that the most striking predictors affecting nurses' mental health were number of weekly working hours and the level of received organizational support. The study contributes to the literature for planning psychosocial interventions that can be implemented to frontline nurses.

Keywords: COVID-19, nurses, depression, anxiety, post-traumatic stress, prevalence, associated factors

Introduction

The coronavirus outbreak spreads rapidly around the world, has significantly impacted the lives of individuals and societies alike (Liu et al., 2020). The negative impact of COVID-19 on the mental health of healthcare professionals has been documented by several research conducted in various countries (Al Maqbali et al., 2021). While fighting the spread of the virus during the pandemic, the stress of defending one's own health and life led to an increase in the risk of tension, anxiety, irritability, sleep disorders, and depressive disorders in healthcare workers (Yoruk & Guler, 2021). In their study, Liu et al. (2020)

stated that healthcare workers experienced more anxiety, depression, and sleep disorders during the pandemic than they had during the pre-pandemic period.

Literature review

One of the most important effects of the pandemic is associated with psychiatric factors. In dealing with the global pandemic, frontline healthcare workers who directly handle the diagnosis, treatment, and care of patients with COVID-19 are at risk for the development of psychological problems. The increasing number of cases, increased workload, depletion of personal

protective equipment or lack of support may create mental distress (Lai et al. 2020). In a study conducted with 1,563 healthcare workers during the COVID-19 pandemic in China, it was found that the level of depression was 50.7%, anxiety was 44.7%, insomnia was 36.1%, and stress-related symptoms was 73.4% (Liu et al., 2020). In the study conducted by Tan et al. (2020) with healthcare workers during the pandemic, it was found that 68 (14.5%) participants screened positive for anxiety, 42 (8.9%) for depression, 31 (6.6%) for stress, and 36 (7.7%) for clinical concern of post-traumatic stress disorder (PTSD). The prevalence of clinically relevant post-traumatic stress (PTS) among healthcare workers ranged from 7.4% to 35% during the pandemic (Chew et al., 2020; Lai et al., 2020). When studies carried out during the pandemic in our country were examined, Şahin et al. (2020) reported that the prevalence of depression, anxiety, and PTS symptoms among healthcare workers were 77.6%, 60.2%, and 6.4%, respectively. The prevalence of depression in nurses was found to be 31.8% in a study by Yoruk & Guler (2021).

Psychological well-being has a significant impact on the performance of individuals. A timely assessment of mental health status and mental health needs of healthcare workers during emergencies will help the management respond to and reduce psychological distress. Knowing the psychological impact of the COVID-19 outbreak among healthcare workers is thus imperative to guide future policies and plans for their psychological wellbeing, as well as to ensure optimal healthcare services. However, the prevalence of depression, anxiety, and post-traumatic stress symptoms in frontline nurses, and affecting factors have largely remained unknown. In the literature, studies suggest that multicenter research should be carried out in the future to take into account cultural and contextual differences, as well as at different periods of the pandemic, in order to provide references for the subsequent clinical development of appropriate intervention measures (Dehkordi et al., 2020; Guixia & Hui, 2020).

Aim: This study aimed to analyze the levels of anxiety, depression, and post-traumatic stress levels and the risk factors of frontline nurses during the COVID-19 pandemic.

Material and Methods

Study design: A web-based survey was conducted in a cross-sectional design. The study

followed the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (von Elm et al., 2014).

Participants and setting: A total of 250 nurses in Istanbul, Turkey were selected using convenience sampling. All participants were invited to complete the questionnaires from August 7, 2020 to December 25, 2020. The study sample consisted of nurses working with patients diagnosed with COVID-19 at inpatient, emergency, or intensive care unit services. Prior to the collection of questionnaires, a calculation of the necessary sample size was carried out using the G*Power program (Faul et al., 2009). The result of the analysis indicated a minimum number of 250 participants. Participants who completely filled in the questionnaires were found eligible, and a total of 244 individuals were included in the study.

Instruments

Personal Information Form: The Personal Information Form consists of 22 questions about sociodemographic characteristics, occupational information, and working conditions, and experiences working with COVID-19 patients. The form was created by the researchers based on the literature (Liu et al., 2020; Dai et al., 2020; Yoruk & Guler, 2021; Şahin et al., 2020). Within the scope of the face validity, two public health experts were asked to submit their opinions. The questionnaire was completed by ten randomly selected nurses for the pilot implementation, and the final version of the questionnaire was assessed.

Hospital Anxiety and Depression Scale (HADS): It is developed by Zigmond & Snaith (1983) and adapted to Turkish by Aydemir et al. (1997), which is consisting of 14 items and two subscales: anxiety (HADS-A) and depression (HADS-D). Cut-off points of ≥ 11 and ≥ 8 were used for quantification of anxiety and depression, respectively. Testing the reliability of HADS, Cronbach's alpha was 0.852 for the anxiety subscale and 0.778 for the depression subscale. The validity and reliability for healthcare settings as well as among the general population were confirmed by previous studies (Aydemir et al., 1997; Erim et al., 2010).

Impact of Event Scale-Revised (IES-R): Post-traumatic stress (PTS) was measured using the IES-R, a 22-item scale, based on the original 15-item IES (Horowitz et al., 1979), with additional items to measure hyperarousal symptoms (Weiss & Marmar 1997). The instrument evaluates PTS

in three subdimensions (intrusion, avoidance, and hyperarousal) and provides an overall score for subjective stress (IES-R score). The IES-R investigates how frequently subjects have been troubled by problems in the last seven days. Psychometric properties of the Turkish version of the IES-R show good internal consistency (Cronbach's alpha: .93; Corapcioglu et al., 2006). A cut-off point of ≥ 33 provided the best diagnostic accuracy for PTS.

Data collection: The researchers created the online questionnaire using Google Forms. The survey was shared electronically using Google Drive's online service system. The participants were contacted by email and messaging apps informing about the objectives of the research and asking them for their involvement. They were also encouraged to invite their coworkers to take part in the research. Thus, the sampling technique used for the study was mixed/snowball sampling. The online survey consisted of three parts. The first part included questions about sociodemographic characteristics and other variables. The second and third parts included the evaluation of anxiety, depression, and PTS levels. The Personal Information Form, HADS, and IES-R were used to conduct an anonymous survey with the permission of the research ethics committees.

Ethical considerations: Ethical approval was obtained from X University Human Research Ethics Committee on July 22, 2020 (No:71). The first part of the online questionnaire included a paragraph about the study and an informed consent form. Participants would read the informed consent and if they agreed to participate in the study, they could click "I agree" to complete the survey. The survey was anonymous, and personal information was not disclosed.

Statistical analysis: Data were analyzed using SPSS software version 26.0. Descriptive statistics were used to determine the distribution of demographic characteristics. The normality of data was assessed using the Kolmogorov-Smirnov test. Initially, potential predictors (i.e., age, gender, daily and weekly working hours) were identified through a literature review (Liu et al., 2020; Dai et al., 2020; Yoruk & Guler, 2021; Şahin et al., 2020). Potential predictors were analyzed individually using chi-square tests and t-tests to determine their independent relationship with outcome variables (See Table 2).

Multivariable logistic regression was used to identify the predictors of anxiety, depression, and PTS. Anxiety, depression, and PTS were entered with 1, respectively; anxiety positive (≥ 11 on the

HAD-A); depressed (≥ 8 on the HAD-D); and PTS positive (≥ 33 on the IES-R score); reversely 0 was anxiety negative (< 11), not depressed (< 8), and PTS negative (< 33). The reference categories are shown in Tables 3, 4, and 5. For prevalence analysis, the odds ratio was estimated by logistic regressions performed according to the multivariate model-building strategy described by Hosmer & Lemeshow (2000) with the inclusion of variables with $p < 0.25$ at the univariate analysis. Covariates with a $p < 0.25$ were identified and considered potential candidates for the multivariate model. In order to create a parsimonious model, variables with a $p > 0.25$ were not included in the model. The Hosmer-Lemeshow test was used to estimate how well the model fitted the data, and the results were presented in adjusted odds ratio (OR) and a 95% confidence interval (CI).

Results

Participants' characteristics: A complete overview of the sample demographics is shown in Table 1.

Prevalence of anxiety, depression and PTS

The average anxiety score was 10.63 ± 4.55 , and 48% ($n=117$) had an anxiety level above the cut-off point. The average depression score was 10 ± 5.02 , and 68% ($n=166$) had depression levels above the cut-off point. Overall, the IES-R average score was 33.45 ± 16.89 , and 51.2% ($n=125$) had PTS level above the cut-off point. Average scores of intrusion, avoidance, and hyperarousal subscales were 12.47 ± 7.15 , 12.02 ± 5.42 , and 8.95 ± 5.93 , respectively.

Univariate analyses of the factors associated with anxiety, depression, and PTS

In univariate analyses, there was a statistically significant difference between anxiety and the independent variables of volunteering to work in a COVID-19 unit ($\chi^2=10.773$; $p=.001$) and the level of received organizational support ($\chi^2=17.09$; $p<.001$).

There was a statistically significant difference between depression and the independent variables of working hours per week ($t=-3.750$; $p<.001$), gender ($\chi^2=4.158$; $p=.041$), educational status ($\chi^2=13.767$; $p=.003$), COVID-19 unit ($\chi^2=7.629$; $p=.022$), volunteering to work in a COVID-19 unit ($\chi^2=13.577$; $p<.001$), the level of received organizational support ($\chi^2=32.492$; $p<.001$), equipment support ($\chi^2=11.326$; $p=.001$), and

receiving training on the use of equipment ($\chi^2=10.240$; $p=.001$).

There was a statistically significant difference between PTS and the independent variables of COVID-19 unit ($\chi^2=16.334$; $p<.001$), volunteering to work in a COVID-19 unit ($\chi^2=5.568$; $p=.018$), the level of received organizational support ($\chi^2= 4.123$; $p= .042$), equipment support ($\chi^2= 4.123$; $p=.042$) and having colleagues diagnosed with COVID-19 ($\chi^2=4.187$; $p= .041$) (Table 2).

Risk factors associated with anxiety

In the current study, multiple logistic regression revealed only the level of received organizational support (inadequate) as a predictor of anxiety (odds ratio [OR]=4,174, 95%; confidence interval [CI]=1,795–9,704). Nurses who mentioned that the level of received organizational support was inadequate were 4.17 times more likely to have anxiety (Table 3). Multicollinearity was evaluated and found to be within acceptable levels (i.e., VIF<10; tolerance>0.1). The overall model had a classification rate of 67.2% and was statistically significant ($\chi^2[2]=294.433$; $p<.001$). The Hosmer and Lemeshow test indicated the model fit the data well ($\chi^2[8]=12.915$; $p=.115$).

Risk factors associated with depression

In the study, multiple logistic regression revealed two predictors of depression, including number of weekly working hours (OR=1,054, 95%; CI=1,016–1,094) and the level of received

organizational support (inadequate) (OR=4.064, 95%; CI=1.732–9.537). For each one point increase in weekly working hours, there was a 1% increase in the depression outcome variable. Nurses who said that the level of received organizational support was inadequate were 4.06 times more likely to be depressed (Table 4). Multicollinearity was evaluated and found to be within acceptable levels (i.e., VIF<10; tolerance>0.1). The overall model had a classification rate of 78.3% and was statistically significant ($\chi^2[2]=234.355$; $p<.001$). The Hosmer and Lemeshow test indicated the model fit the data well ($\chi^2[8]=7.888$; $p=.444$).

Risk factors associated with PTS

In the study, multiple logistic regression revealed two predictors of PTS, including the COVID-19 unit (OR=.221, 95%; CI=0.79–.615) and having colleagues diagnosed with COVID-19 (OR=.483, 95%; CI=.245–.953). Nurses who were working in an emergency unit (compare to inpatient COVID-19 service) were 0.22 times more likely to have PTS. In addition, nurses who had colleagues diagnosed with COVID-19 were 0.48 times more likely to experience PTS (Table 5). Multicollinearity was evaluated and found to be within acceptable levels (i.e., VIF<10; tolerance>0.1). The overall model had a classification rate of 67.6% and was statistically significant ($\chi^2[2]=302.687$; $p<.001$). The Hosmer and Lemeshow test indicated the model fit the data well ($\chi^2[8]=13.056$; $p=.110$).

Table 1 Characteristics of the nurses in the study (n=244)

Variables	Mean \pm SD or n (%)
Age (years)	32.24 \pm 7.95
Years of professional experience	10.92 \pm 8.14
Working hours per week	47.39 \pm 10.28
Working hours per day	9.63 \pm 2.03
Number of patients provided with care per day	8.30 \pm 5.49
Gender	
Female	178 (73)
Male	66 (27)
Marital status	
Single	110 (45.1)
Married	134 (54.9)
Educational status	
Vocational high school	54 (22.1)
Associate's degree	47 (19.3)
Bachelor's degree	113 (46.3)
Postgraduate	30 (12.3)
Current institution	

University hospital	96 (39.3)
Government hospital	73 (29.9)
Private/University Hospital	75 (30.7)
Working department	
COVID-19 inpatient service	111 (45.5)
COVID-19 intensive care unit	102 (41.8)
Emergency service	31 (12.7)
Totally working duration at COVID-19 unit (months)	
< 6	135 (55.3)
≥ 6	101 (41.4)
Having child/children	
Yes	118 (48.4)
No	126 (51.6)
Living with family members	
Yes	209 (85.7)
No	35 (14.3)
Volunteering to work with COVID-19 patients	
Yes	135 (55.3)
No	109 (44.7)
The level of received organizational support	
Adequate	54 (22.1)
Inadequate	190 (77.9)
Equipment support	
Adequate	115 (47.1)
Inadequate	129 (52.9)
Training on the use of personal protective equipment	
Yes	168 (68.9)
No	76 (31.1)
Diagnosed with COVID-19	
Yes	26 (10.7)
No	218 (89.3)
Family member diagnosed with COVID-19	
Yes	30 (12.3)
No	214 (87.7)
Colleagues diagnosed with COVID-19	
Yes	189 (77.5)
No	55 (22.5)
Previous experience working with infectious patients	
Yes	140 (57.4)
No	104 (42.6)
Receiving psychological support	
Yes	5 (2)
No	239 (98)

Note: SD=standard deviation

Table 2 Univariate analyses of the factors associated with anxiety, depression, and PTS

Variables	Anxiety, positive (n: 117)		Depression, positive (n: 166)		PTS, positive (n: 125)	
	n (%)	Chi-Square/t-test (p value)	n (%)	Chi-Square/t-test (p value)	n (%)	Chi-Square/t-test (p value)
Age (mean ± SD)	31.46 ± 7.29	1.484 (.139)*	32.09±7.69	.433 (.665)**	31.92±7.60	.647 (.518)**
Years of professional experience (mean ± SD)	10.44 ± 7.88	.884 (.378)**	10.63±8.06	.810 (.419)**	10.49±8.08	.841 (.401)**
Working hours per week (mean ± SD)	48.64 ± 10.13	-1.840 (.067)*	49.04±10.49	-3.750 (< .001)*,†,‡	47.91±9.81	-.807 (.421)**
Working hours per day (mean ± SD)	9.76 ± 2.06	-.894 (.372)**	9.75±2.02	-1.275 (.204)*	9.80±1.92	-1.329 (.185)*
Number of patients provided with care per day (mean ± SD)	8.19 ± 5.22	.290 (.772)**	8.28±5.53	.083 (.934)**	7.90±5.26	1.164 (.246)*
Gender						
Male	32 (27.4%)	.010 (.919)**	52 (31.3%)	4.158 (.041)*,†	89 (71.2%)	.398 (.528)**
Female	85 (72.6%)		114 (68.7%)		36 (28.8%)	
Marital status						
Single	48 (41%)	1.494 (.222)*	70 (42.2%)	1.780 (.182)*	51 (40.8%)	1.898 (.168)*
Married	69 (59%)		96 (57.8%)		74 (59.2%)	
Educational status						
Vocational high school	25 (21.4%)	5.342 (.148)*	36 (21.7%)	13.767 (.003)*,†	29 (23.2%)	
Associate’s degree	20 (17.1%)		25 (15.1%)		22 (17.6%)	.562 (.905)
Bachelor’s degree	62 (53%)		89 (53.6%)		59 (47.2%)	
Postgraduate	10 (8.5%)		16 (9.6%)		15 (12%)	
Current institution						
University hospital	54 (46.2%)	4.461 (.107)*	71 (42.8%)	5.841 (.054)*	54 (43.2%)	2.584 (.275)**
Government hospital	32 (27.4%)		52 (31.3%)		32 (25.6%)	
Private/University Hospital	31 (26.5%)		43 (25.9%)		39 (31.2%)	
Working department						
COVID-19 inpatient service	54 (46.2%)	5.485 (.064)*	72 (43.4%)	7.629 (.022)*,†	57 (45.6%)	16.334 (< .001)*,†,‡
COVID-19 intensive care unit	54 (46.2%)		78 (47%)		62 (49.6%)	
Emergency service	9 (7.7%)		16 (9.6%)		6 (4.8%)	
Totally working duration at COVID-19 unit (months)						
< 6	63(53.8%)	.187 (.666)**	93 (56%)	.005 (.945)**	65 (52%)	1.231 (.267)**

≥ 6	50 (42.7%)		70 (42.2%)		56 (48%)	
Having child/children						
Yes	60 (51.3%)	.768 (.381)**	83 (50%)	.559 (.455)**	65 (52%)	1.359 (.244)*
No	57 (48.7%)		83 (50%)		60 (48%)	
Living with family members						
Yes	106 (90.6%)	4.469 (.053)*	141 (84.9%)	.073 (.787)**	108 (86.4%)	.025 (.875)**
No	11 (9.4%)		25 (15.1%)		17 (13.6%)	
Volunteering to work with COVID-19 patients						
Yes	52 (44.4%)	10.773 (.001)*,†,‡	78 (47%)	13.577 (< .001)*,†,‡	60 (48%)	5.568 (.018)*,†
No	65 (55.6%)		88 (53%)		65 (52%)	
The level of received organizational support						
Adequate	12 (10.3%)	17.093 (< .001)*,†,‡	19 (11.4%)	32.492 (< .001)*,†,‡	20 (16%)	4.885 (.027)*,†
Inadequate	105 (89.7%)		147 (88.6%)		105 (84%)	
Equipment support						
Adequate	59 (42.7%)	1.743 (.187)*	66 (39.8%)	11.326 (.001)*,†,‡	51 (40.8%)	4.123 (.042)*,†
Inadequate	67 (57.3%)		100 (60.2%)		74 (59.2%)	
Training on the use of personal protective equipment						
Yes	74 (63.2%)	3.292 (.070)*	103 (62%)	10.240 (.001)*,†,‡	85 (68%)	.087 (.768)**
No	43 (36.8%)		63 (38%)		40 (32%)	
Diagnosed with COVID-19						
Yes	13 (11.1%)	.000 (.989)**	19 (11.4%)	.130 (.718)**	16 (12.8%)	.819 (.365)**
No	104 (88.9%)		147 (88.6%)		109 (87.2%)	
Family member diagnosed with COVID-19						
Yes	18 (15.4%)	1.990 (.224)*	24 (14.5%)	1.669 (.196)*	18 (14.4%)	.691 (.406)**
No	99 (84.6%)		142 (88.5%)		107 (85.6%)	
Colleagues diagnosed with COVID-19**						
Yes	94 (80.3%)	1.070 (.301)**		.397 (.529)**	104 (83.2%)	4.187 (.041)*,†
No	23 (19.7%)				21 (16.8%)	

Previous experience working with infectious patient						
Yes	70 (59.8%)	.553 (.457)**	92 (55.4%)	.812 (.368)**	77 (61.6%)	1.869 (.172)*
No	47 (40.2%)		74 (44.6%)		48 (38.4%)	
Receiving psychological support						
Yes	3 (2.6%)	.673 (.461)**	4 (2.4%)	1.000 (.487)**	3 (2.4%)	1.000 (.523)**
No	114 (97.4%)		162 (97.6%)		122 (97.6%)	

Notes: PTS= Post-traumatic stress; COVID-19= Coronavirus disease * =p≤0.25. † =p<0.05. ‡ =p<0.001. ** Not considered as potential candidate for the model

Table 3 Multivariate logistic regression analysis of the factors associated with anxiety

Variables	B	SE	Wald	Adjusted OR (95% CI)	p
Age (mean ± SD)	-.033	.025	1.656	.968 (.921–1.017)	.198
Working hours per week (mean ± SD)	.020	.015	1.777	1.021 (.992–1.050)	.166
Marital status					
Single				Reference	
Married	-.528	.375	1.977	.590 (.283–1.231)	.160
Educational status					
Vocational high school	.151	.229	.432	1.163 (.742–1.823)	.511
Associate's degree	.111	.466	.057	1.117 (.448–2.784)	.812
Bachelor's degree				Reference	
Postgraduate	-.293	.497	.347	.746 (.282–1.975)	.556
Current institution					
University hospital	-.464	.353	1.723	.629 (.315–1.257)	.189
Government hospital				Reference	
Private/University Hospital	.042	.474	.008	1.053 (.412–2.639)	.929
Working department					
COVID-19 inpatient service				Reference	
COVID-19 intensive care unit	-.138	.312	.195	.871 (.473–1.606)	.658
Emergency service	-.640	.498	1.648	.527 (.199–1.401)	.199
Living with family members					
Yes				Reference	
No	-.852	.451	3.570	.427 (.176–1.032)	.059
Volunteering to work with COVID-19 patients					
Yes				Reference	
No	.379	.297	1.619	1.460 (.815–2.616)	.203
The level of received organizational support					
Adequate				Reference	
Inadequate	1.429	.430	11.019	4.174 (1.795–9.704)	.001*
Equipment support					
Adequate				Reference	
Inadequate	-.271	.326	.692	.763 (.402–1.445)	.406
Training on the use of personal protective equipment					
Yes				Reference	
No	.199	.327	.370	1.220 (.643–2.314)	.543
Family member diagnosed with COVID-19					
Yes				Reference	
No	-.427	.447	.913	.652 (.272–1.567)	.339

Cox & Snell R²=0.163; Nagelkerke R²=0.217 *p<0.05.**Table 4 Multivariate logistic regression analysis of the factors associated with depression**

Variables	B	SE	Wald	Adjusted OR (95% CI)	p
Gender					
Female				Reference	
Male	.434	.426	1.039	1.544 (.670–3.558)	.308
Marital status					
Single				Reference	
Married	-.704	.364	3.738	.495 (.242–1.010)	.053
Educational status					

Vocational high school	.139	.269	.266	1.149 (.678–1.948)	.606
Associate’s degree	.709	.516	1.889	2.032 (.739–5.584)	.169
Bachelor’s degree				Reference	
Postgraduate	-.569	.502	1.283	.566 (.211–1.515)	.257
Current institution					
University hospital	-.060	.435	.019	.941 (.402–2.207)	.889
Government hospital				Reference	
Private/University Hospital	-.440	.532	.685	.644 (.227–1.827)	.408
Working hours per week	.053	.019	7.705	1.054 (1.016–1.094)	.006*
Working hours per day	.053	.089	.352	1.054 (.885–1.256)	.553
Working department					
COVID-19 inpatient service				Reference	
COVID-19 intensive care unit	.078	.374	.044	1.081 (.520–2.251)	.834
Emergency service	-.321	.525	.373	.726 (.259–2.030)	.541
Volunteering to work with COVID-19 patients					
Yes				Reference	
No	.536	.359	2.232	1.709 (.846–3.451)	.135
Family member diagnosed with COVID-19					
Yes				Reference	
No	-.409	.552	.548	.664 (.225–1.962)	.459
The level of received organizational support					
Adequate				Reference	
Inadequate	1.402	.435	10.379	4.064 (1.732–9.537)	.001*
Equipment support					
Adequate				Reference	
Inadequate	.458	.385	1.411	1.581 (.743–3.365)	.235
Training on the use of personal protective equipment					
Yes				Reference	
No	.619	.410	2.280	1.857 (.832–4.145)	.131

Cox & Snell R²=0.254; Nagelkerke R²=0.355 *p<0.05.

Table 5 Multivariate logistic regression analysis of the factors associated with PTS

Variables	B	SE	Wald	Adjusted OR (95% CI)	p
Marital status					
Single				Reference	
Married	-.251	.404	.385	.778 (.353–1.717)	.535
Having child/children					
Yes				Reference	
No	-.395	.406	.944	.674 (.304–1.494)	.331
Working hours per day	.094	.072	1.675	1.098 (.953–1.265)	.196
Number of patients provided with care per day	-.019	.030	.387	.981 (.924–1.042)	.534
Working department					
COVID-19 inpatient service				Reference	
COVID-19 intensive care unit	.187	.346	.293	1.206 (.612–2.373)	.588
Emergency service	-1.511	.523	8.346	.221 (.079–.615)	.004*
Volunteering to work with COVID-19 patients					
Yes				Reference	

No	.394	.291	1.831	1.482 (.838–2.621)	.176
The level of received organizational support				Reference	
Adequate					
Inadequate	.277	.401	.478	1.320 (.601–2.897)	.489
Equipment support				Reference	
Adequate					
Inadequate	.265	.316	.704	1.303 (.702–2.419)	.402
Colleagues diagnosed with COVID-19				Reference	
Yes					
No	-.727	.346	4.400	.483 (.245–.953)	.036*
Previous experience working with infectious patient				Reference	
Yes					
No	-.519	.285	3.319	.595 (.340–1.040)	.068

Cox & Snell $R^2=0.135$; Nagelkerke $R^2=0.180$ * $p<0.05$.

Discussion

Prevalence of anxiety, depression and PTS The present study, conducted to evaluate the anxiety, depression, and PTS levels and risk factors of nurses providing treatment and care for patients with COVID-19, revealed that anxiety, depression, and PTS levels are high among the research population. Pouralizadeh et al. (2020) mentioned that nurses working in COVID-19 designated hospitals were 1.82 times more likely to have anxiety than other nurses. In their study with 285 healthcare workers, Zheng et al. (2021) found that 47.1% of nurses caring for patients with COVID-19 had depression while 28.4% had anxiety. Similarly, Lai et al. (2020) reported that depression and anxiety rates in healthcare workers were 50.4% and 44.6%, respectively. The study by Benfante et al. (2020), which focused on post-traumatic stress in healthcare workers during the COVID-19 pandemic, stated that exposure to infected people and the risk of getting infected by a high-infectious disease were all considered risk factors for traumatic symptoms in healthcare workers. In the present study, it was found that nurses had a higher incidence of depression (68%) than that of anxiety (48%) or PTS (51.2%). The different measurement tools used in the studies and the fact that the studies were carried out during different periods of the COVID-19 pandemic (at their peak or decline) explain the difference in the research results; however, the results of the current study are consistent with the literature.

Risk factors associated with anxiety and depression A statistically significant difference was found in this study between the depression outcome variable and weekly working hours,

gender, educational status, the current COVID-19 unit, equipment support, and receiving training on the use of equipment. The variables of volunteering to work in a COVID-19 unit and the level of received organizational support were found to be associated with both the anxiety and depression variables. The present study found that female nurses had a higher incidence of depression than males. In the literature, studies have also shown that, compared with females, males were associated with a significantly lower prevalence of symptoms of depression (Pouralizadeh et al., 2020; Tasnim et al., 2020). In addition, the current study found that those who did not volunteer to work in a COVID-19 unit had a higher incidence of both anxiety and depression. Tasnim et al. (2020) found that anxiety and depression were associated with negative feelings about their choice of profession due to the ongoing crisis of the pandemic and unexpected experiences throughout the process. The concept of volunteering in nursing brings together the ability to overcome and cope with all kinds of difficulties. Therefore, volunteering to work is an important factor in controlling anxiety, which is supported by the results of the current research.

According to the results of the current study, nurses who had inadequate equipment support and were not trained in the use of equipment had a higher incidence of depression. It is known that inadequate personal protective equipment and knowledge of COVID-19 has exposed healthcare workers to severe psychological pressures leading to mental disorders such as anxiety and depression (Tercan et al., 2020; Mokhtari et al., 2020). Regardless of country and geographical location, providing adequate protective equipment support

and information relating to the use of equipment is significantly important in managing psychological problems that may occur among healthcare workers during the pandemic. In this context, it may be concluded that the results of the current study are compatible with the literature, and provide tips to the institutional management on the importance of equipment support and continuity. It also demonstrates the necessity of in-service trainings to inform employees in a sufficiently timely manner.

In the study, weekly working hours and the level of received organizational support were determined as the predictors of depression, while the only predictor for anxiety was the level of received organizational support. It was also found that the level of depression in nurses increased as a result of longer working hours per week. Yoruk & Guler (2021) examined the factors associated with the incidence of depression in nurses during the COVID-19 pandemic and found that those who worked 49 hours or more per week were at significantly higher risk of depression. Similarly, Mokhtari et al. (2020) stated that during the pandemic, increased workload caused severe psychological pressures leading to mental disorders such as anxiety and depression among healthcare workers. In our study, the level of received organizational support (inadequate) was determined as a predictor of both anxiety and depression. In the literature, it was stated that the lack of regular communication and updates, inadequate information about COVID-19, lack of access to testing for staff, lack of a crisis management plan and inadequate social support during quarantine cause increased anxiety levels and mental health problems among healthcare workers (Kang et al., 2020; Shanafelt et al., 2020). As emphasized in previous studies and the results of the current study, it is essential for institutions to adopt different approaches and practices in terms of reviewing working hours and supporting their employees from a psychosocial perspective. It may be recommended to investigate the effectiveness of social support systems on the psychological well-being of nurses in future studies.

Risk factors associated with PTS In the current study, a statistically significant difference was found between PTS and the COVID-19 unit that nurses worked in, volunteering to work in the COVID-19 unit, the level of received organizational support, equipment support, and having colleagues diagnosed with COVID-19. In

the literature, it is known that nurses in high-risk units had higher prevalence of mental health problems and those who had experiences of treating COVID-19 or other infectious diseases were at increased risk of PTS (Benfante et al., 2020). The exposure to critical medical situation and death and trauma makes frontline healthcare worker especially vulnerable to PTSD (Carmassi et al., 2020). Similar to the literature, the results show that frontline healthcare workers are at risk for the development of PTS during the COVID-19 pandemic.

In the current study, those who rated the level of received organizational support as inadequate had a high incidence of PTS. In another study, it was reported that healthcare workers working in an institution that provided frequent communication and updates about COVID-19, as well as testing for all healthcare workers and a completed outbreak-management plan, were less likely to have a high level of anxiety and PTS (Alenazi et al., 2020). In addition, the COVID-19 unit that nurses worked in and having colleagues diagnosed with COVID-19 were determined as the predictors of PTS. Nurses who were working in an emergency unit had higher PTS levels than those working in an inpatient COVID-19 unit. In a study by Benfante et al. (2020), focusing on PTS in healthcare workers during the COVID-19 pandemic, it was stated that inadequate social support, difficulty in accessing psychological material, and the lack of sufficient protection against biological agents were all considered risk factors for traumatic symptoms among healthcare workers. In the current study, nurses who had colleagues diagnosed with COVID-19 were more likely to experience PTS than others. Rossi et al. (2020) found that a colleague being quarantined, hospitalization of a colleague, and the death of a colleague were associated with PTSD. Similarly, in another study, higher PTS levels were found when the healthcare worker had a friend, coworker, or family member who had been diagnosed with COVID-19 (Alenazi et al., 2020). The results of the current study demonstrate the importance of monitoring and evaluating nurses at regular intervals in terms of post-traumatic stress symptoms and implementing prevention and strengthening initiatives.

Limitations: There are some limitations to this research. Firstly, the data are solely on the basis of nurses' self-reporting. Additionally, the participants completed the questionnaires using an online form, which might have led to self-

selection bias. Secondly, we had a limited sample size that might not have represented the entire population. Thirdly, the fact that the study was conducted at the beginning of the second wave, at a time when the number of cases was partially reduced, may have affected the results. Finally, the cross-sectional study could not assess changes in the respondents' anxiety, depression, and PTS over time.

Conclusion: The study revealed that nurses had high levels of anxiety, depression, and post-traumatic stress during the COVID-19 pandemic. It was determined that the most striking predictors affecting nurses' mental health outcomes were the number of weekly working hours and the level of received organizational support. Working in emergency services and having colleagues diagnosed with COVID-19 were associated with post-traumatic stress. An institutional management that evaluates nurses from a psychosocial perspective, the early identification of high-risk workers, and the provision of organizational support to all employees will increase effectiveness in managing psychosocial outcomes. In different institutions, it is recommended to carry out future studies in different periods, such as exacerbation and reduction with a larger sample.

Acknowledgments: The authors are grateful to all the participants for providing valuable information during the COVID-19 pandemic.

References

- Al Maqbali M, Al Sinani M, & Al-Lenjawi B. (2021) Prevalence of stress, depression, anxiety and sleep disturbance among nurses during the COVID-19 pandemic: A systematic review and meta-analysis. *Journal of Psychosomatic Research* 141: 1-18.
- Alenazi TH, Bin Dhimi NF, Alenazi MH, Tamim H, Almagrabi SR, & Aljohan SM. (2020) Prevalence and predictors of anxiety among healthcare workers in Saudi Arabia during the COVID-19 pandemic. *Journal of Infection and Public Health* 13 (11): 1645-1651.
- Aydemir Ö, Güvenir T, Küey L, & Kültür S. (1997) The validity and reliability study of the Turkish version of the hospital anxiety and depression scale. (Original work published in [Turkish]). *Türk Psikiyatri Dergisi* 8 (4): 280-287.
- Benfante A, Di Tella M, Romeo A, & Castelli L. (2020) Traumatic stress in healthcare workers during COVID-19 pandemic: A review of the immediate impact. *Frontiers in Psychology* 11: 1-7.
- Carmassi C, Foghi C, Dell'Oste V, Cordone A, Bertelloni AC, Bui E, & Dell'Osso L. (2020) PTSD symptoms in healthcare workers facing the three coronavirus outbreaks: What can we expect after the COVID-19 pandemic. *Psychiatry Research* 292: 1-10.
- Chew NWS, Lee GKH, Tan BYQ, Jing M, Goh Y, Ngiam NJH, ... Sharma VK. (2020) A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain, Behavior, and Immunity* 88: 559-565.
- Corapcioglu A, Yargiç I, Geyran P, & Kocabaşoglu N. (2006) The validity and reliability of the Turkish version of the impact of events scale (IES-R). (Original work published in [Turkish]). *New/Yeni Symposium: Psikiyatri, Nöroloji ve Davranış Bilimleri Dergisi* 44 (1): 14-22.
- Dai Y, Hu G, Xiong H, Qiu H, & Yuan X. (2020) Psychological impact of the coronavirus disease 2019 (COVID-19) outbreak on healthcare workers in China. *MedRxiv*
- Dehkordi AH, Gholamzad S, Myrfendereski S, & Dehkordi A. (2020) The Effect of Covid-19 on anxiety, quality of work life and fatigue of health care providers in health care centers. *Research Square* 1-14.
- Erim Y, Tagay S, Beckmann M, Bein S, Ciccinnati V, Beckebaum S, Senf W, Schlaak JF. (2010) Depression and protective factors of mental health in people with hepatitis C: A questionnaire survey. *International Journal of Nursing Studies* 47: 342-349.
- Faul F, Erdfelder E, Buchner A, & Lang AG. (2009) Statistical power analyses using G*Power 3.1: test for correlation and regression analyses. *Behav. Res. Methods* 41: 1149-1160.
- Guixia L, & Hui Z. (2020) A study on burnout of nurses in the period of COVID-19. *Psychology and Behavioral Sciences* 9 (3): 31-36.
- Horowitz M, Wilner N, & Alvarez W. (1979) Impact of Event Scale: a measure of subjective stress. *Psychosom Med* 41: 209-218.
- Hosmer DW, & Lemeshow S. (2000) *Applied Logistic Regression*. Wiley, New York.
- Kang L, Li Y, Hu S, Chen M, Yang C, Yang BX, Wang Y, Liu Z. (2020) The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. *Lancet Psychiatry* 7: e14.
- Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Hu S. (2020) Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA Network Open Journal* 3 (3): 203-204.
- Liu Z, Wu J, Shi X, Ma Y, Ma X, Teng Z, You X, ... Zeng Y. (2020) Mental health status of healthcare workers in China for COVID-19 epidemic. *Annals of Global Health* 86 (1): 128.
- Mokhtari R, Moayedi S, & Golitaleb M. (2020) COVID-19 pandemic and health anxiety among

- nurses of intensive care units. *Int J Ment Health Nurs* 29(6): 1275–1277.
- Pouralizadeh M, Bostani Z, Maroufizadeh S, Ghanbari A, Khoshbakht M, Alavi SA, & Ashrafi S. (2020) Anxiety and depression and the related factors in nurses of Guilan University of Medical Sciences hospitals during COVID-19: A web-based cross-sectional study. *International Journal of Africa Nursing Sciences* 13: 2-6.
- Rossi R, Soggi V, Pacitti F, Di Lorenzo G, Di Marco A, Siracusano A, & Rossi A. (2020) Mental health outcomes among frontline and second-line health care workers during the coronavirus disease 2019 (COVID-19) pandemic in Italy. *JAMA Network Open Journal* 3(5): e2010185.
- Shanafelt T, Ripp J, & Trockel M. (2020) Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. *JAMA* 323 (21): 2133-2134.
- Şahin MK, Aker S, Şahin G, & Karabekiroglu A. (2020) Prevalence of depression, anxiety, distress and insomnia and related factors in healthcare workers during COVID-19 pandemic in Turkey. *Journal of Community Health* 45: 1168–1177.
- Tasnim R, Sujana SH, Islam S, Ritu AH, Siddique AB, Toma TY, ... Os JV. (2020) Prevalence and correlates of anxiety and depression in frontline healthcare workers treating people with COVID-19 in Bangladesh. *PsyArXiv Reprints*. 1-26.
- Tercan M, Bozkurt FT, Patmano G, Saraçoğlu G, & Gür SC. (2020) Anxiety and depression differences between the nurses working at a COVID-19 pandemic hospital. *Medical Science and Discovery* 7(6): 526-531.
- Tan BYQ, Chew NWS, Lee GKH, Jing M, Goh Y, Yeo LLL, ... Sharma, V. K. (2020) Psychological Impact of the COVID-19 pandemic on health care workers in Singapore. *Annals of Internal Medicine* 1-3.
- von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, & STROBE Initiative. (2014) The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: Guidelines for reporting observational studies. *International Journal of Surgery* 12 (12): 1495-1499.
- Weiss D, & Marmar C. (1997) The impact of Event Scale - Revised. Wilson J, Keane T, editors. *Assessing psychological trauma and PTSD*. New York: Guilford.
- Yoruk S, & Guler D. (2021) The relationship between psychological resilience, burnout, stress, and sociodemographic factors with depression in nurses and midwives during the COVID -19 pandemic: A cross -sectional study in Turkey. *Perspectives in Psychiatric Care* 57: 390-398.
- Zheng R, Zhou Y, Fu Y, Xiang O, Cheng F, Chen H, ...Li J. (2021) Prevalence and associated factors of depression and anxiety among nurses during the outbreak of COVID-19 in China: A cross-sectional study. *International Journal of Nursing Studies* 114: 1-8.
- Zigmond AS, & Snaith RP. (1983) The hospital anxiety and depression scale. *Acta Psychiatr Scand* 67: 361–370.