

# Anxiety, depression, and sleep disorders among healthcare workers during the COVID-19 pandemic

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## ABSTRACT

**OBJECTIVE:** In this study, we examined the level of anxiety and depression, daytime sleepiness, and sleep quality in healthcare workers working during the COVID-19 pandemic.

**METHODS:** This study was conducted in a tertiary care university hospital. Socio-demographic information form, Beck Anxiety Scale, Beck Depression Scale, Pittsburg Sleep Quality Index, and Epworth Sleepiness Scale were used as data collection tools.

**RESULTS:** A total of 273 healthcare workers were recruited into the study. It was determined that there is an enormous mental health burden on healthcare workers. About 100% and 45.4% of the participants got above-threshold scores from Beck Anxiety Scale, and Beck Depression Scale, and the prevalence of daytime sleepiness and impaired sleep quality was 11.4% and 38.8%, respectively. The female gender was found to have more severe anxiety levels and lower sleep quality ( $p<0.001$ ). In logistic regression analysis, the female gender was a risk factor for having a level of severe anxiety, and the nursing profession was a risk factor for having severe anxiety and low sleep quality ( $p<0.05$ ).

**CONCLUSION:** Global serious outbreaks cause increased depression and anxiety levels and sleep disorders in healthcare workers. Therefore, we believe that trainings and support which aims to strengthen the psychological well-being of healthcare workers should be implemented.

*Keywords:* Anxiety; COVID-19; depression; epworth daytime sleepiness scale; healthcare workers; Pittsburg sleep quality index; sleep.

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Lower respiratory infections have the highest mortality rate among infections globally [1]. Since December 2019, the world has faced COVID-19. It was first identified in Wuhan, China, and spread globally within months effecting the psychological status of the healthcare workers [2].

The potential psychological impact of outbreaks on health-care professionals is determined by several factors such as the uncertainty about the ultimate magnitude, duration, and effects of the crisis; a lack of adequate personal protective equipment and other necessary medical supplies; concerns about the level of preparedness in



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healthcare organizations and the public sector; potential threats to one's health; and the risk of transmission of the disease to one's social environment and coworkers [3, 4]. In addition, the heavy workload, widespread media coverage, lack of specific medications, inadequate support, and increasing number of cases contribute to the mental burdens of healthcare professionals [5].

The physical and psychological health of healthcare workers have become at risk facing this critical scenario due to underlined factors [6, 7]. Under these circumstances healthcare workers have also been exposed to high chronic stress due to their long working hours which contributes to anxiety and stress. Developing anxiety and stress may negatively affect sleep, leading to acute sleep disorders [8]. Developing anxiety and stress may negatively affect sleep, leading to acute sleep disorders [8]. Sleep quality is an important indicator of a person's well-being and good sleep quality not only helps the health workers treat patients more effectively but also maintains optimal immune function, which prevents infection [6].

This study aims to investigate the levels of anxiety, depression, daytime sleepiness, and low sleep quality level symptoms in healthcare workers during the COVID-19 pandemic.

## MATERIALS AND METHODS

### Study Design and Participants

Our study is a descriptive, quantitative, cross-sectional, and one-center survey study. It was carried out in accordance with the Helsinki Declaration principles and approved by the Clinical Research Ethics Committee of a University Hospital with the decision number 2020/0326. Written and electronic informed consent was obtained from each participant before the application of the survey.

The survey was given to physicians, nurses, and other healthcare professionals working in our hospital, which is a tertiary healthcare institution designated as referral center for COVID-19 patients, between March 20 and June 1, 2020. The prepared questionnaire forms were delivered to the participants online through Google survey and were completed face-to-face.

### Instruments

In the survey, the socio-demographic and clinical information of the healthcare professionals participating in the study were questioned regarding age, gender, marital

### Highlight key points

- During the COVID-19 pandemic, there is a large mental health burden on healthcare workers.
- All healthcare professionals had moderate and severe anxiety and depression levels.
- The female gender had more severe anxiety levels.
- Low sleep quality and severe anxiety levels were higher in the nurses.
- Particular attention should be paid to the protection of the mental health of women, nurses, and frontline workers.

status, parenthood, number of children, occupation, occupational experience, chronic illness, smoking, alcohol use, and regular exercise. The following scales were used to determine the participants' depression, anxiety, daytime sleepiness, and sleep quality levels.

### Scales

- Beck anxiety inventory (BAI): The BAI is a 21-question self-report scale developed by Beck et al. [9] and used to measure the severity of anxiety symptoms. The survey is considered reliable and valid among the Turkish population [10]. Symptom severity is interpreted as 0–7 = Normal/minimal anxiety, 8–15 = Mild anxiety, 16–25 = Moderate anxiety, and 26–63 = Severe anxiety.
- Beck depression inventory (BDI): The BDI was developed by Beck et al. [11]. It is designed to measure the severity of depression and monitor changes with treatment. It is a 21-question self-report scale used to measure depression symptoms in vegetative emotional and motivational areas of depression. The reliability of the Turkish form was approved by Hisli [12, 13]. In our study, depression-specific behaviors and symptoms were described, and each sentence was given a score of 0–3. Depression severity is interpreted as 0–9 = Minimal, 10–16 = Mild, 17–29 = Moderate, and 30–63 = Severe.
- Epworth sleepiness scale (ESI): The ESI is a subjective measurement of participants' sleepiness. It was developed by Johns and adapted into Turkish by Agargun [14, 15]. The test consists of a list of eight conditions that assess the participants' tendency to be drowsy on a scale of 0–3. Daytime sleepiness is indicated by a measurement of >10.
- Pittsburg sleep quality index (PSQI): The PSQI was developed by Buysse et al. [16] and a validity and

reliability study were conducted in Türkiye by Agarun et al. [17]. The index contains seven components (subjective sleep quality, sleep duration, sleep delay, habitual sleep efficiency, use of sleeping pills, sleep disturbance, and daytime dysfunction), and the score for each component ranges 0–3 points. The PSQI score varies between 0 and 21. A PSQI score >5 indicates poor sleep quality.

### Statistical Analysis

The statistical analysis of the data obtained in the research was made with the program of Statistical Package for the Social Sciences (SPSS) Version 26.0, IBM Corp., Armonk, NY, ABD. Socio-demographic and clinical categorical variables were reported as numbers and frequencies. Quantitative variables were summarized as both arithmetic means and standard deviations. The Pearson Chi-Square and Fisher Exact test were used to comparing categorical data. The normal distribution was determined in the data. Kruskal–Wallis analysis was used for the comparison of more than two continuous variables. Either Student *t*-test or Mann–Whitney test was used for comparisons between two groups: Pearson or Spearman correlation analyses were carried out for evaluating relationships. Univariate and multivariate logistic regression models were performed to investigate potential impact factors. The results were evaluated at a 95% confidence interval and  $p < 0.05$  significance level.

## RESULTS

Between March 20 and June 1, 2020, a total of 303 healthcare professionals participated in the questionnaire. Of the questionnaires, 30 were not included in the statistical analysis due to missing data. A total of 273 healthcare professionals were included in the statistical analysis. The average age of the participants was 30.58 ( $\pm 7.789$ ) years. Among the participants, 212 (77.7%) were female, 61 (22.3%) were male, 170 (62.3%) were nurses, 23 (8.4%) were physicians, 106 (38.8%) were married and 73 (26.7%) had children. The professional experience of 144 (52.7%) participants was <5 years. Furthermore, 44 (16.1%) had a chronic illness, 59 (21.6%) used alcohol, 68 (24.9%) smoked, 225 (82.4) drank at least one cup of coffee per day, and 60 (22.0%) exercised regularly.

The levels of varying levels of depression and anxiety, daytime sleepiness, and low sleep quality, according to categorical variables are shown in Table 1.

All healthcare workers had a mean BAI score of 33.58 ( $\pm 11.28$ ), a mean BDI score of 10.38 ( $\pm 8.48$ ), a mean ESI score of 5.52 ( $\pm 4.32$ ), and a mean PSQI score of 5.18 ( $\pm 3.21$ ) (Table 2). The mean BAI and PSQI scores were statistically significantly higher in females than males ( $p = 0.000$  and  $p = 0.001$ , respectively). The occupational group with the highest mean scores in BAI, BDI, ESI, and PSQI ( $p = 0.013$ ,  $p = 0.027$ ,  $p = 0.048$ , and  $p = 0.011$ , respectively) was nurses. In healthcare workers with over 5 years of professional experience, the BAI mean score was higher ( $p = 0.002$ ) than in workers with under 5 years of experience (Table 2).

All healthcare professionals had moderate and severe anxiety levels (BAI score >16) and 124 (45.4%) had varying levels of depression (BDI score >10). In addition, daytime sleepiness (ESI score >10) was present in 31 (11.4%) of the healthcare workers, and 106 (38.8%) had poor sleep quality (PSQI score >5) (Table 1).

There was a significant relationship between severe anxiety and low sleep quality ( $p = 0.000$  and  $p = 0.015$ , respectively) in women (Table 1). No statistically significant difference was found in terms of the prevalence of daytime sleepiness, low sleep quality, anxiety, and depression according to age, marital status, having children, occupational experience (years), chronic illness, smoking, regular exercise, and alcohol use and coffee (when compared to occupational groups, nursing had the highest prevalence of daytime sleepiness, low sleep quality, anxiety, depression, and average score rates, as shown in Tables 1 and 2). The presence of severe anxiety, low sleep quality, and depression was associated with both daytime sleepiness and low sleep quality ( $p = 0.000$ ) (Table 1).

In the multivariate logistic regression model, the severe anxiety level primarily affected women ( $p = 0.001$ ). The nursing profession has a higher risk factor of low sleep quality and severe anxiety than other occupational groups ( $p = 0.002$  and  $p = 0.005$ , respectively) (Table 3). The presence of high level depression significantly affected sleep quality and daytime sleepiness ( $p = 0.000$ ) (Table 4). There was a statistically significant correlation between BAI, BDI, ESI, and PSQI total scores according to the Pearson Correlation Test ( $p = 0.000$ ) (Table 5).

## DISCUSSION

This cross-sectional survey study found high rates of anxiety and depression levels and low sleep quality among healthcare workers treating COVID-19 patients. Our results confirm concerns about healthcare workers' psy-

**TABLE 1.** Association with severity of anxiety, depression, day-time sleepiness, and sleep quality with demographic characteristics of participants

Variables	% (n=273)	Anxiety severity	Depression severity	Day-time sleepiness	Sleep quality
		Severe BAI 26-63 (n=194)	BDI >16 (n=54)	Epworth >10 (n=31)	Pittsburgh >5 (n=106)
Gender					
Female	77.70	77.40	21.20	11.30	42.50
Male	22.30	49.20	14.80	11.50	26.20
P		<b>0.000</b>	0.263	0.973	0.015
Age					
<35 years	75.10	69.30	19.50	11.70	39.00
35≥	24.90	76.50	20.60	10.30	38.20
P		0.256	0.847	0.75	0.908
Marital status					
Married	38.80	68.90	16.00	9.40	34.00
Single	61.20	72.50	22.20	12.60	41.90
P		0.524	0.216	0.425	0.189
Parenthood					
No	73.30	71.50	21.00	12.50	42.00
Yes	26.70	69.90	16.40	8.20	30.10
P		0.792	0.402	0.324	0.075
Profession					
Physician	8.40	60.90	8.70	8.70	26.10
Nurse-midwife	62.30	78.80	22.40	13.50	46.50
Other	29.30	57.50	17.50	7.50	26.30
P		<b>0.001</b>	0.253	0.343	<b>0.004</b>
Professional expertise					
<5 years	52.70	70.80	18.80	12.50	38.90
≥5 years	47.30	71.30	20.90	10.10	38.80
P		0.93	0.652	0.529	0.983
Chronic diseases					
No	83.90	69.00	18.80	11.40	38.00
Yes	16.10	81.80	25.00	11.40	43.20
P		0.086	0.343	1	0.518
Alcohol consumption					
No	78.40	72.00	17.80	10.30	36.90
Yes	21.60	67.80	27.10	15.30	45.80
P		0.532	0.11	0.286	0.217
Smoking					
No	75.10	71.20	19.00	11.20	36.60
Yes	24.90	70.60	22.10	11.80	45.60
P		0.921	0.586	0.902	0.187
Coffee consumption					
No	17.60	66.70	12.50	10.40	31.30
Yes	82.40	72.00	21.30	11.60	40.40
P		0.459	0.163	0.821	0.235
Exercise					
No	78.00	71.40	20.70	11.70	40.80
Yes	22.00	70.00	16.70	10.00	31.70
P		0.837	0.493	0.708	0.198
Anxiety					
Medium 16–25	28.90			6.30	19.00
Severe 26–93	71.10			13.40	46.90
P				0.095	<b>0.000</b>
Depression					
0–16	80.20			5.50	31.50
>16	19.80			35.20	68.50
P				<b>0.000</b>	<b>0.000</b>

BAI: Beck anxiety inventory; BDI: Beck depression inventory; P: Is significant at the P&lt;0.005 (Chi-square tests).

**TABLE 2.** Association with mean scores of Anxiety, Depression, Day-time sleepiness and sleep quality with demographic characteristics of participants

Variables	Anxiety total score			Depression total score			Epworth (day-time sleepiness)			Pittsburgh (sleep quality)		
	Mean	SD	p	Mean	SD	p	Mean	SD	p	Mean	SD	p
Gender												
Female	34.82	11.66	<b>0.00</b>	10.81	8.52	0.080	5.53	4.21	0.786	5.47	3.18	0.001
Male	29.26	8.61		8.9	8.24		5.48	4.7		4.18	3.12	
Age												
<35 years	33.49	11.07	0.903	10.5	8.28	0.359	5.58	4.2		5.13	3.25	
≥	33.85	11.99		10.04	9.11		5.34	4.68	0.313	5.34	3.09	0.404
Marital status												
Married	33.34	11.53	0.658	9.38	8.06	0.089	5.48	4.41		4.86	3.01	
Single	33.73	11.15		11.02	8.7		5.54	4.27	0.784	5.38	3.32	0.263
Parenthood												
No	33.79	11.14	0.488	10.81	8.54	0.097	5.53	4.3		5.39	3.32	
Yes	33.01	11.71		9.23	8.26		5.48	4.39	0.797	4.62	2.81	0.157
Profession												
Physician	31.74	10.48	<b>0.013</b>	7.3	6.06	<b>0.027</b>	4.57	5.16	<b>0.048</b>	3.91	2.8	<b>0.011</b>
Nurse-midwife	34.55	10.66		11.41	8.81		5.82	4.12		5.55	3.2	
Other	32.04	12.62		9.09	8.05		5.14	4.45		4.76	3.23	
Professional expertise												
<5 years	33.19	11	<b>0.002</b>	10.79	8.3	0.206	5.65	4.32		5.16	3.46	
≥5 years	34.02	11.61		9.93	8.69		5.37	4.33	0.429	5.2	2.92	0.465
Chronic diseases												
No	32.91	10.99	0.488	10.09	8.23	0.313	5.5	4.29		5.13	3.2	
Yes	37.05	12.26		11.93	9.66		5.59	4.51	0.994	5.45	3.3	0.526
Alcohol consumption												
No	33.71	11.57	0.918	10.23	8.56	0.416	5.52	4.41		5.13	3.2	
Yes	33.08	10.24		10.93	8.25		5.49	4.01	0.633	5.45	3.3	0.528
Smoking												
No	34	11.79	0.535	10.48	8.7	0.984	5.61	4.56		5.1	3.19	
Yes	32.29	9.55		10.1	7.83		5.22	3.49	0.967	5.43	3.27	0.444
Coffee consumption												
No	34.29	12.59	0.966	9.98	8.8	0.584	5.46	4.18		4.96	3.12	
Yes	33.43	11.01		10.47	8.43		5.53	4.36	0.981	5.23	3.23	0.605
Exercise												
No	34.04	11.78	0.407	10.79	8.58	0.104	5.65	4.43		5.27	3.18	
Yes	31.93	9.19		8.95	8.03		5.05	3.91	0.361	4.85	3.32	0.23
Anxiety												
<26				4.42	4.36	<b>0.000</b>	3.85	3.63	<b>0.000</b>	3.95	2.9	<b>0.000</b>
≥26				12.81	8.56		6.2	4.4		5.68	3.2	
Depression												
0–16	30.58	8.42	<b>0.000</b>				4.63	3.41	<b>0.000</b>	4.58	2.86	<b>0.000</b>
>16	45.76	13.16					9.11	5.61		7.63	3.41	
Day-time sleepiness												
No	32.58	10.19	<b>0.002</b>	9.25	7.27	<b>0.000</b>				4.9	3.08	<b>0.000</b>
Yes	41.35	15.79		19.26	11.67					7.35	3.38	
Sleep quality												
Normal	30.26	9.05	<b>0.000</b>	7.59	6.3	<b>0.000</b>	4.56	3.51	<b>0.000</b>			
Impaired	38.8	12.46		14.79	9.57		7.03	5				

SD: Standart deviation; P: is significant at the P<0.05 (Nonparametric tests: Mann-Whitney U Test/Kruskal Wallis Test).

**TABLE 3.** Logistic regression analyses of anxiety and sleep quality between demographic characteristics of participants

	B	SE	Wald	df	Sig.	Exp(B)	95% CI for EXP(B)	
							Lower	Upper
<b>Anxiety</b>								
Gender	1.11	0.323	11.816	1	0.001	3.035	1.612	5.717
Age	0.651	0.462	1.982	1	0.159	0.522	0.211	1.291
Marital status	0.304	0.399	0.581	1	0.446	0.738	0.337	1.613
Parenthood	0.324	0.524	0.382	1	0.536	1.383	0.495	3.865
Profession			12.195	2	0.002			
Physician nurse	0.76	0.491	2.4	1	0.121	2.138	0.818	5.592
Physician others	0.321	0.521	0.38	1	0.538	0.725	0.261	2.013
<b>Sleep quality</b>								
Gender	0.615	0.337	3.32	1	0.068	1.849	0.955	3.583
Age	0.616	0.425	2.098	1	0.147	0.54	0.235	1.243
Marital status	0.077	0.368	0.044	1	0.833	0.925	0.45	1.905
Parenthood	0.908	0.513	3.135	1	0.077	2.481	0.907	6.781
Profession			10.425	2	0.005			
Physician nurse	0.896	0.508	3.115	1	0.078	2.449	0.906	6.623
Physician others	0.022	0.557	0.002	1	0.969	0.978	0.328	2.916

CI: Confidence interval; SE: Standard error; P: Is significant at the  $p < 0.05$ .

**TABLE 4.** Logistic regression analysis of sleep disorders with psychiatric disorders

	B	SE	Wald	df	Sig.	Exp (B)	95% C.I. for EXP(B)	
							Lower	Upper
<b>Day-time sleepiness</b>								
Depression total score	0.125	0.03	16.851	1	0.000	1.133	1.068	1.203
Anxiety total score	0.006	0.022	0.086	1	0.77	0.994	0.952	1.037
<b>Sleep quality</b>								
Depression total score	0.085	0.024	13.132	1	0.000	1.089	1.04	1.14
Anxiety total score	0.034	0.017	3.838	1	0.05	1.034	1	1.07

CI: Confidence interval; SE: Standard error; P: Is significant at the  $p < 0.05$ .

chological well-being and sleep disturbance during the COVID-19 pandemic. All participants had high anxiety scores and nearly half of them had high depression scores in our study. The prevalence of daytime sleepiness and low sleep quality was 11.4% and 38.8%, respectively. The effects of the COVID-19 epidemic on sleep and psychological burdens were significantly higher in the female gender and nurse occupation group than in other groups.

The psychological response of health-care professionals to the pandemic is complex. The spread of the virus, the health of family and others, limited resources, feelings of vulnerability or loss of control, changes in work routine, and concerns about social isolation triggers psychological problems [5]. Literature has abundant studies concerning the psychological well-being of health-care professionals during past coronavirus infections. For ex-

**TABLE 5.** Relationship between psychological symptoms and sleep disorders (n=273)

	Anxiety total score	Depression total score	Epworth total score	Pittsburgh total score
Anxiety total score				
Pearson Correlation	1			
Sig. (2-tailed)				
Depression total score				
Pearson Correlation	0.698*	1		
Sig. (2-tailed)	0.000			
Epworth total score				
Pearson Correlation	0.398*	0.476*	1	
Sig. (2-tailed)	0.000	0,000		
Pittsburgh total score				
Pearson Correlation	0.404*	0.490*	0.274*	1
Sig. (2-tailed)	0.000	0.000	0.000	

\*: Correlation is significant at the 0.01 level (2-tailed).

ample in a study performed in a major teaching hospital in Toronto during the 2003 SARS epidemic, it is stated that 29% of its participants experienced emotional distress [18]. In Korea, after the 2015 Middle East Respiratory Syndrome (MERS) epidemic, it was shown that healthcare workers who worked directly in MERS patient care showed a higher rate of psychological distress compared to other colleagues [4], and finally according to a recent Saudi Arabian study of 582 participants (75.1% of whom were women) 41% of them were under more stress about COVID-19 than they were about MERS-CoV [19].

Stress is considered the primary cause of insomnia [20]. Using the PSQI, Huang et al. [21] found that decreased sleep quality was present in 18.2% of the general Chinese population during the COVID-19 outbreak. It was also reported that personnel working in an isolated environment are 1.71 times more likely to experience insomnia [20]. Qiu et al. [8] found that 39.2% of healthcare workers in the COVID-19 pandemic have sleep disorders. Zhang et al. [22] found that anxiety (13.0%), depression (12.2%), and insomnia (38.4%) are statistically higher in healthcare workers (doctors and nurses) compared to other occupational groups ( $p < 0.01$ ).

In a recent meta-analysis, the prevalence rates of anxiety, depression, and insomnia of healthcare workers during COVID-19 in China were reported to be 23.2%, 22.8%, and 34.32%, respectively [1]. Zang et al. [20] determined

the prevalence of symptoms associated with anxiety, depression, and insomnia among healthcare professionals as 44.7%, 50.7%, and 36.1%, respectively. They also reported that nurses are more stressed and sleepless than doctors. Lai et al. [5] reported that 44.6% of participants had anxiety, 50.5% had depression, and 34.0% had insomnia in their study of 1257 healthcare workers. They further reported that nurses of the female gender experience more severe symptom levels than nurses of the male gender.

Wang et al. [7] found anxiety (7%), depression (25%), and disturbed sleep quality (38%) (PSQI >7) in their study investigating the sleep quality of 129 health-care personnel members (90% of whom were women) working in a child health center with the use of the BAI, BDI, and PSQI. Wang et al. [7] stated that sleep disturbance is associated with anxiety and depression ( $p < 0.05$ ). Qi et al. [8] found 71.7% poor sleep quality in healthcare workers, of whom 80.1% were women and 78.4% were healthcare workers fighting on the front line. This indicates that women have poorer quality of sleep than men.

Liu et al. [23] found that from the 512 healthcare workers, 84.57% of whom were women, 12.5% of the healthcare professionals who directly cared for, diagnosed, or treated COVID-19 patients had anxiety symptoms. It was found that the variables of gender, age, education, and marital status did not increase the participants' scores. In Türkiye, Elbay et al. [2] conducted a study on the epidemic. In their work, they identified early depressive symptoms in 64.7% and anxiety disorder symptoms in 51.6% and stress related symptoms in 41.2% of physicians. Female gender, younger age, and lifelong psychiatric found that it was independently associated with worse psychiatric outcomes in those with the disorder and those working in front positions.

Like other studies, the participants in our study contained mostly women and nurses (76.7% women and 60.8% nurses). Consistent with the findings of other studies on mental health in healthcare professionals, the frequency of severe anxiety levels was found to be higher in females and nursing healthcare workers than in other groups [24]. In addition, there were significant statistical differences regarding both anxiety and depression levels in the female gender and nurse group healthcare workers with average scores ( $p < 0.005$ ).

In our study, the female gender and the nursing professions had higher scores of both daytime sleepiness and sleep quality. However, a statistically significant difference was present only in low sleep quality scores.

Furthermore, there was a statistically significant positive relationship between anxiety, depression, low sleep quality, and daytime sleepiness scores. In multivariate logistic regression, a substantial effect of depression levels on low sleep quality and daytime sleepiness was determined. In addition, healthcare workers with sleep disorders reported higher anxiety and depression level than those without sleep disorders ( $p=0.000$ ).

In our study, we can attribute the point that the nurses are more psychologically affected than other healthcare workers due to their increased contact and direct care with COVID-19 patients, as well as the higher risk of infection and heavy workload. We believe that the high number of women working in nursing field may contribute to these results. Furthermore, the logistic regression analysis of gender and occupational groups confirms that 3 times as many women have severe anxiety disorders as men.

Many studies have been conducted on sleep quality and insomnia during the COVID-19 pandemic, but no studies have been made to evaluate daytime sleepiness with the use of the ESI. The healthcare sector is a stressful organization that provides 24/7 service, long working hours, and heavy workloads. In terms of studies conducted with healthcare professionals in our country outside the context of the pandemic, Sahan et al.'s [25] ESI study of the sleepiness status of 226 healthy workers found daytime sleepiness in 30.1% of the participants.

Our study found a lower total ESI score and frequency of daytime sleepiness than studies conducted on healthcare workers, except health-care professionals working during pandemics. This unexpected result can be explained by the reduction of stress and psychological pressure of healthcare workers, the preservation of circadian sleep rhythms due to flexible work, and the reduction of working hours, protecting healthcare workers in terms of their psychological state and the risk of contamination during the pandemic period. However, we can still say that regarding psychological problems (anxiety and depression) caused by the pandemic affect daytime sleepiness and sleep quality in healthcare workers, the female gender and the nurse profession are more affected than other groups.

In summary, our results regarding daytime sleepiness show that healthcare workers have low daytime sleepiness rates when their work is flexible. However, sleep disorders may be caused by medical crises with unknown consequences, such as the COVID-19 pandemic, in addition to global fear, panic, emotional, and psychological disorders caused by increased workload, and responsi-

bility in healthcare workers. Furthermore, female gender and being nurse are found to be a risk factor for investigated psychological consequences

The limitation of our study is that it is restricted to a cross-sectional structure and lacks longitudinal follow-up. In addition, since it was conducted in a large teaching hospital, the results may not be generalizable to other hospitals or community settings. Moreover, because it is a questionnaire study, the participants were not diagnosed by a clinician and pre-existing mental health symptoms were not differentiated from new symptoms.

Although a lot of research has been published describing the psychological effects of healthcare professionals working actively during the pandemic, there have been very few studies to date on the various risk factors that can lead to sleep disturbance in healthcare professionals during the COVID-19 pandemic. In our study, levels of anxiety and depression and sleep disorders were evaluated together, and their effects on each other were investigated. According to the best of our knowledge, it is the first study assessing anxiety and depression levels with the ESI and the PSQI distinguishes our study from other studies.

## Conclusion

High rates of increased anxiety and depression levels and sleep disorders have developed in healthcare workers struggling with the COVID-19 pandemic. Therefore, it is essential to identify intervention programs and develop support strategies to prepare healthcare professionals for major global epidemics and disasters, protect their mental health, and increase their psychological resilience. Support and training aimed at strengthening psychological well-being should be given to healthcare workers to increase trust and reduce stress. Particular attention should be paid to protecting of the mental health of women, nurses, and frontline workers.

**Ethics Committee Approval:** The Goztepe Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 03.06.2020, number: 2020/0326).

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