DOI: 10.4149/BLL_2022_133

Bratisl Med J 2022; 123 (11)

833 – 839

CLINICAL STUDY

Impact of the first, second and third peak of the COVID-19 pandemic on anxiety, depression and stress symptoms of healthcare workers

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ABSTRACT

BACKGROUND AND OBJECTIVES: Numerous studies have been conducted on the psychological effects of the COVID-19 pandemic. However, how the mental health of health workers will be affected among the number of peaks during the pandemic has not been evaluated yet. The study aims to investigate the effects of the first, second, and third peaks of COVID-19 on anxiety, depression, and stress symptoms in healthcare workers.

METHODS: The current study included 4031 healthcare workers, 1051 during the first peak period, 1409 during the second peak period, and 1571 during the third peak period. The Depression Anxiety Stress scale-21(DASS-21) was used to assess the participants' levels of anxiety, depression, and stress symptoms.

RESULTS: The mean age of the participants was 33.74 ± 7.95, and 2634 (66.3 %) were female. 36.9 %(n = 1486) of the participants were physicians, 41.1 % (n = 1655) were nurses and 22.1 % (n = 890) were other healthcare workers. A statistically significant difference was documented in the DASS-21 anxiety ($F_{(2:4028)}$ = 502.893, p < 0.001, Post-hoc = 3. Peak > 2. Peak > 1. Peak), DASS-21 depression ($F_{(2:4028)}$ = 46.034, p < 0.001, Post-hoc = 3. Peak > 2. Peak > 1. Peak), DASS-21 stress ($F_{(2:4028)}$ = 65.548, p < 0.001, Post-hoc = 3. Peak = 2. Peak > 1. Peak), and DASS-21 total scores ($F_{(2:4028)}$ = 156.860, p < 0.001, Post-hoc = 3. Peak > 2. Peak > 1. Peak) of healthcare workers during all three peak periods.

CONCLUSIONS: Our findings show that as the peak number rises, so do the levels of anxiety and depression among healthcare workers. As a result, it is possible to assert that prolongation of the COVID-19 pandemic worsens mental problems *(Tab. 2, Fig. 3, Ref. 35)*. Text in PDF *www.elis.sk*

KEY WORDS: anxiety, COVID-19, depression.

Introduction

Despite the development of vaccines for COVID-19 infection, the pandemic has still significant health, economic, and social consequences for many people (1). Many studies have shown that COVID-19 has negative mental effects on both patients and healthy people (2). It is foreseen that if the pandemic is prolonged, these effects will have devastating consequences (3). It is obvious that the social and economic consequences of the pandemic process affect all societies, including developed countries (4, 5). Furthermore, it is certain that the feelings of loneliness, boredom, irritability, restlessness, anger, anxiety, sadness, worry, and family problems, which continue to rise as a result of measures such as school closure, quarantine, exacerbate mental problems (6). Individuals who live far away from their families and loved ones for reasons such as education or work, as well as the elderly who live alone, are more likely to develop mental disorders such as depression and anxiety (7). It is not hard to predict that if the pandemic is prolonged, mental health problems will get worse.

The fact that the number of cases and official records from around the world can be shared online has revealed that the number of cases in various countries fluctuates, with ups and downs and peaks (8). Following the spread of COVID-19 in March 2020, various countries experienced their second and even third peak in their history. As a result, numerous studies have been conducted to investigate possible mood swings between these various peaks (9, 10). The studies focused on the peak periods of the number of cases and the examinations of healthcare workers on mental health through variables such as burnout, somatic symptoms,

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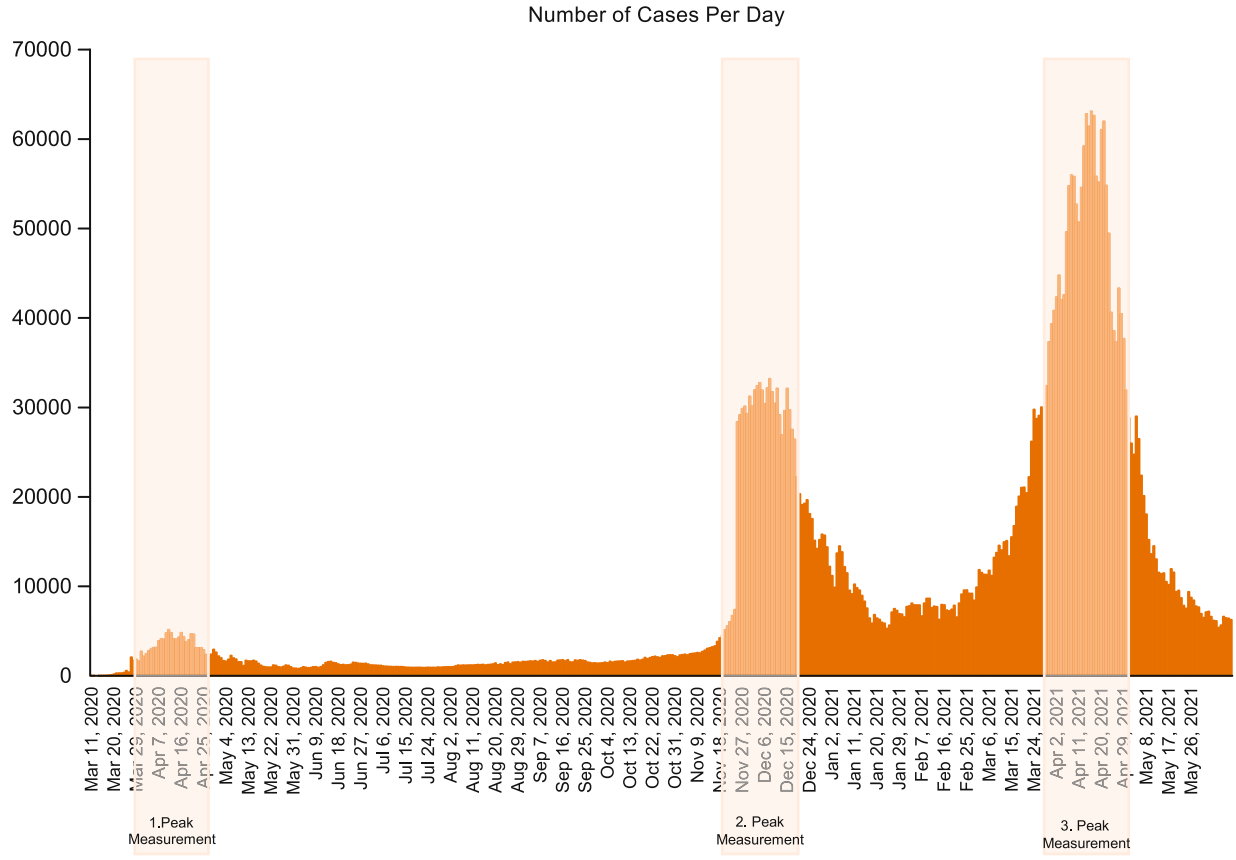

Fig. 1. The number of confirmed daily COVID-19 cases and peak processes in Turkey.

health status, job satisfaction, and the anxiety and depression levels of the general population (11, 12). The results show that negative mental symptoms generally increase in the second peak periods when compared to the first peak periods (10, 13). In a study conducted with Italian nurses, there was no significant difference in anxiety levels between the two peak waves, but there was a significant increase in depression levels between the two peaks (9). We completed and published a study that compared the first two peaks of this study. In the first part of our study, we concluded that the second peak, when the number of cases of healthcare workers in our country increased again, resulted in significantly higher levels of anxiety, depression, and stress than the first peak (10). To summarize, the differences between the peaks indicate that the peaks also have mental health reflections. Besides, studies on the mental effects of COVID-19 peaks in the literature tend to focus on the differences between the two peaks. This is most likely due to the fact that most countries have experienced two peaks. However, despite the fact that there are countries with three peaks, there has been no research on the mental effects of these peaks that we know.

In light of all of this information, the aim of this study is to compare the anxiety, depression, and stress levels of healthcare workers in three different peaks as a follow-up to the study that compared the anxiety, depression, and stress levels of healthcare professionals in two peaks.

Material and methods

Participants

The sample of the current cross-sectional study consists of the doctors, nurses, and healthcare assistants working in the COVID-19 related units during the peak periods of the COVID-19 pandemic. The study included 4031 healthcare workers, 1051 during the first peak period, 1409 during the second peak period, and 1571 during the third peak period. The study's inclusion criteria were determined to be between the ages of 18 and 65, not to have a major psychiatric illness, to have worked in a COVID-19-related unit for at least 15 days, to have experienced a pandemic peak during the period of study, and to volunteer to participate. An online survey was used to invite participants to the study, and informed consent was obtained online. Only consented participants were able to access and fill in the scales. Re-participation through the online scale has been disabled. Scales that were filled in incomplete or out of instruction were excluded from the study. The study was conducted under the responsibility of Psychiatry Department of Kirikkale Yuksek Ihtisas Hospital. Local ethics committee ap-

Tab. 1. Comparison of the sociodemographic data of the participants according to COVID-19 peaks.

Variable	Group			t/χ^2	*df*	p
	1. Peak (n=1051)	2. Peak (n=1409)	3. Peak (n=1571)			
Age; mean±SD (year)	32.94±7.82	32.40±7.60	32.83±7.64	F=1.779	2 (4028)	0.169
Gender; n (%)						
Female	685 (65.2)	952 (67.6)	997 (63.5)	χ^2=5.539	2	0.063
Male	366 (34.8)	457 (32.4)	574 (36.5)			
Marital Status; n (%)						
Married	543 (51.7)	766 (54.4)	885 (56.3)			
Single	392 (37.3)	508 (36.1)	546 (34.8)	χ^2=6.643	4	0.156
Other	116 (11.0)	135 (9.6)	140 (8.9)			
Education Status; n (%)						
High School	33 (3.1)	57 (4.0)	66 (4.2)			
University	554 (52.7)	734 (52.1)	856 (54.5)	χ^2=4.472	4	0.346
Postgraduate	464 (44.1)	618 (43.9)	649 (41.3)			
Income status, n (%)						
Income less than the expense	70 (6.7)	199 (14.1)	350 (22.3)			
Expense equals income	447 (42.5)	662 (47.0)	777 (49.5)	χ^2=193.828	4	<0.001*
Income more than the expense	534 (50.8)	548 (38.9)	444 (28.3)			
Job title, n (%)						
Doctor	381 (36.3)	545 (38.7)	560 (35.6)			
Nurse	454 (43.2)	559 (39.7)	642 (40.9)	χ^2=6.485	4	0.166
Other healthcare workers	216 (20.6)	305 (21.6)	369 (23.5)			
Life style, n (%)						
Family	527 (50.1)	1025 (72.7)	1283 (81.7)			
Single	331 (31.5)	312 (22.1)	180 (11.5)	χ^2=347.779	4	<0.001*
Other (hostel etc.)	193 (18.4)	72 (5.1)	108 (6.9)			
COVID-19 Test, n (%)						
Positive	24 (2.3)	343 (24.3)	535 (34.1)	χ^2=370.779	2	<0.001*
Negative	1027 (97.7)	1066 (75.7)	1036 (65.9)			

* $p \leq 0.05$, F: One-Way ANOVA test, χ^2: Pearson Chi-square test

proval was obtained for the study and all stages were completed in accordance with the principles of the Declaration of Helsinki.

Measures

In accordance with the study's objectives, a sociodemographic data form was developed to question the demographic information of the participants, such as gender, age, employment, and education status, within the scope of the literature. In this section, individuals' COVID-19 test results were also inquired about.

The Depression Anxiety Stress Scale-21 (DASS-21) was used to assess the participants' anxiety, depression, and stress symptoms in accordance with the aim of the study (16). The 21-item scale is a 4-point Likert scale with seven items assessing anxiety, depression, and stress symptoms (14). Each subscale has a score ranging from 0 to 21, and the scale has a score ranging from 0–63. For the practitioner's anxiety subscale, 0–3 points are considered normal, 4–5 points are considered mild anxiety, 6–7 points are considered moderate anxiety, 8-9 points are considered severe anxiety, and 10 points or higher are considered extremely severe anxiety. The scoring for depression is as follows; 0–4 points as normal, 5–6 points as mild depression, 7–10 points as moderate depression, 11–13 points as severe depression, and 14 and higher points as extremely severe depression. The stress subscale is scored as follows: 0–7 points: normal, 8–9 points: mild, 10–12 points: moderate, 13–16 points: severe, and 17 points or higher: extremely severe. The Turkish validity and reliability study of the scale was conducted by Sariçam et al in 2018 (15).

Procedure

This is a cross-sectional study in which the Sociodemographic data form and the DASS-21 scale were used online to compare the anxiety, depression, and stress levels of healthcare workers during the first, second, and third peak periods of the pandemic. The forms were used after obtaining informed consent from the participants. Those who filled out the forms out of instruction or incompletely and did not meet the inclusion criteria were barred from participating in the study. After the forms of the study's participants were scored according to the instructions, they were entered into the appropriate data set and statistically processed.

The current study aimed to compare the symptoms of anxiety, depression, and stress experienced by healthcare workers during the three COVID-19 peak periods. Due to changes in healthcare workers' workplaces during the pandemic, only healthcare professionals working in COVID-19-related units during the peak period were included in the study. Because of the change in duty, repeated measurements in the same healthcare workers were not possible. Peak periods were determined based on the number of cases announced daily by the Republic of Turkey's Ministry of Health (18). Figure 1 depicts the distribution of the number of cases in Turkey as well as the measurement times (16). According to this, the first peak measurements of the participants were done between 04.07.2020 and 05.05.2020, the second peak measurements were done between 22.11.2020 and 20.12.2020 and the third peak measurements were done between 29.03.2021 and 01.05.2021 (Fig. 1). A comparison of healthcare workers' anxiety, depression, and stress levels during the first and second peak periods has previously been presented (10). When the third peak was reached in Turkey, the measurements were repeated, and the third peak period was compared to the first and second peak periods.

Data analysis

SPSS 22.0 was used to perform statistical analyses of the study data. Descriptive data were presented with frequency and percentage for categorical variables and mean and standard deviation for continuous variables. The conformity of the data to normal distribution was tested with Kolmogorov–Smirnov, Skewness and

Kurtosis values. The conformity of continuous variables between the three groups to the normal distribution was assessed and tested using One-way ANOVA. To determine the difference between groups, the Tukey test was used. Chi-square analysis was used for the intergroup comparisons of categorical data. The statistical significance was $p \leq 0.05$.

Results

The mean age of the participants was 33.7 years. The study included 4031 volunteer participants, with 2634 (66.3 %) females and 1397 (34.7 %) males. Of the participants 36.9 % (n = 1486) were doctors, 41.1 % (n = 1655) were nurses, and 22.1 % (n = 890) were other healthcare professionals. The comparison of the sociodemographic data of the two peak groups is presented in Table 1. Accordingly, the two peak groups were statistically similar in terms of age, gender, marital status, educational status, and occupation variables. However, there was a statistically significant difference in terms of income status ($\chi^2 = 193.828$, df = 4, $p < 0.001$), lifestyle ($\chi^2 = 347.779$, df = 4, $p < 0.001$) and COVID-19 test result ($\chi^2 = 370.779$, df = 4, $p < 0.001$) variables between the three groups.

The comparison of DASS-21 anxiety, DASS-21 depression, and DASS-21 stress characteristics of healthcare workers during the three peak periods is presented in Table 2. As a result, there was a statistically significant difference between the groups in terms of DASS-21 depression symptoms level ($F_{(2:4028)} = 46.034$, $p < 0.001$, Post-hoc = 3. Peak > 2. Peak > 1. Peak) (Fig. 2) and severity classification (2nd = 75,649, df = 8, $p < 0.001$). There was a statistically significant difference between DASS-21 anxiety symptoms levels ($F_{(2:4028)} = 502.893$, $p < 0.001$, Post-hoc = 3. Peak > 2. Peak > 1. Peak) (Fig. 2) and severity classification ($\chi^2 = 852$, df = 8, $p < 0.001$). There was a statistically significant difference between DASS-21 stress symptoms levels ($F_{(2:4028)} = 65.548$, $p < 0.001$, Post-hoc = 3. Peak = 2. Peak > 1. Peak) (Fig. 2) and severity classification ($\chi^2 = 75.649$, df = 8, $p < 0.001$). When comparing the DASS-21 total scores, a statistically significant difference was found between the three groups ($F_{(2:4028)} = 156.860$, $p < 0.001$, Post-hoc = 3. Peak > 2. Peak > 1. Peak (Fig. 3).

Discussion

The most important finding of this study, which compares the depression, anxiety, and stress levels of healthcare workers during the COVID-19 pandemic, which increased in three different peaks in our country in April 2020, December 2020, and April 2021, was that the third peak had higher depression and anxiety scores than the previous ones. Anxiety and depression levels were found to rise in each peak when compared to the previous peak. On the other hand, stress levels did not show the same upward trend.

It is known from studies conducted during the pandemic that this illness has a negative impact on mental health (17, 18). It has been demonstrated that mental issues are more prevalent, particularly in countries where restrictions are imposed (19). It is undeniable that the prolongation of the pandemic course and fluctuations in the number of cases have an impact on mental health (20). Peaks, in general, have a negative impact on important psychological symptoms such as anxiety, depression, burnout, somatic symptoms, and PTSD (20). However, there are some studies that show no difference in psychological symptoms when comparing peaks (21–24). The current study, which was planned as a continuation of a previous study that compared the first and second peaks, discovered that anxiety and depressive symptoms in healthcare workers were higher in the third peak than in the first and second peaks (10). The most likely explanation for this result is that the study's population was made up of healthcare workers who were at the forefront of the COVID-19 pandemic. Because the fact that they are dealing with the disease's most painful symptoms in its most basic form is a

Tab. 2. Comparison of the Depression, Anxiety and Stress feature of the participants according to the COVID-19 peaks.

Variable	Group			F/χ^2	*df*	P
	1. Peak (n=1051)	2. Peak (n=1409)	3. Peak (n=1571)			
DASS-21 Depression Score; mean±SD	5.64±3.85	6.52±4.41	7.27±4.41	F=46.034	2 (4028)	<0.001*
	Post-hoc: 3. Peak > 2. Peak > 1. Peak					
Depression Severity; n (%)						
Normal	437 (41.6)	506 (35.9)	462 (29.4)			
Mild	209 (19.9)	236 (16.7)	278 (17.7)			
Moderate	289 (27.5)	414 (29.4)	487 (31.0)	χ^2=75.649	8	<0.001*
Severe	69 (6.6)	146 (10.4)	198 (12.6)			
Extremely severe	47 (4.5)	107 (7.6)	146 (9.3)			
DASS-21 Anxiety Score; mean±SD	3.28 ± 3.02	4.37 ± 3.48	7.50 ± 4.04	F=502.893	2 (4028)	<0.001*
	Post-hoc: 3. Peak > 2. Peak > 1. Peak					
Anxiety Severity; n (%)						
Normal	671 (63.8)	680 (48.3)	250 (15.9)			
Mild	164 (15.6)	234 (16.6)	261 (16.6)			
Moderate	129 (12.3)	253 (18.0)	344 (21.9)	χ^2=852.063	8	<0.001*
Severe	34 (3.2)	116 (8.2)	247 (15.7)			
Extremely severe	53 (5.0)	126 (8.9)	469 (29.9)			
DASS-21 Stress Score; mean±SD	5.47 ± 3.23	6.91 ± 3.82	7.17 ± 4.31	F=65.548	2 (4028)	<0.001*
	Post-hoc: 3. Peak = 2. Peak > 1. Peak					
Stress Severity; n (%)						
Normal	838 (79.7)	860 (61.0)	893 (56.8)			
Mild	97 (9.2)	220 (15.6)	247 (15.7)			
Moderate	99 (9.4)	251 (17.8)	293 (18.7)	χ^2=179.416	8	<0.001*
Severe	13 (1.2)	58 (4.1)	81 (5.2)			
Extremely severe	4 (0.4)	20 (1.4)	57 (3.6)			
DASS-21 Total Score; mean±SD	14.40±8.80	17.81±10.55	21.95±12.28	F=156.860	2 (4028)	<0.001*
	Post-hoc: 3. Peak > 2. Peak > 1. Peak					

*: $p \leq 0.05$, DASS-21: Depression Anxiety Stress Scale-21, F: One-Way ANOVA test, Post-hoc: Tukey test, χ^2: Pearson Chi-Square test

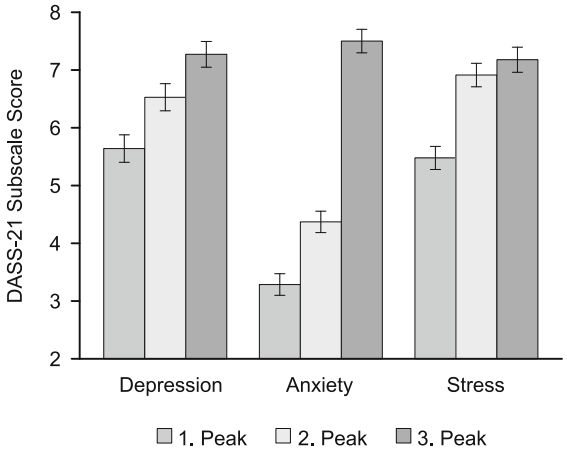

Fig. 2. Comparison of the depression, anxiety and stress levels between the three peaks.

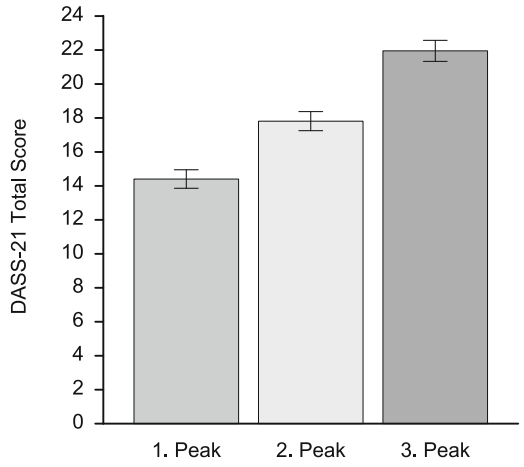

Fig. 3. Comparison of Depression Anxiety Stress Scale-21 scores between the three peaks.

significant factor. It should also be accepted that they are the group most affected by this period (9, 25). When viewed in this light, it is possible that no negative mental state exists between the peaks in studies conducted in the general population or with students (19, 21–23, 26). Studies conducted with healthcare workers confirm the negative effect of peaks according to our article (9, 27). However, it is possible that pandemic-related mental symptoms such as insomnia and burnout of healthcare workers may cause an increase in anxiety and depressive symptoms (23). Furthermore, the fact that healthcare workers are more aware the consequences of the disease and are more likely to comply with measures such as isolation and restriction as they face the consequences may be a contributing factor to the current outcome (19). Although healthcare workers are aware of the importance of seeking psychological assistance and accessing mental health services, time constraints and difficult working conditions can prevent them from doing so (21). Although a vaccine for COVID-19 infection has been discovered, it is not possible to say that it can cause a positive effect that can provide psychological relief to healthcare workers during our country's peak period. Traumatic events such as the demise of patients and colleagues experienced by healthcare workers during the pandemic may increase anxiety and depressive symptoms as a result of PTSD symptoms (28, 29). Staying away from activities that positively affect mental health, such as not being able to engage in social activities and not being able to do physical activities such as sports and walking, may have an effect on the increase in anxiety and depression when compared to non-health workers (28). Finally, SARS CoV-2 mutations and their effects, which emerge as a result of close monitoring of scientific developments, can have a negative impact on healthcare workers (28, 29). Given all of this information, the increase in symptoms of healthcare workers during the pandemic should be regarded as expected.

Another significant finding of our study is that stress symptoms in healthcare workers did not increase in the third peak when compared to the second peak (22). The most likely explanation for this result is that healthcare workers' mental resilience began to improve, and they began to develop coping mechanisms. On the other hand, increasing vaccination applications and developing policies to support them might be perceived as a sign of hope and reduce the mental strain on healthcare workers (26, 30). Individuals may feel less helpless if they believe the pandemic will end (31). The relaxed restriction practices may also have provided some relief to individuals (1). The long duration of the pandemic may have increased people's ability to find and use self-sufficiency behaviors to manage their stress (32). Previous research has found a link between self-sufficiency and stress and anxiety levels, and that self-sufficiency may be protective against depression (33, 34).

Another finding from our study was that, even after the vaccination campaign was launched to provide social immunity throughout the country and public awareness of the infection increased, COVID-19 test positivity in healthcare workers continued to rise. It is worth noting that these results are significantly higher when compared to the general population. It is certain that this disease, as well as the risk of transmitting a disease to their relatives, has a negative impact on the mental health of healthcare workers (29).

It is well known that during the pandemic duration, the economic situation deteriorates, job opportunities become scarce, income inequality increases and purchasing power declines. (10) However, previous research has shown that people with low incomes and who are economically disadvantaged are at a higher risk of developing depression symptoms (19). In our study, as in the literature, the economic situation deteriorated compared to previous peak periods, and so did the income-expenditure balance. Although our country's health sector has more job opportunities than other sectors, it was thought that the reason for this economic deterioration, which we determined in our study, could be financial difficulties experienced by individuals working in other sectors in the family, in addition to the economic effects of the pandemic on countries (29).

We discovered that the number of people living with their families increased in the last wave of the pandemic compared to previous periods. The reason for this is that, in the early stages

of the pandemic, healthcare workers did not want to stay in their own homes for fear of infecting their family members, but as the methods of infection protection were better understood during the pandemic, the uncertainty regarding the infection was slightly reduced, and the vaccine reached the family members of healthcare workers and the financial challenges of out-of-home accommodation made the workers thinking of going back home. However, as previously stated, the reason there is no significant relationship between the stress levels of healthcare workers between the last two peak periods can be attributed to the fact that returning to the home environment, which is a social interaction area, and providing family support increases the capacity to tolerate stress (35).

The results of this study can be evaluated within some limitations. The first is that psychometric measurements could not be taken in all three peaks of the study's same healthcare workers. Because of health policies, healthcare workers alternately work in COVID-19-related clinics. As a result, healthcare workers who worked in COVID-19-related units during peak periods were included in the study. A second limitation is that the participants' depression, anxiety, and stress levels during the pre-pandemic period are unknown, and the sample population does not represent the entire universe. Secondly, the fact that participants reported their current problems through online communication channels via self-report scales may have prevented the conduction of an objective evaluation. The last limitation is that the long-term consequences of the physical and mental symptoms of healthcare workers could not be evaluated prospectively due to the cross-sectional design of the study.

Conclusion

Despite the information on the infection, vaccination studies, and public awareness studies, as a result of this research conducted on the mental health of healthcare workers working at the forefront in the fight against the pandemic, the reasons such as healthcare workers' workload, lack of equipment, uncertainties about when the pandemic will end, and burnout revealed that healthcare workers have experienced higher levels of anxiety and depression symptoms in the third peak period compared to the second peak period. It is critical to provide psychological counseling to healthcare workers across the country, regulate working conditions, and arrange treatment as needed owing to this situation.

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Received June 7, 2022.
Accepted July 6, 2022.