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Investigating the psychological impact of COVID-19 on healthcare workers in the intensive care unit

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Ethics Committee Approval
Final confirmed ethical approval was obtained from the Social and Humanities Research Ethical Committee of Istinye University (Decision date: 16.04.2020, decision number: 2020/04.02). All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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No conflict of interest was declared by the authors.

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Abstract

Background/Aim: The disease caused by the SARS-CoV-2 virus, COVID-19, has become the first viral disease outbreak defined as a pandemic in the 21st century. Experience with previous endemics shows that critical care workers disproportionately suffer from depression and anxiety after facing such outbreaks; however, data are limited regarding the early phase of spread. Our aim was to investigate depression and anxiety in healthcare workers employed in ICUs during the initial phase of COVID-19 spread in Istanbul, Turkey, and possible relationships with various characteristics of healthcare workers.

Methods: This cross-sectional study evaluated descriptive and demographic characteristics, professions, COVID-19-related perceptions, depression and anxiety in healthcare workers from the 12 ICUs of six hospitals located in Istanbul, Turkey. The Beck Depression (Beck-D) and Anxiety (Beck-A) Inventories and the State-Trait Anxiety Inventory (STAI) TX-I and TX-II were used to assess depression and anxiety. Employees that worked in ICUs were included, regardless of profession, ICU type (neonatal/pediatric or adult), age, education and working status. We compared recorded data among employees with regard groups based on ICU type, sex, education status, profession, marital status, children, cohabiting status, and whether they were residing at their home. Additionally, multivariable regression analyses were performed to identify factors that were independently associated with scores obtained from the depression and anxiety scales.

Results: A third of the studied population were found to have moderate-to-severe levels of depression and anxiety according to the Beck-D and Beck-A scales. The STAI TX-I scores were similar in all comparison groups except for significantly higher scores in participants living with their family/friends (P=0.027). STAI TX-II scores were higher in pediatric/neonatal ICU workers (P=0.001), nurses (P=0.002), employees without children (P=0.046), and those residing in their home (P=0.031). Beck-D scores were higher in nurses (P=0.001), those with lower education (P=0.025), subjects without children (P=0.008) and individuals living with their family/friends (P=0.002). Beck-A scores were higher in participants with lower education (P=0.001), nurses (P<0.001), those without children (P=0.049), subjects living with their family/friends (P=0.001), and those not residing in their home (P=0.003). There were only weak correlations between COVID-19-related perceptions and scale scores. Multivariable regression showed that being a physician and living alone were independently associated with lower Beck-D and Beck-A scores.

Conclusion: The psychological impact of COVID-19 seems to be unassociated with disease-related perceptions during the early spread of disease, but about a third of ICU employees were found to have clinically-relevant levels of depression and anxiety. Our results show that nurses should receive continuous mental assessment and support, and that ICU employees may benefit from being provided with accommodation when caring for patients with diseases such as COVID-19.

Keywords: COVID-19, Healthcare workers, Anxiety, Depression, Altruism, Social support

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Introduction

Viral disease outbreaks have emerged as a frequent threat to the world, with recent examples such as SARS-CoV-1, MERS-CoV, H1N1, Zika and Ebola in the last 15 years [1]. Although the most recent outbreak (SARS-CoV-2 causing COVID-19) seems to have lower mortality/morbidity rates compared to most other examples, it has become the first to be defined as a pandemic in the 21st century [2]. As a result of its rapid transmission and fast rate of disease progression in severe cases, this disease exceeded the number of mortalities caused by all recent outbreaks combined, even before it was defined as a pandemic [3]. COVID-19 has caused or resurfaced healthcare deficiencies, major economic problems, international adversities and limitations in social support [4-7]. However, healthcare workers, who are often described to be on the frontlines of this 'war', are maybe the worst affected due to the possibility of disease contraction, increased workload, stigmatism, and the social/psychological impact of constant daily exposure to the worst cases of the disease [8-11].

In the response to COVID-19, lack of equipment, protective gear and limited access to supplies (both healthcare-related and personal) are among the problems that must be addressed immediately [12]; however, the psychological implications of these and other emerging problems, such as the possibility of carrying the disease to loved ones, being isolated from social surroundings, lack of mental support and the anxiety and depression caused by all aspects of facing this disease head-on [13], are also critical for an adequate response to this pandemic. Furthermore, our experience with previous epidemics has shown that, after intensive care unit (ICU) personnel return to routine workloads, the psychological impact of these events may lead to significant problems in the short and long term [14, 15].

It is evident that many factors are involved in healthcare workers' perception and response to such ordeals. Fear, stress, anxiety, depressive feelings, self-perception, social support, sufficient knowledge/training and altruism are among the most important personal attributes that determine an individual's role as a healthcare worker [16, 17]. These attributes are even more important for those in emergency or critical care, as it has been shown that these employees have a greater risk for psychiatric problems, including anxiety and depression [18]. These findings have recently been supported by results from studies investigating the mental well-being of healthcare workers who responded to COVID-19 in China [19, 20].

Our aim in this study performed during the early phase of the COVID-19 pandemic was to determine the depression- and anxiety-related problems (measured via self-report questionnaires) of healthcare workers employed in the ICUs of six hospitals in Istanbul, Turkey, and to identify whether these findings were associated with demographic or profession-related characteristics. In order to determine the influence of caring for patients with COVID-19, we included individuals from adult ICUs (who were actively responding to COVID-19) and pediatric ICUs (who were not receiving any patients with COVID-19 at the time of the study).

Materials and methods

In this cross-sectional study, the impact of the COVID-19 pandemic on Turkish healthcare workers employed in six adult and six pediatric ICUs (including one neonatal ICU) were analyzed via an online questionnaire form prepared on SurveyMonkey (tr.surveymonkey.com). Preparation of the form was performed after the first confirmed COVID-19 case was reported in Turkey (March 10, 2020). We planned to include all persons who were primarily employed in an ICU, regardless of profession, ICU type (pediatric or adult), age, education and working status (day, night or shifts). The inclusion of pediatric ICU staff and workers was done to be able to compare the characteristics of individuals with or without (or very limited) exposure to COVID-19 patients. Employees were asked two questions to determine their exposure to patients with COVID-19: (i) whether their ICU had admitted any patients with COVID-19, and (ii) whether they had directly cared for (or carried out their duties in a room with) patients diagnosed with COVID-19 as part of their employment.

Two weeks after the first case and on the day at which the confirmed number of cases surpassed 2000 (March 25), a total of 650 individuals from the following six institutions in Istanbul received the questionnaire: Acibadem University Hospital, Memorial Yeniyuzyil University Hospital, Istinye University Liv Hospital, Okmeydani Research and Training Hospital, Bakirkoy Dr. Sadi Konuk Research and Training Hospital and Goztepe Research and Training Hospital. For a response to be included in the analysis, we defined a threshold of at least 90% completion of the form. According to this definition, a total of 576 responses (88.6% of total) were accepted and received by March 30 –the day on which data gathering was completed.

Questionnaire

All participants filled a self-report questionnaire that included demographic/descriptive questions, work-related questions, and the State-Trait Anxiety Inventory (STAI) TX-I and TX-II scales in addition to Beck depression inventory (Beck-D) and Beck anxiety inventory (Beck-A) scales. We must note that, although the STAI-TX-I and the Beck-A scales investigate similar characteristics, we utilized both to be able to (i) ascertain whether the two STAI measures demonstrated any alterations (considering state/trait differences), and (ii) to be able to directly compare the results obtained from the Beck anxiety and STAI-TX-I scale if necessary. The questionnaire included queries about individuals' choices and actions based on the COVID-19-related problems among healthcare workers (disease-related perceptions). These included the assessment of self-perceptions regarding knowledge level, psychological effects, patient care and social isolation. Additionally, subjects were asked whether they were uncomfortable about going home after work, and whether they were temporarily living somewhere other than their home. Apart from these two, the remaining questions were assessed on a scale from 0 to 10. Scoring was as follows: 0 was defined as least perception or lack of bearing on the individual, while 10 indicated the highest degree of self-perception or influence on the individual. The questionnaire was prepared with respect to prior studies' findings and was given its final form after preliminary application of the questionnaire to a group of

residents and nurses employed in an ICU (n=19) who reported that the questionnaire was understandable.

Questions Specific to COVID-19 Perceptions

The following questions, prepared by the researchers and translated to English with the best possible explanatory context, were presented to all individuals. Each of these items were assessed on a scale from 0 to 10:

- How much knowledge do you feel that you have concerning COVID-19? (0: none, 10: complete)
- As an ICU worker, what is the level of psychological burden you feel due to COVID-19? (0: none, 10: heaviest burden ever felt in the ICU)
- How willing are you to care for patients with COVID-19? (0: not willing at all, 10: would volunteer if necessary)
- What is the degree of social isolation you feel due to COVID-19? (0: none, 10: worst social isolation ever felt)
- How uncomfortable do you feel about going home from the ICU during this period? (0: no change compared to usual, 10: extremely high discomfort / cannot go home)
- How worried are you about contracting COVID-19? (0: not worried at all, 10: constantly worrying during work)
- How much do you fear carrying home the virus causing COVID-19? (0: no fear at all, 10: worst fear ever felt)

We evaluated the answers to these questions as "disease-related perceptions" and investigated their correlations and/or relationships with other variables.

State-Trait Anxiety Inventory

This inventory has two subsections: the STAI TX-I is used to assess the 'state' anxiety levels of individuals, while the STAI TX-II is used to investigate 'trait' anxiety levels. The inventory was developed by Spielberger [21] and the Turkish validity and reliability study of the scale was performed by Oner and Le Compte [22]. Each subsection consists of 20 items. Total score ranges between 20-80 points in both sub-scales of the scale, and the level of anxiety is proportional to the score.

Beck depression and anxiety inventories

The depression and anxiety of individuals were assessed with the Beck-D and the Beck-A. The Beck-D consists of 21 items that are used to report the intensity of symptoms or attitudes related to depressive characteristics, each scored on a scale of 0 to 3 [23]. The Beck-A also consists of 21 items (for anxiety-related questions) that are scored in the same way as the Beck-D (from 0 to 3) [24].

Ethics

This study was conducted according to the Helsinki Declaration. Necessary permissions for the questionnaire and its application were obtained from the Deanery of the primary center of the study after a small-committee review of our study plan (due to precautions associated with the pandemic). Final confirmed ethical approval was obtained from the Social and Humanities Research Ethical Committee of Istinye University (Decision date: April 16, 2020; decision number: 2020/04.02).

Statistical analysis

All analyses were performed on SPSS v21 (SPSS Inc., Chicago, IL, USA). Q-Q and histogram plots were used to determine whether variables were normally distributed. Data are given as mean (standard deviation) or median (1st quartile - 3rd quartile) for continuous variables with regard to normality of distribution and frequency (percentage) for categorical variables. Normally distributed variables were analyzed with the independent samples t-test or one-way analysis of variances (ANOVA) depending on group count. Pairwise comparisons after initial ≥3-group analyses were performed with the Tukey test. Non-normally distributed variables were analyzed with the Mann-Whitney U or the Kruskal-Wallis tests depending on group count, and pairwise comparisons of these variables were performed with the Bonferroni correction method. Spearman correlation coefficients were calculated for the assessment of relationship between continuous variables. Multiple linear regression analysis (stepwise selection method) was performed to determine factors independently associated with total scale scores. Two-tailed p values of less than 0.05 were considered statistically significant.

Results

Among the 576 respondents, 285 were employed in pediatric ICUs and 291 were employed in adult ICUs. Mean age was 31.5 (8.1) years overall, 58% were females and 42% were males. 86.3% were continuing to stay in their own home. In terms of education status, 442 of the participants (76.7%) were university graduates or had received higher education; concurrently, 86.8% of the respondents were either physicians or nurses. With respect to exposure to patients with COVID-19, we found that 95.9% of adult ICU workers were aware that their ICU had admitted patients with COVID-19, while this value was 0% for pediatric ICUs. On the other hand, 93.5% of adult ICU workers and 8.1% of pediatric ICU workers reported that they had had direct exposure to a patient with COVID-19 or had carried out their duties in a room with a patient with COVID-19. Marriage status was evenly distributed, 48.1% were married and 51.9% were single; however, only 69 individuals (12%) lived alone in their household. The majority did not have children (63.5%) (Table 1).

When overall scores were evaluated, we found mean STAI-TX-I and TX-II scores to be 53.41 (10.55) and 44.20 (7.61) points, respectively. The Beck-D score showed normal results in 36.7% of participants, while the Beck-A score was normal in 38.2% of participants. Median Beck-D total score was 12 (7–20) and median Beck-A total score was 13 (7–21) points; however, the percentage of individuals with moderate or severe symptom intensity was 32.5% in Beck-D and 35.6% in Beck-A (Table 1).

When total scores obtained from each scale were compared with regard to groups, we found that only the STAI TX-II score demonstrated a significant difference with regard to being employed in a pediatric or adult ICU (P=0.001). Gender, marital status and number of people in the household were not associated with any of the scores; however, interestingly, those with children had lower total scores for STAI TX-II and Beck-D and Beck-A (P=0.046, P=0.008 and P=0.049, respectively) (Table 2).

Table 1: Summary of participants' characteristics and total scale scores

Parameter	Value
Intensive care unit type (n=576)	
Pediatric	285 (49.48%)
Adult	291 (50.52%)
Gender (n=576)	
Female	334 (57.99%)
Male	242 (42.01%)
Age, years (n=575)	30 (25 - 38)
Education status (n=576)	
Primary	8 (1.39%)
High	126 (21.88%)
University	289 (50.17%)
Masters	58 (10.07%)
Doctorate	95 (16.49%)
Profession (n=576)	
Doctor	164 (28.47%)
Nurse	336 (58.33%)
Medical Secretary	34 (5.90%)
Cleaning Staff	12 (2.08%)
Others (medical technician, administrative staff, etc.)	30 (5.21%)
Working years (n=573)	7 (3 - 14)
Has your ICU admitted any patients with COVID-19? (n=576)	
Adult ICU employees (‘Yes’)	279 (95.9%)
Pediatric ICU employees (‘Yes’)	0 (0%)
Have you had direct exposure to patients with COVID-19? (n=576)	
Adult ICU employees (‘Yes’)	272 (93.5%)
Pediatric ICU employees (‘Yes’)	23 (8.1%)
Marital Status (n=576)	
Married	277 (48.09%)
Single	299 (51.91%)
Children (n=576)	
None	366 (63.54%)
Present, age <16	177 (30.73%)
Present, age >16	33 (5.73%)
Number of people in household (n=576)	
≥ 6	42 (7.29%)
3 - 5	333 (57.81%)
2	132 (22.92%)
1	69 (11.98%)
Knowledge level (n=576)	8 (6 - 8)
Degree of psychological burden (n=576)	8 (7 - 10)
Willingness to care for patients with COVID-19 (n=574)	6 (4 - 8)
Degree of social isolation felt (n=576)	8 (5 - 10)
Degree of discomfort about going home (n=576)	10 (9 - 10)
Residing at home (n=576)	497 (86.28%)
Degree of worry concerning disease contraction (n=576)	8 (6 - 10)
Fear level of carrying the disease home (n=576)	10 (10 - 10)
STAI TX-I Total Score (n=571)	53.41 (10.55)
STAI TX-II Total Score (n=569)	44.20 (7.61)
Beck-D Total Score (n=569)	12 (7 - 20)
Normal	209 (36.73%)
Mild (10–16 points)	175 (30.76%)
Moderate (17–29 points)	140 (24.60%)
Severe (30–63 points)	45 (7.91%)
Beck-A Total Score (n=571)	13 (7 - 21)
Normal	218 (38.18%)
Mild (10–16 points)	150 (26.27%)
Moderate (17–29 points)	133 (23.29%)
Severe (30–63 points)	70 (12.26%)

Data are given as mean (standard deviation) or median (1st quartile - 3rd quartile) for continuous variables with regard to normality of distribution, and as frequency (percentage) for categorical variables

On the other hand, education level and profession were found to be significantly influential on both the depression and anxiety total scores of the Beck scales. The Beck-D and Beck-A scores were both found to be significantly higher in nurses compared to physicians (P=0.001 and P<0.001, respectively). Subjects with lower levels of education were found to have higher Beck-A scores compared to individuals that had received higher education (P=0.001). Finally, we also found that subjects who were not residing at their own home had significantly higher Beck-A scores than those that were residing at their homes (P=0.003); however, Beck-D scores were similar between these two groups. Additionally, there was a statistically significant but marginal decrease in STAI TX-II scores among individuals who were not residing at home (P=0.031) (Table 2).

Table 2: Comparison of total scale scores between groups

	STAI TX-I Total Score	STAI TX-II Total Score	Beck-D Total Score	Beck-A Total Score
Intensive care unit type				
Pediatric	54.08 (10.36)	45.28 (7.44)	13 (7 - 20)	12 (7 - 21)
Adult	52.76 (10.70)	43.15 (7.64)	12 (7 - 20)	13 (7 - 21)
P-value	0.134	0.001	0.662	0.445
Gender				
Female	53.44 (10.00)	44.06 (6.88)	12 (7 - 19)	13 (7 - 21)
Male	53.37 (11.29)	44.39 (8.51)	12 (7 - 21)	11 (6 - 22)
P-value	0.934	0.623	0.667	0.228
Education Status				
Primary & High	53.35 (10.50)	44.93 (6.93)	14 (8 - 20) [a]	15 (10 - 24)
University	53.82 (10.99)	44.27 (7.24)	12 (7 - 21) [ab]	12 (7 - 22) [a]
Master & Doctorate	52.69 (9.73)	43.44 (8.74)	11 (6 - 17) [b]	11 (6 - 16) [a]
P-value	0.558	0.251	0.025	0.001
Profession				
Physician	51.98 (10.05)	42.45 (8.00) [a]	11 (6 - 16) [a]	9.5 (6 - 15.5) [a]
Nurse	54.16 (10.37)	45.00 (7.11) [b]	14 (8 - 21) [b]	14 (8 - 23.5) [b]
Others	53.18 (12.08)	44.48 (8.30) [ab]	11 (7 - 22) [ab]	13 (4 - 21) [ab]
P-value	0.080	0.002	0.001	<0.001
Marital Status				
Married	54.30 (10.35)	44.06 (7.98)	12 (7 - 18)	12 (7 - 23)
Single	52.59 (10.68)	44.33 (7.25)	13 (8 - 21)	13 (7 - 21)
P-value	0.052	0.677	0.254	0.581
Children				
Absent	53.99 (10.30)	44.68 (7.57)	13 (8 - 21)	13 (7 - 21)
Present	52.40 (10.93)	43.37 (7.62)	10.5 (6.5 - 17)	11 (6 - 21)
P-value	0.081	0.046	0.008	0.049
Lives				
With Family/Friend	53.77 (10.45)	44.31 (7.48)	13 (7 - 20)	13 (7 - 22)
Alone	50.78 (10.95)	43.38 (8.50)	8 (5 - 16)	10 (4 - 13)
P-value	0.027	0.338	0.002	0.001
Residing at home				
Yes	53.35 (10.63)	44.47 (7.65)	12 (7 - 20)	12 (7 - 21)
No	53.81 (10.08)	42.47 (7.15)	13.5 (8 - 18)	15.5 (11 - 22)
P-value	0.718	0.031	0.471	0.003

Data are given as mean (standard deviation) or median (1st quartile - 3rd quartile) for continuous variables with regard to normality of distribution. Same letters denote the lack of statistically significant difference between groups in pairwise comparison.

Analysis of correlations between parameters yielded only a few notable findings. There were weak relationships between STAI TX-I total scores and two parameters: psychological effect of the disease (r = 0.426, P<0.001) and being afraid of contracting the disease (r = 0.403, P<0.001). Other correlations were too weak to be noted; nevertheless, a majority of analyses showed statistical significance (Table 3).

Table 3: Relationship between age, working year, answers to questions and total scale scores

		STAI TX-I Total Score	STAI TX-II Total Score	Beck-D Total Score	Beck-A Total Score
Age	r	-0.035	-0.131	-0.174	-0.139
	P	0.408	0.002	<0.001	0.001
Working year	r	-0.004	-0.112	-0.135	-0.107
	P	0.932	0.008	0.001	0.011
Knowledge level	r	-0.028	-0.159	-0.053	-0.066
	P	0.501	<0.001	0.204	0.116
Degree of psychological burden	r	0.426	0.154	0.310	0.245
	P	<0.001	<0.001	<0.001	<0.001
Willingness to care for patients with COVID-19	r	-0.179	-0.215	-0.146	-0.069
	P	<0.001	<0.001	<0.001	0.102
Degree of social isolation	r	0.367	0.296	0.287	0.140
	P	<0.001	<0.001	<0.001	0.001
Degree of discomfort about going home	r	0.384	0.141	0.260	0.201
	P	<0.001	0.001	<0.001	<0.001
Degree of worry concerning disease contraction	r	0.403	0.279	0.289	0.226
	P	<0.001	<0.001	<0.001	<0.001
Fear level of carrying the disease home	r	0.363	0.117	0.237	0.242
	P	<0.001	0.005	<0.001	<0.001

r: Spearman correlation coefficient

Multiple linear regression analyses for the Beck-D and Beck-A scales were performed to determine factors that demonstrated significant relationships with total score from each scale. The following variables were included in the models: ICU type, gender, education status, profession, marital status, children (present/absent), co-inhabiting (alone/shared) and residence status (home/other). Results were similar for both scales, being a physician and living alone were the only two variables found to be independently associated with lower Beck-D (P=0.007 and P=0.009, respectively) and lower Beck-A scores (P<0.001 and P=0.002, respectively) (Tables 4 and 5).

Table 4: Significant related factors with the Beck-D Scale total scores, multiple linear regression analysis

	β1	SE	β2	t	*P*-value	95% CI for β	
(Constant)	18.558	1.443		12.862	<0.001	15.724	21.392
Profession (Physician)	-2.398	0.884	-0.113	-2.711	0.007	-4.134	-0.661
Living Alone	-3.223	1.222	-0.109	-2.637	0.009	-5.624	-0.822

β1: Unstandardized β, β2: Standardized β, SE: Standard Error, Dependent Variable: Beck-D Total Score; R2=0.025; F=7.358; *P*=0.001

Table 5: Significant related factors with the Beck-A Scale total scores, multiple linear regression analysis

	β1	SE	β2	t	*P*-value	95% CI for β	
(Constant)	20.733	1.609		12.885	<0.001	17.573	23.894
Profession (Physician)	-3.927	0.982	-0.164	-3.999	<0.001	-5.856	-1.998
Living Alone	-4.146	1.363	-0.125	-3.042	0.002	-6.824	-1.469

β1: Unstandardized β, β2: Standardized β, SE: Standard Error, Dependent Variable: Beck-A Total Score; R2=0.044; F=12.946; *P*<0.001

Discussion

Healthcare workers throughout the world have been severely affected by the COVID-19 outbreak. Although some attention has been given to the physical and daily needs of healthcare workers, their psychological well-being has not received sufficient interest due to the immediate risks imposed by the disease. However, it is well established that healthcare workers employed in emergency and intensive care have significantly increased risks for adverse psychological outcomes [18].

Our investigation of ICU employees' depressive feelings and anxiety showed that education level, type of profession, having children, and cohabiting status (alone vs. not alone) were significantly influential on both depression and anxiety. However, interestingly, working in an ICU with or without COVID-19 patients (adult vs. pediatric ICU) had no bearing on the levels of depression or anxiety. This was in conflict with a very recent study from China that reported worse mental health outcomes in healthcare workers that were in the front lines during COVID-19 [12]. There are many factors that may influence an individual's response to threats of this magnitude. Among these, altruism, personal fear, family-related fear, stigmatism and social support seem to play an important role [25-27]. When these factors are assessed with regard to their face value, it is rather compelling to suggest that our findings (lower anxiety scores in those with children, higher scores in single people and lower scores in those that live alone) are conflicting. However, it is possible to associate these seemingly conflicting results with altruism and social support. The self-sacrificing attitude shown by healthcare workers in this crisis may have helped them to overcome fear and anxiety. For instance, considering the high education levels of this group, it is possible that knowing their children are relatively safe from COVID-19 could have reduced anxiety and depressive feelings, in addition to the mental support provided by their children. Also, those living alone could be feeling content for the fact that they have little possibility of transmitting the disease to a loved one. Finally, although it is a given that married people have the risk of carrying the disease home which would negatively affect their mental well-being, the fact that married couples have been shown to have higher levels of social support that improve health-related outcomes [28-30] may be an important factor that reduces their levels of anxiety and depressive feelings; thus causing a lack of statistical significance in pairwise comparison of marital status. We also believe that we should note the significantly higher Beck-A scores among individuals who were not residing in their homes (86.3% of the study group), indicating increased anxiety, most probably due to being afraid of the risk of carrying the disease to their loved ones at home. Another crucial finding to note was the fact that around one-third of all ICU employees were found to have either moderate or severe symptom intensity in both the Beck-D and the Beck-A scales.

With regard to questions specific to COVID-19 outbreak, we found that the majority of persons were highly concerned about this disease. However, it was interesting to observe that there were only weak correlations between disease-specific questions assessing the impact of these factors on individuals (from 0 to 10) and scores that were obtained from the depression or anxiety scales. We believe that these results can be explained by the fact that healthcare workers were coping well with the possibilities lying ahead, even though they were well aware of the dangers of this pandemic. Our belief is that the current study indicates the need for continuous social and mental support during the spread of COVID-19.

We also found that physicians had significantly lower scores compared to other healthcare workers; whereas nurses had higher scores than any other profession. A recent study by Zhu et al. also showed that nurses and medical technicians had higher levels of stress compared to physicians [31]. A previous study in Emergency Department workers responding to SARS also had similar findings and showed that nurses had a higher risk for stress when compared to other healthcare workers in emergency departments [32]. In a study similar to ours, Lai and colleagues also found that being a nurse (among other variables) was associated with worse mental health symptoms [12]. Our results with the Beck-D and Beck-A scores showed that nurses had worse results compared to other professions. The present findings support the majority of previous studies that indicate nurses may be especially vulnerable to the adverse psychological effects of disease outbreaks such as COVID-19 [12, 33, 34]. It is also noteworthy that physicians seem to consistently have lower degrees of severity in psychological evaluations and/or outcomes throughout these studies. A somewhat conflicting result was reported in healthcare workers caring for COVID-19 patients in Singapore. Particularly interesting was the fact that front-line nurses included in the study had significantly lower traumatization scores when compared with nurses that were not in the front-line of COVID-19 care [35]. The authors attributed this difference to the high preparedness level of their country (due to experience with SARS) and the possibility that front-line nurses had better overall experience and training. While this conclusion may indeed be true, it is also important to note that their study was performed in a period of almost 3 weeks in which the number of COVID-19 patients rose from 84 to 200, without any deaths [35]. Thus, it is arguable that healthcare workers in their sample were not representative of a group that had experienced the impact of COVID-19 to its full extent.

Zhu and colleagues reported that, increased risk for stress, depression and anxiety during COVID-19 were independently associated with the following risk factors: being female, having a history of mental disorder or chronic disease, having relatives with COVID-19, and being an employee for over 10 years (possibly due to age) [31]. In the current study,

multivariate regression analyses with Beck-D and Beck-A as dependent variables demonstrated that both of these scales were independently associated with the same two parameters: being a physician and living alone. Each of these parameters significantly reduced Beck-D and Beck-A scores. Therefore, contrary to the previous study, gender and working years were not found to be associated with any of the scores in our study group; however, our study was performed in the early period of the spread of COVID-19 in Turkey, which may be the cause of indifference in scores, especially with regard to the age parameter as the number of mortalities were relatively low in this period.

We believe our findings indicate the heightened senses of self-sacrifice and altruism among ICU workers in the face of this pandemic. However, we also conclude that social support mechanisms may be crucial in the long term. Particularly considering the possibility of increased workloads and exhaustion in the following weeks, we believe any and all precautions should be taken to protect the psychological well-being of healthcare employees, especially those employed in ICUs, in this trying period. Our conclusions regarding these results are supported by previous smaller-scale studies exploring this topic [36-38] and also a recent systematic review [39], as well as studies from Turkey which showed increased COVID-19-related anxiety among females [40] and worse mental-wellbeing among patients [41].

Limitations

These results in our group of healthcare workers should be cautiously evaluated, as this study was performed 2 weeks after the first case of COVID-19 was confirmed in Turkey (begun on the day with 2000 confirmed cases and ended on the day with over 10000 confirmed cases); additionally, we did not perform longitudinal follow-up. However, considering the speed of the spread and the fact that Istanbul had a disproportionally high number of COVID-19 patients (relative to population) at the time of the study, we believe our results represent the targeted sample very well. Another limitation is the fact that the spread of disease and the increase in mortalities after the study period could have influenced healthcare workers' perceptions and attitudes. It is also important to note that the baseline variations between employees of pediatric and adult ICUs could have affected the results. Additionally, since this is a cross-sectional study applying an online questionnaire, it may have been susceptible to recall bias and non-response bias. However, neither of these problems are likely to have affected outcomes; recall bias would have been minimal with regard to the fact that the questions consisted of personal or work-related parameters, and we ensured that non-response bias was virtually non-existent (88.6% response rate) by following up with potential participants and reminding them about the study and the questionnaire form sent to them. Sampling bias may also come to mind, but the response rate and the fact that all individuals working in the ICU were included in the study (regardless of any factors) is an important strength of the present study. Finally, we chose to apply both the STAI and Beck anxiety scales, because the STAI scale would have been more valuable to assess COVID-19-related variations in state and trait anxiety; whereas, the Beck scales would have been more reliable to assess possible contrasts in depressive and anxiety-related findings. Further studies must be carried out to investigate the psychological burden of COVID-19 on healthcare workers in the following weeks and months.

Conclusion

It seems that the psychological impact of COVID-19 on healthcare workers is largely unassociated with COVID-19-related perceptions, but a third of the participants had moderate or severe levels of depression and anxiety –which may have been clinically relevant and must be evaluated in future studies. Furthermore, univariate analyses suggest that nurses are a group which may need continuous support to ensure mental well-being, indicating the need for targeted interventions aimed at increasing coping during the pandemic. Multivariable regression showed that being a physician and living alone were independently associated with lower Beck-D and Beck-A scores. Therefore, providing accommodation for ICU employees who choose to stay away from their home during COVID-19 could reduce short and long-term problems related to depression and anxiety.

References

1. Ryu W-S. Chapter 21 - New Emerging Viruses. In: Ryu W-S, ed. Molecular Virology of Human Pathogenic Viruses. Boston: Academic Press; 2017. pp. 289-302.
2. Cucinotta D, Vanelli M. WHO Declares COVID-19 a Pandemic. Acta Biomed. 2020;91(1):157-60.
3. Mahase E. Coronavirus: covid-19 has killed more people than SARS and MERS combined, despite lower case fatality rate. British Medical Journal Publishing Group; 2020.
4. Wang G, Zhang Y, Zhao J, Zhang J, Jiang F. Mitigate the effects of home confinement on children during the COVID-19 outbreak. Lancet. 2020;395(10228):945-7.
5. Mckibbin WJ, Fernando R. The global macroeconomic impacts of COVID-19: Seven scenarios. Asian Econ Pap. 2021;20(2):1–30.
6. Baldwin R, Tomiura E. Thinking ahead about the trade impact of COVID-19. Economics in the Time of COVID-19. London, UK: CEPR Press; 2020.
7. Del Rio C, Malani PN. COVID-19-new insights on a rapidly changing epidemic. JAMA. 323(14):1339-40.
8. Wang J, Zhou M, Liu F. Exploring the reasons for healthcare workers infected with novel coronavirus disease 2019 (COVID-19) in China. J Hosp Infect. 2020;105(1):100-1.
9. Calisher C, Carroll D, Colwell R, Corley RB, Daszak P, Drosten C, et al. Statement in support of the scientists, public health professionals, and medical professionals of China combatting COVID-19. Lancet. 2020;395(10226):e42-e3.
10. AYANIAN, John Z. Mental health needs of health care workers providing frontline COVID-19 care. In: JAMA Health Forum. American Medical Association, 2020. pp. e200397-e200397.
11. Huang Y, Zhao N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 epidemic in China: a web-based cross-sectional survey. Psychiatry Res. 2020;288:112954.
12. Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, et al. Factors Associated With Mental Health Outcomes Among Health Care Workers Exposed to Coronavirus Disease 2019. JAMA Netw Open. 2020;3(3):e203976.
13. Maunder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, et al. The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. CMAJ. 2003;168(10):1245-51.
14. Bai Y, Lin CC, Lin CY, Chen JY, Chue CM, Chou P. Survey of stress reactions among health care workers involved with the SARS outbreak. Psychiatr Serv. 2004;55(9):1055-7.
15. Lee AM, Wong JG, Mcalonan GM, Cheung V, Cheung C, Sham PC, et al. Stress and psychological distress among SARS survivors 1 year after the outbreak. Can J Psychiatry. 2007;52(4):233-40.
16. Mcalonan GM, Lee AM, Cheung V, Cheung C, Tsang KW, Sham PC, et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. Can J Psychiatry. 2007;52(4):241-7.
17. Ho C, Chee C, Ho R. Mental Health strategies to combat the psychological impact of Coronavirus Disease 2019 (COVID-19) beyond paranoia and panic. Ann Acad Med Singap. 202016;49(3):155-60.
18. Naushad VA, Bierens JJ, Nishan KP, Firjeeth CP, Mohammad OH, Maliyakkal AM, et al. A systematic review of the impact of disaster on the mental health of medical responders. Prehosp Disaster Med. 2019;34(6):632-43.
19. Ying Y, Kong F, Zhu B, Ji Y, Lou Z, Ruan L. Mental health status among family members of health care workers in Ningbo, China during the Coronavirus Disease 2019 (COVID-19) outbreak: a cross-sectional study. BMC Psychiatry. 2020;20(1):379.
20. Kang L, Li Y, Hu S, Chen M, Yang C, Yang BX, et al. The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. Lancet Psychiatry. 2020;7(3):e14.
21. Spielberger CD. State-trait anxiety inventory for adults. APA PsycTests. 1983.
22. Öner N, Lecompte WA. Durumluk-sürekli kaygı envanteri el kitabı: Boğaziçi Üniversitesi Yayınları; 1985.
23. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry. 1961;4(6):561-71.
24. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol. 1988;56(6):893-7.
25. Feldman MD. Altruism and Medical Practice. J Gen Intern Med. 2017;32(7):719-20.
26. Mikkola L, Suutala E, Parviainen H. Social support in the workplace for physicians in specialization training. Med Educ Online. 2018;23(1):1435114.
27. Yassi A, Zungu M, Spiegel JM, Kistnasamy B, Lockhart K, Jones D, et al. Protecting health workers from infectious disease transmission: an exploration of a Canadian-South African partnership of partnerships. Global Health. 2016;12:10.
28. Han SH, Kim K, Burr JA. Social support and preventive healthcare behaviors among couples in later life. Gerontologist. 2019;59(6):1162-70.

29. Williams AM, Cano A. Spousal mindfulness and social support in couples with chronic pain. Clin J Pain. 2014;30(6):528-35.
30. Ryan LH, Wan WH, Smith J. Spousal social support and strain: impacts on health in older couples. J Behav Med. 2014;37(6):1108-17.
31. Zhu Z, Xu S, Wang H, Liu Z, Wu J, Li G, et al. COVID-19 in Wuhan: Immediate psychological impact on 5062 health workers. medRxiv. 2020:15;21.
32. Wong TW, Yau JK, Chan CL, Kwong RS, Ho SM, Lau CC, et al. The psychological impact of severe acute respiratory syndrome outbreak on healthcare workers in emergency departments and how they cope. Eur J Emerg Med. 2005;12(1):13-8.
33. Chan AO, Huak CY. Psychological impact of the 2003 severe acute respiratory syndrome outbreak on health care workers in a medium size regional general hospital in Singapore. Occup Med (Lond). 2004;54(3):190-6.
34. Shih F-J, Gau M-L, Kao C-C, Yang C-Y, Lin Y-S, Liao Y-C, et al. Dying and caring on the edge: Taiwan's surviving nurses' reflections on taking care of patients with severe acute respiratory syndrome. Appl Nurs Res. 2007;20(4):171-80.
35. Tan BYQ, Chew NWS, Lee GKH, Jing M, Goh Y, Yeo LLL, et al. Psychological impact of the COVID-19 pandemic on health care workers in Singapore. Ann Intern Med. 2020:18;173(4):317-20.
36. Au-Yong PA, Peh WM, Koh FH, Teo LM, Ng SP, Tan AL, et al. Perceptions of healthcare workers in high-risk areas of a Singapore hospital during COVID-19: a cross-sectional study. Singapore Med J. 2021.
37. Vindrola-Padros C, Andrews L, Dowrick A, Djellouli N, Fillmore H, Bautista Gonzalez E, et al. Perceptions and experiences of healthcare workers during the COVID-19 pandemic in the UK. BMJ Open. 2020;10(11):e040503.
38. Van Der Goot WE, Duvivier RJ, Van Yperen NW, De Carvalho-Filho MA, Noot KE, Ikink R, et al. Psychological distress among frontline workers during the COVID-19 pandemic: A mixed-methods study. PLoS One. 2021;16(8):e0255510.
39. Da Silva FCT, Barbosa CP. The impact of the COVID-19 pandemic in an intensive care unit (ICU): Psychiatric symptoms in healthcare professionals. Prog Neuropsychopharmacol Biol Psychiatry. 2021;110:110299.
40. Demir ÜF. The effect of COVID-19 pandemic on sleeping status. J Surg Med. 2020;4(5):334-9.
41. Bozkurt E, Kurtses Gürsoy B, Atay E, Bilir A, Kaynarca Ö. Perceived stress level and health anxiety during COVID-19 pandemic period in patients with diabetes mellitus and hypertension: A prospective cross-sectional study. J Surg Med. 2021;5(8):785-90.

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