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Healthcare workers' sleep quality after COVID-19 infection: A cross-sectional study

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Abstract

Introduction: The COVID-19 pandemic not only affected physical health but also caused high levels of mental health problems including sleep disturbances, depression and post-traumatic stress symptoms. The aim of this study was to examine the sleep parameters of healthcare workers before COVID-19 infection and after recovery.

Materials and Methods: Healthcare workers who were infected with COVID-19 and whose treatment was completed at least 30 days ago were included in the study. A web-based cross-sectional survey was conducted on the participants.

Results: The median PSQI score increased significantly after COVID-19 infection (7.0) compared with the level before COVID-19 infection (5.0). The increases in median scores for subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medication and daytime dysfunction were all significant.

Conclusion: Sleep quality decreased during the convalescence period from COVID-19 infection as compared with the pre-COVID-19 period.

1 | INTRODUCTION

Sleep is an important biological process for maintaining homeostasis and quality of life. Increased sleep quality has positive effects on physical and mental health.[1] Sleep loss negatively affects immune responses by disrupting the circadian rhythm of the body.[2] Sleep disorders have been shown to have a strong impact on infectious disease risk, the occurrence and progression of many diseases, and the incidence of depression.[3]

The COVID-19 pandemic not only affected physical health but also caused high levels of mental health problems including sleep disturbances, depression, and post-traumatic stress symptoms.[4,5] It has been shown that the need for isolation, which arises as part of combating this disease, impairs the sleep quality in healthy people.[6] Similarly, healthcare workers, who are at the forefront in combating this pandemic, face an extraordinary workload because of the health measures implemented globally. It is clear that healthcare workers are physically and mentally affected by the pandemic because of the ongoing crisis.[7]

Six months after symptom onset, the main complaints of patients recovering from COVID-19 were fatigue, muscle weakness and sleep difficulties. Sleep difficulties were one of the most common symptoms with a rate of 26%.[8] Although there are studies showing impaired sleep quality in hospitalised COVID-19 patients,[9] to the best of our knowledge, there is no study in the literature examining the sleep parameters of patients before COVID-19 infection and after discharge. This is the first study in this context.

The aim of this study was to examine the sleep parameters of healthcare workers before COVID-19 infection and after recovery.

2 | MATERIALS AND METHODS

2.1 | Study design

The present study was designed as a prospective, cross-sectional study. Participants who fully completed the questionnaire from 1 March 2021 to 15 March 2021 were included in the study. The

study was initiated after the approval of the local ethics committee (E48670771-512.10-50).

2.2 | Patient selection

Healthcare workers who were infected with COVID-19 and whose treatment was completed at least 30 days ago were included in the study. The patients included in the study consisted of patients who were infected with COVID-19 and whose reverse transcriptase PCR test was positive at the time of illness. Those under the age of 18, who did not sign the consent form at the beginning of the questionnaire, did not fully complete the questionnaire, and whose treatment was finished less than 30 days ago were excluded from the study.

2.3 | Collection of data

In this study, a web-based cross-sectional survey was conducted on the participants. We used e-questionnaire developed by Google Form. With a short presentation, the participants were informed about the aims of the study, and electronic informed consent was requested from each participant before starting the study. Participants were able to withdraw from the survey without any justification and no data was recorded. No personal data that would reveal the identity of the participants was collected during the study. The questionnaire took ~10 minutes to complete. In the questionnaire, demographic data of the patients, such as age, gender, body mass index, number of night shifts in a month, smoking history, time of COVID-19 infection, whether they were hospitalised because of COVID-19, and questions about sleep quality before and after the illness were asked. The Pittsburgh Sleep Quality Index (PSQI), an 18-item questionnaire, was used to measure sleep quality. The validity and reliability of PSQI in the Turkish patient group were proven in a previous study.[10] PSQI includes items that evaluate sleep quality, sleep duration, sleep latency, habitual sleep efficiency, sleep disturbances, use of sleeping medication and daytime dysfunctions. Each dimension is scored from 0 to 3, and the total score is between 0 and 21. PSQI scores higher than 5 points indicate poor sleep quality.

2.4 | Primary outcome

To identify differences or changes in the quality of sleep of patients recovering from COVID-19 infection.

2.5 | Statistical analysis

Descriptive statistics were presented as mean ± standard deviation and median with 25%-75% interquartile range (IQR) for continuous variables depending on their distribution. Numbers and percentages were used for categorical variables. The normal distribution of

> **What's known**
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> People who contracted Covid-19 before suffering many problems as anxiety and depression in their daily life.
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> **What's new**
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> Sleep quality decreased during the convalescence period from COVID-19 infection as compared with the pre-COVID-19 period. There is no previous before-after COVID-19 research about sleep quality and disorder. This is the first article in this aspect.

numerical variables was analysed by the Shapiro-Wilk, Kolmogorov-Smirnov and Anderson-Darling tests.

The Wilcoxon test was used for comparisons between the Pittsburgh Sleep Quality Index scores of healthcare professionals before and after COVID-19 infection. NparLD package in R-project software was used to evaluate the effects of several demographic and clinical variables on Pittsburgh Sleep Quality Index before and after COVID-19 infection.

For statistical analysis, Jamovi project (2020), Jamovi (Version 1.6.16.0) [Computer Software] (Retrieved from https://www.jamovi.org) and JASP (Version 0.14.1.0) (Retrieved from https://jasp-stats.org) were used. The significance level (P-value) was set at .05 in all statistical analyses.

3 | RESULTS

Initially, a total of 275 participants were enrolled in the study, of which 9 participants were excluded from the study because they did not complete the questionnaire and 18 were excluded because they had COVID-19 infection less than 30 days ago. Thus, a total of 248 people were included in the study.

The mean age of the group was 32.8 (±8.0) years, 118 (47.6%) participants had a normal weight and 29% of the participants were smoking. The median number of night shifts of the participants was 2.0 [2.0-3.0]. The median duration after COVID-19 infection was 75 [50.3-120] days, and 31 (12.5%) participants were hospitalised for COVID-19. All descriptive values were shown in Table 1

The median PSQI score increased significantly after COVID-19 infection (7.0) compared with the level before COVID-19 infection (5.0) (P < .001). The increases in median scores for subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction were all significant (P < .001, P < .001, P < .001, P < .001, P = .008, P < .001, P < .001 and P < .002, respectively) (Table 2, Figure 1).

We evaluate the effects of several sociodemographic factors on the change of PSQI subscale scores before and after COVID-19 infection. Body mass index had a significant effect on sleep duration (P = .028) and a higher BMI was associated with more change

TABLE 1 Sociodemographic and COVID disease-related features of the healthcare personnel

	Overall (n = 248)
Age, mean ± SD	32.8 ± 8.0
Sex (%)	
Male	118 (47.6)
Female	130 (52.4)
BMI (%)	
Below 19 (underweight)	8 (3.2)
19-24.9 (normal)	118 (47.6)
25-29.9 (overweight)	89 (35.9)
30-34.9 (obese)	23 (9.3)
Above 35 (morbid obese)	10 (4.0)
Smoking (%)	
Yes	72 (29.0)
No	176 (71.0)
Count of night shift, Median [IQR; 25%–75%]	2.0 [2.0-3.0]
How many days ago you contracted COVID? median [IQR; 25%–75%]	75 [50.3-120]
Have you been hospitalized because of COVID? (%)	
Yes	31 (12.5)
No	217 (87.5)

Note: Descriptive statistics were summarized as mean ± standard deviation or median [IQR; 25%–75%] according to normal distribution of data. Categorical variables were given with number (%).
Abbreviation: IQR, interquartile range.

TABLE 2 Pittsburgh Sleep Quality Index parameters of the healthcare personnel before and after COVID disease

	Before COVID disease	After COVID disease	P-value*
Pittsburgh Sleep Quality Index	5.0 [4.0-8.0]	7.0 [4.0-11.0]	<.001
Subjective sleep quality	1.0 [1.0-1.0]	2.0 [1.0-2.0]	<.001
Sleep latency	1.0 [0.0-2.0]	1.0 [0.8-2.0]	<.001
Sleep duration	0.0 [0.0-1.0]	0.0 [0.0-1.2]	<.001
Sleep efficiency	0.0 [0.0-1.0]	0.0 [0.0-2.0]	.008
Sleep disturbance	1.0 [1.0-1.0]	1.0 [1.0-2.0]	<.001
Use of sleep medication	0.0 [0.0-0.0]	0.0 [0.0-0.0]	<.001
Daytime dysfunction	1.0 [0.0-2.0]	1.0 [0.0-2.0]	.002

Note: Descriptive statistics were summarized as median [IQR; 25%-75%].
Abbreviation: IQR, interquartile range.
*The Wilcoxon test was used.

(Figure 2A). Smoking had a significant effect on sleep latency (P = .018) and being a smoker caused a more significant change (Figure 2B). Gender had a significant effect on sleep duration (P = .017) and sleep efficiency (P = .023). Being a male was associated with a more significant change in these two subscales (Figure 2C,D). The number of night shifts in a week significantly affected subjective sleep quality (P = .038) and sleep efficiency (P = .043). The duration after COVID-19 infection (number of days passed) significantly affected subjective sleep quality (P = .038).

4 | DISCUSSION

Even 6 months after the diagnosis of COVID-19, most patients report at least one symptom. Among these reported symptoms, sleep difficulties occupy an important place with a rate of 23%. After critical illness, especially after intensive care, sleep disturbance is quite common even up to 1 year.[11,12] Improving sleep quality to speed recovery from COVID-19 infection and prevent the need for intensive care will significantly reduce the risk of critical illness.[13] In the present study, the subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medication and daytime dysfunction were significantly increased in patients recovering from COVID-19 infection. In this respect, the importance of sleep in terms of both physical and psychological health should be kept in mind, especially in healthcare workers fighting in the front lines after COVID-19 infection.[8] In a case series, three out of four patients reported worsening in subjective sleep quality and sleep problems, including changes in subjective sleep quality, sleep latency and daytime function, were detected in the vast majority (85%) of patients who recovered from COVID-19 infection and were followed up for 8 weeks after discharge.[1,14] In a study of 35 patients recovering from COVID-19 infection, sleep quality was associated with both gender and the severity of pneumonia.[15] There are studies in which sleep disorders were found to be significantly higher in inpatients compared with outpatients.[16] Similar to the post-SARS-COV-1 syndrome, there are studies reporting post-COVID syndrome with sleep disturbance in patients recovering from COVID-19.[17]

Providing frontline healthcare during outbreaks, such as COVID-19, which is on top of the world's agenda, contributes significantly to the risk of mental health problems in healthcare workers both in the short and long term.[18] In a study conducted with 105 people, a group of healthcare workers on duty during the COVID-19 pandemic was compared with a group that worked before the COVID-19 pandemic. The PSQI score of the group working during the pandemic was 10.62 and the PSQI score of the group not working during the pandemic was 4.92, and it was found that the pandemic caused strong changes in sleep patterns and quality.[19] As found in the present study, it has been shown that not only COVID-19 infection but also quarantine measures affect sleep patterns and sleep quality.[20] There are studies reporting worsened sleep quality in approximately one-quarter of the participants after quarantine.[21] In a study conducted on nurses, the average PSQI score was 7.26, and it was shown that female nurses were more easily affected by sleep disorders than male nurses.[22] According to our findings, we found that male healthcare workers were more affected by sleep

FIGURE 1 The comparison of Pittsburgh Sleep Quality Index total and subscale scores before and after contracting COVID-19 disease
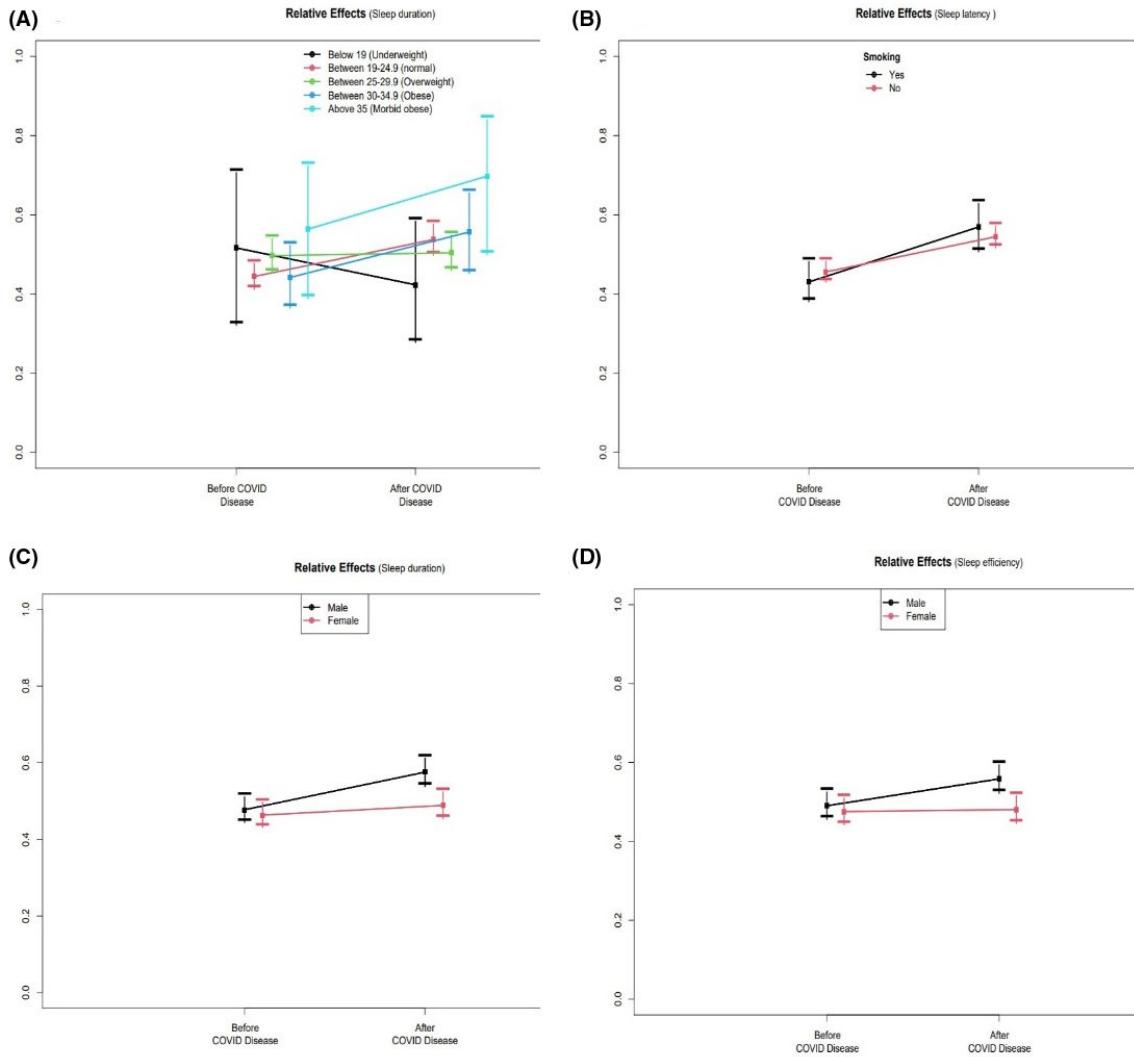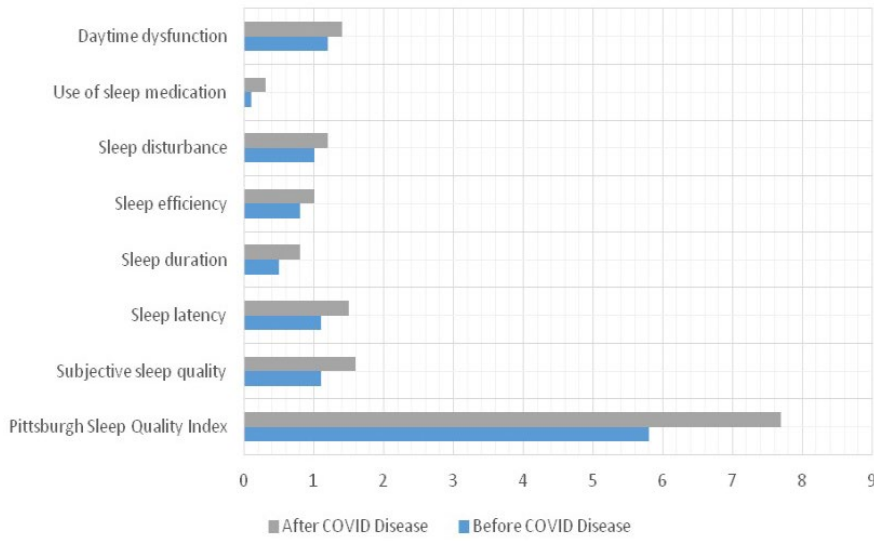

FIGURE 2 A, The effect of body mass index on the change in sleep duration before and after COVID-19 disease. B, The effect of cigarette smoking on the change in sleep latency before and after COVID-19 disease. C, The effect of gender on the change in sleep duration before and after COVID-19 disease. D, The effect of gender on the change in sleep efficiency before and after COVID-19 disease

disorders after COVID-19 infection. In a study conducted with civil servants working outside the health sector, the average PSQI score of 4.535 showed that the incidence of sleep disorders was lower.[22] There are studies suggesting that certain occupational factors are associated with the psychological outcomes of healthcare workers during an infectious disease outbreak.[23] It was thought that working in a high-risk environment, quarantine conditions, and work-related stress worsened psychological consequences, and this stress was associated with sleep quality.[20,23,24] However, there are studies that argue that the effect of coronaviruses is broad and that they are not specific to mental health.[25]

People who smoke are at risk for poor sleep quality.[26] In the present study, smoking increased sleep latency. BMI had a significant effect on sleep duration and increased BMI was associated with more changes. Similar studies have shown that as BMI increases, sleep duration decreases.[27]

5 | STUDY LIMITATIONS

The present study has several limitations. First, memory bias may have been a factor for the questions directed at the pre-COVID-19 period. Conducting the study only with health sector employees and not in other occupational groups may have had an effect on the results. Potential confounding factors that could cause sleep disturbances, such as caffeine intake, dietary status, medical history and night shift details, were not addressed in the present study to keep the questionnaire as short as possible.

6 | CONCLUSION

Sleep quality decreased during the convalescence period from COVID-19 infection as compared with the pre-COVID-19 period. The increase in PSQI scores for subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleeping medication, and daytime dysfunction were all significant. In addition, smoking, male gender, and high BMI were identified as important factors in reducing sleep quality. Preventive measures should be taken to protect the health status of healthcare workers during the pandemic.

CONFLICTS OF INTEREST
The authors have declared no conflicts of interest.

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