RESEARCH

Fatigue and Sleep Quality Levels of Post-COVID-19 Healthcare Workers and Affecting Factors

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Abstract: Healthcare workers (HCWs) are the occupational group with the highest potential to be affected by infectious diseases and epidemics. In this study, it was aimed to reveal the fatigue and sleep quality levels of HCWs who survived COVID-19 and influencing factors. This cross-sectional study was conducted with 133 post-COVID-19 HCWs who applied to internal medicine outpatient clinic between March 1, 2021, and April 15, 2021, in Turkey. Sociodemographic Data Form, Fatigue Assessment Scale (FAS) and Pittsburgh Sleep Quality Index (PSQI) were used to obtain research data. More than half of the post-COVID-19 HCWs had fatigued (55.6%) and had poor sleep quality (59.4%). The mean fatigue and sleep quality score was higher under the age of 40. Increasing PSQI score (the worse sleep quality), increased the fatigue 1.54 times. Being female worsened sleep quality 6.61 times, being overweight worsened sleep quality 4.81 times, and increasing FAS score worsened sleep quality 1.39 times. In this study, it was determined that post-COVID-19 HCWs had high levels of fatigue and poor sleep quality. For the health service to continue without interruption during the prolonged pandemic process, it is thought that the situations that may negatively affect the work performance of HCWs should be minimized.

INTRODUCTION

Healthcare workers (HCWs) have been affected by many different infectious diseases until today and they are the occupational group with the highest potential to be affected by future epidemics[1]. They are at higher risk of transmission due to contact with patients with high viral loads and inadequate personal protective equipment[2],[3],[4],[5]. Indeed, WHO has identified HCWs as a group at risk of developing physical and mental problems as a result of working directly or indirectly with COVID-19 patients[6].

Fatigue is seen as one of the most common complaints in people infected with SARS-CoV-2, and its prevalence has been shown to range from 44-69.6%[7],[8],[9]. These results have raised concerns that the COVID-19 agent has a risk of triggering a post-viral fatigue syndrome[10],[11]. On the other hand, the rate of sleep disorder in people after COVID-19 has been reported as 30.8%[12]. Indeed, many COVID-19 cases have been found to develop a severe post-viral syndrome called "post-COVID-19 Syndrome" with a persistent chronic fatigue state, impaired sleep-wake cycle, neurocognitive effects, and progressive anhedonia[13].

Fatigue and sleep quality levels are among the most common problems in post-COVID-19 people, which can negatively affect their work performance. It is obvious that HCWs lead the fight against pandemic and that they are the most worn-out occupational group both physically and mentally during the pandemic process all over the world. It is considered important to take protective measures as soon as possible to prevent this situation. Therefore, in this study, it was aimed to reveal the fatigue and sleep quality levels of post-COVID-19 HCWs and affecting factors.

METHOD

The study was conducted in accordance with the recommendations of the Declaration of Helsinki and was approved by the Local Ethics Committee (2021-03/04, 10.03.2021).

Participants: This cross-sectional study was conducted with post-COVID-19 HCWs who applied to Sivas Cumhuriyet University Hospital internal medicine outpatient clinic between March 1, 2021 and April 15, 2021 for any reason. According to Sivas Provincial Health Directorate data, 1,925 COVID-19 cases were seen among HCWs in the city centre from the beginning of the pandemic until February 9, 2021. In power analysis (G*Power 3.1.9.7 program) [Tails = two, Effect size = 0.4, α err probe = 0.05, Power (1- β err probe) = 0.95] it was found to include at least 124 individuals. The study

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was completed with 133 volunteers whom the COVID-19 PCR test turned negative and who applied to the outpatient clinic within the specified period. The polymerase chain reaction (PCR) test results of the participants were checked electronically (Ministry of Health e-Pulse Personal Health System). Those with chronic illnesses or psychiatric disorders that could manifest themselves with fatigue were not included in the study. The individuals who agreed to participate in the study were informed about the study and their written informed consent was obtained. Sociodemographic Data Form, Fatigue Assessment Scale (FAS) and Pittsburgh Sleep Quality Index (PSQI) were used to obtain research data. Data collection tools were applied to the participants by the researchers.

The Sociodemographic Data Form: The participants' age, gender, marital status, occupation, height, body weight, COVID-19 diagnosis date, smoking status and COVID-19 treatment type were questioned.

FAS: It was used to determine the fatigue levels of individuals. It was created by Michielsen et al. and Cronbach's alpha value was reported to be 0.87[14]. The FAS is a 10-item scale that assesses symptoms of fatigue. Each item of FAS is a five-point Likert-type scale ranging from 1 ("never") to 5 ("always"). Items 4 and 10 were reverse scored. Total scores can range from 10 representing the lowest level of fatigue to 50 representing the highest. If the FAS score is <22; no fatigue, if the FAS score is between 22-34; fatigued and if the FAS score ≥35; is considered to be over-fatigued[15].

PSQI: It was used to determine sleep quality of individuals[16]. It consists of 19 items and its score varies between 0-21 points. When the score is less than five, sleep quality is good, while when the score is five or higher, sleep quality is poor. Sensitivity was determined as 89.6% and specificity 86% in PSQI[16]. The reliability and validity study of the test was demonstrated by Agargun et al.[17].

Statistics: The data obtained from our study were evaluated with the SPSS 22.0 program. Descriptive statistics such as mean, standard deviation and percentage distribution were calculated in the evaluation. The normality of the data was measured with the Kolmogorov-Simirnov test. Since the data did not meet the parametric conditions, Mann Whitney U test was used for two independent groups and Kruskal Wallis (post hoc Mann Whitney U) test was used for more than two groups. Chi-square test was used to evaluate the data obtained by counting. Binary logistic regression analysis was performed. To predict post-COVID-19 fatigue scores; gender, age group, marital status, occupation, smoking, body mass index (BMI), COVID-19 treatment type, duration after recovery from COVID-19 and PSQI score were included in the model. To predict post-COVID-19 sleep quality scores; gender, age group, marital status, occupation, smoking, BMI, COVID-19 treatment type, duration after recovery from COVID-19 and FAS score were included in the model. The level of error was taken as 0.05.

FINDINGS

Sociodemographic characteristics of the HCWs and distribution of these characteristics according to post-COVID-19 FAS and PSQI are presented in Table 1. Most of the participants were female, most were under 40, and most were married. Most of them did not smoke and most of them had BMI at underweight / normal weight level. Most of the participants had completed their COVID-19 treatments as outpatient. Most of the HCWs were fatigued and most of them had poor sleep quality. The sleep quality of female HCWs was worse than that of male (p = 0.001) (Table 1).

Table 2 shows the distribution of the means of the post-COVID-19 FAS and PSQI by sociodemographic characteristics of the HCWs. The mean fatigue score of HCWs under the age of 40 was higher than those aged 40 and over (p = 0.010). The mean sleep quality score was higher in female (p= 0.001), those under 40 years of age (p= 0.019), and those who were overweight (compared to obese) (p= 0.012) (Table 2).

Logistic regression model predicting post-COVID-19 fatigue scores is given in Table 3. Increasing PSQI score (the worse sleep quality), increased the fatigue 1.54 times (p= 0.001). (Table 3).

Table 4 shows logistic regression model predicting post-COVID-19 sleep quality scores. Being female worsened sleep quality 6.61 times (p= 0.002), being overweight worsened sleep quality 4.81 times (p= 0.017) and increasing FAS score worsened sleep quality 1.39 times (p= 0.001) (Table 4).

DISCUSSION

In our study, we aimed to reveal the fatigue and sleep quality levels of HCWs who survived COVID-19 and influencing factors. The number of HCWs infected with COVID-19 continues to increase both in our country and worldwide, and it is thought that this will have a significant impact on healthcare systems[18],[19],[20]. Therefore, it is extremely important to determine the physical and mental well-being of HCWs who have survived COVID-19. However, we found a limited number of studies in the literature on HCWs who survived COVID-19.

In a study conducted with post-COVID-19 individuals in which more than half of the participants (51.6%) were HCWs, Townsend et al. found the prevalence of fatigue to be 52.3% similar to our study[21]. They reported that female was more in the severe fatigue group (p = 0.002), but no differences in age, BMI, as in our study. Although it was not significant in our study, female was more in the group we defined as fatigued / over-fatigued (56.2%). In the same study, researchers did not observe any relationship between being a HCW and meeting the case definition of fatigue[21].

In a systematic review and meta-analysis study of HCWs exposed or infected with COVID-19, the frequency of fatigue among HCWs was found to be 38.0%[22]. On the other hand, the frequency of fatigue in the general population infected with COVID-19 was found to be between 42.4- 46.1% according to the meta-analysis results[23],[24]. The reason that the frequency of fatigue in HCWs we detected in our study is higher than previous studies and the general population may be that the workload intensity of HCWs continues to increase with the prolongation of the pandemic process. Continuous exposure to viral loads from patients can interact with high environmental stress that can affect the immune system[25],[26]. This could explain the increase in physical symptoms of COVID-19 in HCWs over time.

In a study in Kingdom of Saudi Arabia conducted with 200 post-COVID-19 patients who applied to the pulmonology clinic for follow-up, the FAS score of the participants was found to be 40.8 ± 5.8 and it was higher in male than in female[27]. The reason for this result, which was calculated much higher than the FAS score mean we found in our study, may be that this study was conducted with individuals with continuing post-COVID-19 pulmonary complaints. On the other hand, similar to our study the researchers did not reported any relationship between fatigue score and age, marital status and smoking[27].

In the study by Salazar de Pablo et al. the frequency of poor sleep among HCWs was found to be 37.9% during the COVID-19 pandemic[22]. In the another meta-analysis study, it was reported that the pooled prevalence of HCWs' insomnia was 27.8% during the pandemic and it was higher in nurses compared to physicians (42.4% vs. 39.1%)[28]. In our study, the sleep quality of female HCWs was worse than that of male, and considering that most of the nurses were female, the findings of both studies were consistent with each other. In the same study the researchers found the overall prevalence of HCWs' impaired sleep quality as 64.3% during the pandemic similar to the

Table 1. Sociodemographic characteristics of the healthcare workers and distribution of these characteristics according to post-COVID-19 Fatigue Assessment Scale and Pittsburgh Sleep Quality Index

Characteristic		Fatigue Assessment Scale (n=133)		Pittsburgh Sleep Quality Index (n=133)	
	Total	Non- Fatigued	Fatigued/Over-Fatigued	Good Sleep Quality	Poor Sleep Quality
	n (%)	n (%)	n (%)	n (%)	n (%)
		59(44.4)	74(55.6)	54(40.6)	79(59.4)
Gender					
Male	60(45.1)	27(45.0)	33(55.0)	34(56.7)	26(43.3)
Female	73(54.9)	32(43.8)	41(56.2)	20(27.4)	53(72.6)
		x^2= 0.018 p= 0.893		x^2= 10.516 p= 0.001	
Age group (years)					
X ± SD	36.0 ± 9.7; Min=18, Max=63				
<40	83(62.4)	32(38.6)	51(61.4)	29(34.9)	54(65.1)
≥40	50(37.6)	27(54.0)	23(46.0)	25(50.0)	25(50.0)
		x^2= 2.423 p= 0.120		x^2= 2.343 p= 0.126	
Marital status					
Single + Widow	43(32.3)	21(48.8)	22(51.2)	14(32.6)	29(67.4)
Married	90(67.7)	38(42.2)	52(57.8)	40(44.4)	50(55.6)
		x^2= 0.283 p= 0.595		x^2= 1.247 p= 0.264	
Occupation					
Physician	45(33.8)	18(40.0)	27(60.0)	18(40.0)	27(60.0)
Nurse/Midwife	36(27.1)	17(47.2)	19(52.8)	11(30.6)	25(69.4)
Other Healthcare Workers	52(39.1)	24(46.2)	28(53.8)	25(48.1)	27(51.9)
		x^2= 0.534 p= 0.766		x^2= 2.718 p= 0.257	
Smoking					
No	98(73.7)	13(37.1)	22(62.9)	18(51.4)	17(48.6)
Yes	35(26.3)	46(46.9)	52(53.1)	36(36.7)	62(63.3)
		x^2= 0.645 p= 0.422		x^2= 1.740 p= 0.187	
Body Mass Index					
Underweight / Normal weight	61(45.9)	29(47.5)	32(52.5)	24(39.3)	37(60.7)
Overweight	50(37.6)	20(40.0)	30(60.0)	17(34.0)	33(66.0)
Obese	22(16.5)	10(45.5)	12(54.5)	13(59.1)	9(40.9)
		x^2= 0.646 p= 0.724		x^2= 4.062 p= 0.131	
COVID-19 treatment					
Outpatient treatment	127(95.5)	57(44.9)	70(55.1)	50(39.4)	77(60.6)
Inpatient treatment	6(4.5)	2(33.3)	4(66.7)	4(66.7)	2(33.3)
		*p= 0.693		*p= 0.223	
Duration after recovery from COVID-19 (Month)					
X ± SD	4.0 ± 1.5; Min=1, Max=10				

X Mean. SD standard deviation. *Fisher's exact test

high rate we found in our study and they indicated that subgroup analysis for insomnia by gender and exposure was not conducted due to inadequate data[28]. The frequency of poor sleep in the general population during the COVID-19 outbreak was reported to be about one-third of the value (18.0%) we found in our study (59.4%)[29]. In the meta-analysis study by Krishnamoorthy et al. they found that maximum burden of poor sleep quality was among COVID-19 patients (82%) followed by HCWs (43%) and general population (34%)[30]. The increased working hours and night shifts of HCWs during the pandemic may have caused poor sleep quality in HCWs compared to the general population[31].

In a study in China conducted with HCWs working in the early period of the pandemic, the percentages of insomnia and fatigue were found by the researchers to be 49.0%- 63.4% and 53.8%- 72.2%, respectively similar to our study[32]. But unlike in our study they found that HCWs who were married (OR = 1.60, 95%CI = 1.31–1.97) or divorced/widowed (OR = 1.84, 95% CI = 1.16–2.91) were found to be at higher risk of insomnia than unmarried HCWs and younger HCWs (OR = 0.99, 95% CI = 0.97–1.00) had lower risks of insomnia[32]. This discrepancy in study results may be due to cultural differences.

In our study, we determined that being overweight and increased fatigue were associated with poor sleep quality, but we did not find a study in the literature comparing these characteristics in post-COVID-19 individuals. In a study conducted in the general population in Italy, it was observed that in post-quarantine PSQI global score was increased in normal weight (5.09±3.59 vs 7.91±3.08 score), over weight (5.22±3.53 vs 8.03±3.37 score), grade I obesity (6.27±3.66 vs 9.00±3.59 score), and grade II obesity (6.92±3.76 vs 8.44±4.02 score) compared to before quarantine[33].

On the other hand, although not statistically significant in our study, those who received inpatient COVID-19 treatment had higher levels of fatigue. Receiving inpatient COVID-19 treatment is an indication that the disease is severe, so it was an expected result that the level of fatigue was found to be high in these individuals. Although not statistically significant, as the duration after recovery from COVID-19 increased, the fatigue score decreased, and sleep quality improved in our study. In a study of post-COVID-19 patients it was revealed that a statistically significant negative correlation between mean duration after recovery from COVID-19 and FAS similar to our study[27]. So in both studies, fatigue and poor sleep quality were higher in the first days after recovery, and similar to these findings Goyal et al observed that during the period next 2 weeks after cure from COVID-19 patients gradually developed insomnia, and easy fatiguability[34].

The limitations of our study can be listed as follows; using only FAS and PSQI, respectively, to determine the levels of fatigue and sleep quality of HCWs, the evaluations of the participants were not supported by clinical examinations and not knowing the fatigue and sleep quality levels of the participants before they survived COVID-19.

Table 2. Distribution of the means of the post-COVID-19 Fatigue Assessment Scale and Pittsburgh Sleep Quality Index by sociodemographic characteristics of the healthcare workers (n=133)

Characteristic	Fatigue Assessment Scale (X ± SD)	Pittsburgh Sleep Quality Index (X ± SD)
	22.4 ± 5.3	5.7 ± 3.3
Gender		
Male	21.9 ± 5.2	4.6 ± 2.8
Female	22.9 ± 5.3	6.5 ± 3.5
	U= 2044.0 p= 0.508	U= 1470.0 p= 0.001
Age group (years)		
<40	23.3 ± 5.2	6.2 ± 3.4
≥40	21.0 ± 5.1	4.8 ± 3.2
	U= 1522.5 p= 0.010	U= 1573.5 p= 0.019
Marital status		
Single + Widow	22.2 ± 5.3	6.0 ± 3.4
Married	22.5 ± 5.3	5.5 ± 3.3
	U= 2028.5 p= 0.652	U= 1735.0 p= 0.334
Occupation		
Physician	22.9 ± 5.6	5.5 ± 3.2
Nurse/Midwife	22.4 ± 5.3	6.4 ± 3.6
Other Healthcare Workers	22.0 ± 5.0	5.3 ± 3.3
	KW= 0.478 p= 0.787	KW= 2.236 p= 0.327
Smoking		
No	22.3 ± 5.2	5.9 ± 3.4
Yes	22.9 ± 5.6	5.1 ± 3.3
	U= 1535.5 p= 0.357	U= 1936.5 p= 0.255
Body Mass Index		
Underweight / Normal weight	23.1 ± 5.4	5.7 ± 3.4
Overweight	22.1 ± 5.8	6.4 ± 3.5
Obese	21.3 ± 3.1	4.0 ± 2.2
	KW= 1.176 p= 0.556	KW= 8.255 p= 0.016*
*Significant difference= Obese- Overweight; U= 28.183 p= 0.012		
COVID-19 treatment		
Outpatient treatment	22.4 ± 5.3	5.8 ± 3.4
Inpatient treatment	24.2 ± 4.9	3.5 ± 1.2
	U= 460.5 p= 0.387	U= 222.5 p= 0.084
X Mean. SD standard deviation, U Mann-Whitney U Test, KW Kruskal-Wallis Test		

Conclusion

In our study we found that more than half of the HCWs who survived COVID-19 had fatigued and had poor sleep quality. The mean fatigue and sleep quality score was higher under the age of 40. Increasing PSQI score (the worse sleep quality), increased the fatigue 1.54 times. Being female worsened sleep quality 6.61 times, being overweight worsened sleep quality 4.81 times, and increasing FAS score worsened sleep quality 1.39 times. HCWs are potentially at risk of contracting COVID-19 disease due to their profession. For the health service to continue without interruption during the prolonged pandemic process, it is thought that the situations that may negatively affect the work performance of HCWs should be minimized and especially those who have the disease should be followed up regularly.

Conflicts of Interest

The authors report no conflict of interest.

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Table 3. Logistic regression model predicting post-COVID-19 fatigue

Category	OR (95% CI)	P
Gender		
Male	1.00	
Female	0.74(0.25-2.18)	0.589
Age group (years)		
<40	1.00	
≥40	0.44(0.16-1.19)	0.107
Marital status		
Single + Widow	1.00	
Married	1.76(0.61-5.09)	0.298
Occupation		
Other Healthcare Workers	1.00	
Physician	1.09(0.42-2.83)	0.864
Nurse/Midwife	0.73(0.22-2.45)	0.608
Smoking		
No	1.00	
Yes	1.88(0.70-5.03)	0.209
Body Mass Index		
Underweight / Normal weight	1.00	
Overweight	0.99(0.33-2.99)	0.998
Obese	1.73(0.50-6.04)	0.388
COVID-19 treatment		
Outpatient treatment	1.00	
Inpatient treatment	4.05(0.52-31.57)	0.182
Duration after recovery from COVID-19	0.95(0.72-1.27)	0.747
PSQI score	1.54(1.28-1.84)	0.001
OR Odds ratio, CI Confidence interval, Reference category; †= non-fatigued		

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Table 4. Logistic regression model predicting post-COVID-19 sleep quality scores† (n= 133)

Category	OR (95% CI)	P
Gender		
Male	1.00	
Female	6.61(1.96-22.30)	0.002
Age group (years)		
<40	1.00	
≥40	0.89(0.31-2.59)	0.833
Marital status		
Single + Widow	1.00	
Married	0.46(0.13-1.63)	0.231
Occupation		
Other Healthcare Workers	1.00	
Physician	1.55(0.53-4.52)	0.423
Nurse/Midwife	0.85(0.23-3.10)	0.803
Smoking		
No	1.00	
Yes	0.38(0.12-1.20)	0.098
Body Mass Index		
Underweight / Normal weight	1.00	
Overweight	4.81(1.32-17.49)	0.017
Obese	1.59(0.35-7.22)	0.547
COVID-19 treatment		
Outpatient treatment	1.00	
Inpatient treatment	0.30(0.03-2.82)	0.290
Duration after recovery from COVID-19	0.95(0.68-1.32)	0.755
FAS score	1.39(1.20-1.60)	0.001
OR Odds ratio, CI Confidence interval, Reference category; †= Good sleep quality		

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