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Sleep Quality and Burnout Among Health Care Workers During the COVID-19 Pandemic

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A B S T R A C T

Background: The COVID-19 pandemic has put a tremendous burden on healthcare professionals, impacting various aspects of their psychological lives and well-being, including sleep quality. Prolonged sleep deprivation has been linked to burnout, which is increasingly recognized as a threat to patient safety. **Objective:** To assess sleep quality and burnout among health care workers (HCWs) during the COVID-19 pandemic. **Methods:** A cross-sectional study was conducted during the COVID pandemic from September to December 2021. The study participants were HCWs from three hospitals that dealt with the pandemic. A Google form was designed and distributed to the target group. We used the Pittsburgh sleep quality index (PSQI) and the Maslach Burnout Inventory (MBI) to assess sleep quality and burnout, respectively. **Results:** The study included 257 HCWs; about three-fourths (73.5%) of them had poor sleep with an average PSQI score of 6.33 ± 2.07, while 29.2% of them had burnout. Poor sleep quality was significantly related to female gender, the presence of comorbidity, working for more than 48 hours per week, frontline workers, and those who had family members or colleague infected with COVID-19. Burnout was significantly associated with poor sleep. The total PSQI score was statistically significantly positively correlated with the MBI score (r = 0.5 and p-value = 0.001**). **Conclusions:** The COVID-19 pandemic had a significant impact on sleep quality among HCWs, which in turn contributed to burnout. Preventive interventions to promote good sleep quality and prevent burnout in HCWs during a healthcare crisis are essential.

INTRODUCTION

Events such as earthquakes, hurricanes, and disease outbreaks are linked to psychiatric problems, including sleep disturbance. The COVID-19 pandemic caused and aggravated pre-existing mental health problems among health care workers (HCWs).[1] According to recent studies, healthcare workers who have direct contact with COVID-19-positive patients are more susceptible to experiencing symptoms of anxiety, depression, and sleeplessness.[2]

During the COVID-19 pandemic, HCWs have been dealing with more and more sleep disorders that impair sleep quality. Research by Motahedi S et al., 2021; Wang et al., 2020; and Alnofaiey et al., 2020 has shown that during COVID-19, the prevalence of sleep problems among healthcare workers ranged from **Table 1: Sociodemographic, work and COVID-19 related factors among the studied group**

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Characteristics	N (%) *
Age (years)	
Mean ± SD	33.8 ± 9.1
Sex	
Male	119 (46.3)
Female	138 (53.7)
Marital status	
Single	107 (41.6)
Married	150 (58.4)
Smoking status	
Smoker	80 (31.1)
Not smoker	177 (68.9)
Job	
Nurse	116 (45.1)
Physician	62 (24.1)
Pharmacist	36 (14.0)
Lab technician	27 (10.5)
Radiology technician	16 (6.2)
Comorbidity	
Yes	109 (42.4)
No	148 (57.6)
Years of work	
Less than 5 years	119 (46.3)
5- <10 years	70 (27.2)
≥ 10 years	68 (26.5)
Number of working hours per week	
>48 hours	111 (43.2)
≤ 48 hours	146 (56.8)
Number of night shifts per month	
≥ 8	100 (38.9)
< 8	157 (61.1)
Private work	170 (66.1)
Following UpToDate about COVID-19 pandemic	177 (68.9)
Satisfaction with the management protocol	228 (88.7)
Satisfaction with personal protective equipment	17 (6.6)
Previous COVID-19 infection	240 (93.4)
Family member or colleague infected with COVID-19	110 (42.8)
Family member or colleague died from COVID-19	10 (3.9)

Data were presented as number and percentages, unless mentioned otherwise. SD, standard deviation. Comorbidity includes hypertension, diabetes, or cardiac disease.

43.9% to 78.8%.[3-5] Numerous risk factors contribute to sleep disturbances in healthcare workers (HCWs). During the COVID-19 epidemic, HCWs reported caring for up to four times their regular patient load over an

Table 2: Individual components and total PSQI and burnout scores among the studied group;

extended period.[6] Additional factors included exposure to the illness, the potential for infection to spread to family members, the lack of personal protective equipment, and decisions about allocating limited resources to patients.[7] Sleep loss impairs doctors' emotional and cognitive abilities, which raises the risk of unfavourable outcomes like medical errors and compromised safety.[8] It also causes cumulative deficiencies in mood and executive function, which can hinder collaboration and communication within the HCWs team. Prolonged sleep deprivation can also lead to burnout.[9]

Burnout was first described by Maslach et al. as a state of psychological, emotional, and physical stress caused by prolonged exposure to occupational stress. It involves emotional exhaustion, depersonalization, and diminished professional accomplishment.[10] The incidence of burnout can be triggered by the lethal and uncontrollable nature of COVID-19, in addition to the comparatively high rate of infection and fatality among HCPs.[11] Burnout can have detrimental effects on medical personnel as well as patients. In addition to having a negative impact on worker morale, motivation, absenteeism, physical and mental health outcomes, it also causes a decline in the standard of care that the staff provides, which negatively impacts patients. High levels of burnout among medical personnel have been linked to less safe patient care, according to several systematic reviews.[12,13]

Therefore, the medical community should receive more attention because physician occupational and psychological well-being is crucial as it affects not just physicians themselves but also their team members, healthcare organizations, and patients. Also, few studies have concentrated on the sleep quality and burnout of HCWs during pandemic events, especially in the outbreak of COVID-19. Therefore, the current study was designed to assess sleep quality and burnout of HCWs during the COVID-19 pandemic and to identify factors affecting sleep quality and burnout among HCWs.

METHODS

A cross-sectional study was conducted during the COVID pandemic from September to December 2021. The study participants were HCWs from 3 hospitals that dealt with the pandemic (Al-Ahrar, Zagazig Fever,

Characteristics	Mean ± SD*	Median (IQR)
Total PSQI	6.33 ± 2.07	6.49 (4.91-7.96)
Subjective sleep quality	1.01 ± 0.53	0.97 (0.11-1.98)
Sleep latency	1.12 ±0.54	0.99 (0.68-1.65)
Sleep duration	0.84 ± 0.41	0.89 (0.45-1.21)
Sleep efficiency	0.67 ± 0.35	0.68 (0.31 -1.01)
Sleep disturbance	1.23 ± 0.38	1.29 (0.84-1.57)
Use of sleep medication	0.47 ± 0.24	0.52 (0.23-0.69)
Daytime dysfunction	0.97 ± 0.48	0.98 (0.56-1.34)
Prevalence of poor sleep: N (%)		
Poor sleep (PSQI > 5)	189 (73.5)	
Good sleep (PSQI ≤ 5)	68 (26.5)	
Maslach Burnout Inventory score	61.9 ± 10.4	58.4 (55.1-71.1)
Emotional Exhaustion subscale score	26.4 ± 4.6	25.4 (24.5-29.5)
Depersonalization subscale score	11.1 ± 2.7	10.2 (9.1-12.5)
Personal accomplishment subscale score	24.7 ± 4.2	22.9 (21.7-27.2)
Burnout prevalence: N (%)	75 (29.2)	
Emotional Exhaustion	75 (29.2	
Depersonalization	67 (26.1)	
Personal accomplishment	73 (28.4)	

Data were presented as mean ± standard deviation, median (interquartile range), or number and percentages. PSQI, Pittsburgh sleep quality index. and Zagazig General Hospitals). All participants in the study gave their online informed consent, and the study was approved by the Institutional Review Board (IRB) of Zagazig University.

HCWs (physicians, nurses, pharmacists, lab technicians, and radiology technicians) who had been working full-time at COVID-19 isolation or quarantine units for at least six months at the time of the study and directly dealt with isolated COVID-19 cases were legible to be included in the study. Participants having previous diagnoses of psychiatric disorders (e.g., anxiety, depression, or sleep disorders) or those using medications that affect sleep were excluded.

Assuming that the total number of HCWs working in COVID-19 isolation/quarantine units of selected hospitals was 2300, and the prevalence of poor sleep quality among HCWs during the COVID-19 pandemic was 75%[14], and error rate of 5%, the sample size was estimated to be 257 using open epi program.

An electronic form of the questionnaire (a Google form) was prepared and sent to the target group using the most widely used platforms in Egypt: WhatsApp and Facebook. The Google Form began with an explanation of the study's goals and the participant's consent, followed by the following items:

(1) Socio-demographic characteristics: age, sex, residence, education, marital status and relevant clinical data such as smoking status, history of previous psychiatric or sleep disorders, medications affecting sleep, and comorbidity.

(2) Occupational characteristics: duration of work, number of night shifts per month, total working hours per week, and presence of private work.

(3) COVID-19-associated risks: following COVID-19 news and updates, being infected or knowing someone (a friend or colleague) who was infected or died from COVID-19, being satisfied with the management protocols and arrangements between triage and isolation, and being satisfied with the availability of personal protective equipment (PPE).[15]

(4) Pittsburgh sleep quality index (PSQI):[16,17] The internal consistency is just passably good (Cronbach's alpha = 0.65). The reliability was supported by moderate to high correlations (r = 0.53 to 0.82, p=0.01) between the total PSQI score and the five PSQI components. There are 24 questions in the PSQI (19 self-rated and 5 bed partner-rated). There were just 19 self-rated questions used in the scoring. Together, these yield seven component scores: (a) subjective quality of sleep; (b) sleep latency; (c) duration of sleep; (d) habitual efficiency of sleep; (e) disturbance of sleep; (f) use of sleep medication; and
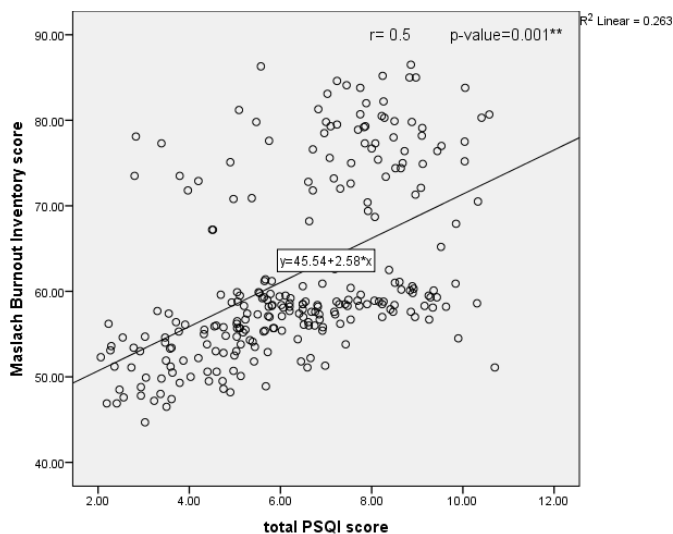
Figure 1: scatter plot with line chart for the correlation between total PSQI and Maslach Burnout Inventory score

(g) dysfunction throughout the day. Every item is rated from 0 to 3, where 3 is the Likert scale's negative extreme. The combined score of the seven components is 0 to 21. A total score of more than 5 denotes poor sleep quality, whereas a component score of more than or equal to 2 indicates that this component is of poor quality. [16,17]

(5) Maslach Burnout Inventory (MBI)[10]: A questionnaire of 22 questions comprised three subscales: emotional exhaustion (EE) with nine items, depersonalization (DP) with five items, and the personal accomplishment (PA) dimension, encompassing eight items. A Likert scale for each item (frequency of feelings) was used, starting from never (0) to every day (6), with the notion that the items in the personal accomplishment domain are reversely scored.[10] We used the median score for each subscale as a cut-off point for burnout. Scores above the median were considered positive emotional exhaustion, depersonalization, and accomplishment, respectively. Burnout was considered positive if any of the three subscales were positive.

Statistical analysis: Data analysis was performed using the statistical package for social sciences software version 25 (SPSS, IBM Corporation, Armonk, NY, USA). Quantitative data were presented as mean ± standard deviations (SD), while categorical variables were labelled with their absolute frequencies. The chi-

square test, Fischer exact test, and extended Mantel-Haenszel chi-square for linear trend were used for categorical variables to compare the studied groups when appropriate. Binary logistic regression with backward stepwise (Wald) method was used to predict the most evident risk factors for poor sleep and burnout. Statistically significant and highly significant levels were set at $P < 0.05$ and $P < 0.001$, respectively.

RESULTS

The average age of our participants was 33.8 years. More than half of the participants were females (53.7%) and married (58.4%). Less than one third (31.1%) were smokers, and 42.4% had comorbidity. Moreover, 45.1% were nurses, 46.3% had less than 5 years of work experience, 43.2% worked more than 48 hours per week, 38.9% had more than 8 shifts per month, and more than half (66.1%) had private work (Table 1).

Concerning COVID-19-related factors, more than two-thirds (68.9%) followed UpToDate on the COVID-19 pandemic; most of them (88.7% and 91.1%) were satisfied with the management protocol and PPE, respectively; only 6.6% had a previous COVID-19 infection; and 42.8% and 3.9% had a family member or colleague infected with COVID-19 and died, respectively (Table 1).

Table 2 shows the individual components and total PSQI and burnout scores. About three-fourths (73.5%) had poor sleep with an average 6.33 ± 2.07, while less than one-third (29.2%) had burnout. The most common type was emotional exhaustion (29.2%), followed by personal accomplishment (28.4%), and lastly, depersonalization (26.1%) (Table 2). Total PSQI was statistically significantly positively correlated with the Maslach Burnout Inventory score (r=0.5 & p-value=0.001**) (Figure 1).

Regarding sleep quality, poor sleep was significantly related to females, the presence of comorbidity, being a nurse, less than 5 years of work experience, working for more than 48 hours per week, having more than 8-night shifts per month, and being frontline workers. Also, having a family member or colleague infected with COVID-19 was significantly associated with poor sleep [odds ratio (95% CI); 3.3 (1.8–5.9), 15.4 (5.9-40.1), 2.4 (1.3–4.49), 2.1 (1.1–3.6), 2.1 (1.13-3.66), 12.7 (4.9-33.1), 3.8 (2.1-7.2) and 1.99 (1.1-3.59) respectively], while other variables were not

Table 3: Multivariate binary logistic regression analysis (Backward method) for the predictor factors of poor sleep among the studied group

The predictor factors	Poor sleep			
	AOR	95% Confidence Interval		P-value
		Lower Bound	Upper Bound	
Female sex	3.3	1.6	6.6	**0.001****
Comorbidity	13.4	4.9	36.4	**0.001****
Job				
Nurse	1	ref	ref	
Physician	3.5	0.75	16.4	0.1
Pharmacist	2.6	0.51	13.4	0.2
Lab technician	2.9	0.52	17.1	0.2
Radiologist	1.5	0.26	8.7	0.6
Years of work				
< 5 years	1	ref	ref	
5-<10 years	1.1	0.43	2.3	0.9
≥ 10 years	1.1	0.45	2.6	0.8
Number of working hours per week (>48 hours)	0.43	0.04	4.4	0.48
Number of night shifts per month (> 8)	5.7	0.56	57.8	0.14
Frontline worker	4.1	1.9	8.4	**0.001****
Family member or colleague infected with COVID-19	2.4	1.2	4.9	**0.01***

AOR: adjusted odds ratio; ref, reference group. *Statistically significant (p ≤ 0.05); ** highly statistically significant (p ≤ 0.001)

Table 4: Multivariate binary logistic regression analysis (Backward method) for the predictor factors of burnout among the studied group

The predictor factors	AOR	95% Confidence Interval		P-value
		Lower Bound	Upper Bound	
Female sex	2.1	1.1	4.1	**0.02***
Comorbidity	1.3	0.64	2.17	0.58
Private work	0.58	0.32	1.07	0.08
Poor sleep	2.1	1.13	4.33	**0.04***

AOR: adjusted odds ratio; *Statistically significant (p ≤ 0.05).

significantly associated with poor sleep (Supplementary Table 1). In multivariate analysis using binary logistic regression, only the presence of comorbidity, frontline workers, female sex, and the presence of a family member or colleague infected with COVID-19 were the most significant determinants of poor sleep [AOR 95% CI: 13.4 (4.9-36.3), 4.1 (1.9-8.4), 3.3 (1.6-6.6) & 2.4 (1.2-4.9) respectively] (Table 3).

Concerning burnout, it was significantly associated with females, the presence of comorbidity, and poor sleep [odds ratio (95% CI); 3.0 (1.7–5.3), 1.7 (1.1-2.98)

and 2.6 (1.3-5.4) respectively]. Interestingly, private work was significantly protective factor against burnout [odds ratio (95% CI); 0.42 (0.24–0.74)] (Supplementary Table 2). In multivariate analysis using binary logistic regression, female sex and poor sleep were the only significant predictors of burnout on binary logistic regression [AOR 95% CI: 2.1 (1.1-4.1) and 2.1 (1.13-4.33), respectively] (Table 4).

DISCUSSION

The topic of sleep quality and occupational wellness among healthcare workers during the COVID-19 pandemic is crucial and warrants a comprehensive discussion. The COVID-19 pandemic has placed an unprecedented burden on healthcare professionals, impacting various aspects of their psychological lives and well-being, including sleep quality, due to high stress levels, high workloads, and exhaustion among HCWs. [5,18]

The prevalence of sleep disturbances has increased during the COVID-19 pandemic compared to normal times. [19,20] Chronic sleep deprivation can contribute to burnout, which is increasingly recognized as a threat to patient safety.[9]

The aim of the current study was to assess the sleep quality and burnout of HCWs working during the COVID-19 pandemic and identify factors affecting sleep quality and burnout among HCWs.

The current study revealed that 73.5% of HCWs had poor sleep quality during the COVID-19 pandemic, with an average total PSQI score of 6.33 ± 2.07. The high prevalence rate of poor sleep quality in this study was consistent with other previous studies by Jahrami and his colleague [14] in Bahrain and Abbas et al. [15] in Kuwait, who reported a prevalence of poor sleep quality in 75% and 78.8% of HCWs during the COVID-19 pandemic, and the mean PSQI scores were 7.0±3.3 and 9.36±4.4, respectively. Another study from Egypt reported that 83% of studied nurses reported poor sleep quality during the COVID-19 pandemic, and the mean PSQI score was 8.52 ± 3.98. [21] A similar higher prevalence rate was reported in Iraq (68.3%). [20] Moreover, Al-Otaibi et al. reported poor sleep quality in 67.9% of second line HCWs during the pandemic in Kuwait. [22] Also, Olagunju et al. reported poor sleep quality in 60% of HCWs in Nigeria during the COVID-19 pandemic. [23] In Brazil, a large nationwide study revealed that 41.4% of the HCWs developed new-onset or worsening preexisting insomnia, and 61.4% of the study subjects reported poor sleep quality during the pandemic.[24]

The high prevalence of poor sleep quality among HCWs during the COVID-19 pandemic confirmed that the COVID-19 pandemic had a negative impact on sleep quality as HCWs have faced an increased workload, long working hours, high patient volumes, and the emotional toll of caring for critically ill patients, which contributes to heightened stress levels.

Chronic stress can lead to insomnia, restless sleep, and overall poor sleep quality. In contrast, in 2019 (one year before COVID-19), Azzez et al. reported a lower prevalence (45.5%) of poor sleep quality among HCWs in Iraq.[25]

As regard risk factors for poor sleep quality, the current work illustrated that poor sleep was significantly related to female sex, the presence of comorbidity, being a nurse, less than 5 years' work experience, working for more than 48 hours per week, having more than 8-night shifts per month, frontline workers, and those who had family members or a colleague infected with COVID-19. But on binary logistic regression for all these significant factors, only the presence of comorbidity, frontline workers, female sex, and the presence of a family member or colleague infected with COVID-19 were the most significant determinants of poor sleep quality. These findings are in line with results from China by Wright KP et al. [26] who reported that frontline HCWs are the leading group affected by different mental health issues, including sleep disturbances, than before the pandemic. Abbas et al.[15] concluded that HCWs on the front lines of COVID-19, taking swabs, and having a positive comorbidity were independent predictors of poor sleep among HCWs in Kuwait. In another study from Kuwait, Al-Otaibi et al. reported an association between female sex, ≤ 5 years' work experience, and poor sleep quality.[22] Also, Omar et al. concluded that the presence of chronic diseases, night shifts, private work, and long working hours were significant predictors of poor sleep quality among Egyptian nurses.[21] Another study from Egypt by Elweshahi et al. showed that female sex, history of psychiatric illness, and affection of a close relative or friend with COVID-19 were significantly associated with higher mental illnesses and insomnia among HCWs.[27]

With regard to burnout among HCWs, the current study demonstrated that less than one-third (29.2%) of HCWs had burnout. Concerning the dimensions of burnout, emotional exhaustion was the predominant (29.2%), followed by personal accomplishment (28.4%), and lastly, depersonalization (26.1%). These results were in line with those obtained in low- and middle-income countries, where the prevalence of burnout among primary care professionals revealed a high level of PA (31.9%), EE (28.1%), and DP (16.4%).[28] Another study in Brazil by Santos et al.

showed that burnout was identified in 17.3% of nurses, nursing technicians, and nursing assistants during the COVID-19 pandemic, with a high level of burnout in EE (28.0%) and PA (30.1%) and a moderate level in DE (10.1%). [29] Similar prevalence rates were recorded from Brazil (20.1% of HCWs and 30.7% of HCWs complaining of insomnia) and from India (personal burnout was 16.8%, work-related burnout was 10.5%, and pandemic burnout was 25.4% of community health workers). [24,30]

The prevalence of burnout among HCWs in the current study was lower than those conducted in Tunisia (77.9%), Morocco (84.44%), France (55%), and Iran (53%).[31-34] The difference in the prevalence of burnout between countries could be explained by the vulnerability of the health care system, which has been challenged by this pandemic, and their economic level.

As regards factors associated with burnout, the current study demonstrated that burnout was significantly associated with female gender, the presence of comorbidity, and poor sleep. But on binary logistic regression analysis, female sex and poor sleep were the only significant predictors of burnout. This agrees with results by Santos et al., who reported a significant association between level of burnout and professional category, gender, and sleep disorders. [29]

According to the results of this research, the total PSQI was statistically significantly positively correlated with the Maslach Burnout Inventory score. This was in concordance with Santos et al., who reported a significant relationship between sleep disorders and burnout scores. [29] A strong positive relationship between work-related exhaustion and sleep reactivity was recorded.[35] Prolonged exhaustion among health care workers because of chronic stress can contribute to poor sleep quality.[36]

CONCLUSIONS

The COVID-19 pandemic had a significant impact on sleep quality among health care workers, particularly females, with associated comorbidity. Poor sleep quality is a predictor of HCW burnout. Poor sleep quality and burnout in HCWs may impact the quality of life, work performance, and safety of both patients and HCWs. Preventive interventions to promote good sleep quality and prevent burnout in HCWs during a healthcare crisis are essential to promoting wellbeing.

Ethical Approval

The study obtained all required approvals from the Institutional Review Board of Zagazig University (ZU-IRB) number 6449 dated 29-9-2020.

Conflict of interest: All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author contributions: Al Zahraa Mohamed Soliman: Idea, methods, data collection, statistical analysis, writing; Noha Osman Frere: methods, writing and revision; Walaa Sabry Fouad: literature search, discussion and writing; Raghda Ali Elshamy: Idea**,** methods, data collection**,** literature search and critical review.

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