

SLEEP QUALITY AND ITS DETERMINANTS AMONG NURSES DURING COVID- 19 PANDEMIC

By

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DOI: 10.21608/ejom.2021.82911.1239

Submit date: 2021-07-01

Revise date: 2021-08-06

Accept date: 2021-08-12

Author's contributions: all authors contributed equally in this work.

Abstract

Introduction: Poor sleep quality is a critical occupational health problem for health care providers, particularly nurses especially during COVID-19 pandemic, that not only affects their physical and mental health, but also affects patient's safety and job performance. **Aim of Work:** To measure the prevalence of poor sleep quality among Egyptian nurses during the pandemic of COVID 19 and to determine different factors affecting sleep quality. **Materials and Methods:** This web-based cross-sectional survey was conducted to assess sleep quality and its determinants among Egyptian nurses, during the period from September 2020 to February 2021 using self-administered validated Arabic version of Pittsburgh sleep quality index (PSQI). **Results:** The current study involved 351 Egyptian nurses, recruited from 15 Egyptian governorates. Most of them were less than 30 years old (73.2%); 75.5% were females and 56.1% were married. About 17% of nurses were working in isolation hospitals, 82.1% were night shifters, and (31.9%) had COVID-19 infection. Assessment of sleep quality, revealed that 83.5% had poor sleep quality (PSQI score>5), the most affected domain was sleep latency (1.72±0.86), whereas the least affected one was sleep medications use (0.35±0.79). Poor sleep quality was associated with young age, smokers, work experience less than 10 years, previous COVID-19 infection, working in isolation hospitals, night shifts, private work and long working hours. **Conclusion and Recommendations:** The current study showed that there was high prevalence of poor sleep quality among the studied nurses during COVID-19 pandemic. Presence of chronic diseases, night shifts, private work and long working hours/week were significant predictors of poor sleep quality among participants which indicated the need for well-organized work schedules for

nurses. Work place periodic health assessments and management of sleep disorders are essential, with more attention to wellness and coping programs at all health facilities, especially those involved in fighting COVID-19.

Keywords: Sleep quality, Nurses, Pittsburgh sleep quality index (PSQI), COVID-19 pandemic.

Introduction

Sleep disorders are becoming a major global public health concern that affects millions of people (Dong et al., 2020). Compared with non-health care providers, medical field workers on the front lines of the COVID-19 pandemic have more sleep disturbances and more inferior sleep quality (San Martin et al., 2020).

Nurses are especially vulnerable to sleep disturbances because they are exposed to various situations that can disrupt sleep quality, such as work schedules (Dong et al., 2017, Ahmed and Hamed, 2020). Nurses, who are the most overworked professional group in an organization, are now compelled to work according to irregular schedules due to health care organizations' efforts to provide high-quality, cost-effective care with minimal staffing (Stanojevic et al., 2016).

These erratic schedules cause poor sleep quality among nursing staff, resulting in physical and mental health issues that impact their professional performance and, as a result, may

jeopardize patient safety (Saleh et al., 2014).

Regarding poor sleep quality prevalence among nurses, the average Pittsburgh sleep quality index (PSQI) total score was greater than five in 87.8% of the night shift workgroup, compared to 56.7 % in the morning shift group ($p < 0.001$) (Ahmed and Hamed, 2020). According to a study done in Iran, up to 57 % of female shift-working nurses suffer from sleep disturbances (Ghalichi et al., 2013). Irritability, impaired memory, lack of attention in the workplace, work-related accidents or injuries, absence, and even depression can result from a lack of sleep. Sleep deprivation has been linked to metabolic and endocrine disorders, as well as poor health outcomes (Dong et al., 2020 and Kim-Godwin et al., 2021).

Aim of Work

To measure the prevalence of poor sleep quality among Egyptian nurses during the pandemic of COVID 19 and to determine different factors affecting sleep quality.

Materials and Methods

Study design: This is a web-based cross-sectional study.

Place and duration of the study: As data collection during the 2nd wave of COVID-19 pandemic and social distancing measures are followed to prevent and control the spread of infection, an electronic form (Google-form) of the questionnaire was prepared and distributed to the target group through What's App and Facebook public and private platforms, which are the most common platforms used in Egypt. This study was done during the duration from September 2020 to February 2021

Study sample

The target population of nurses was recruited according to specific inclusion criteria. Women and men of all ages and qualifications, full-time and permanent employees who worked for at least six months in Egyptian health facilities during the study period and agreed to participate in the study were included.

Sample size:

The sample size was calculated based on the prevalence of poor sleep quality among nurses reported in a previous Egyptian study by (Ahmed

and Hamed, 2020), and it was 72.3%. Considering the 95% level of confidence and 5% precision level, the calculated sample size was 308 nurses (Daniel, 1999). The sample size was increased to 351 participants to improve the validity of the study.

Sampling technique: A Snowball non-probability sampling approach was used to reach the target group and attain the required sample size.

Study methods

An electronic anonymous (Google-form) **self – administered Arabic questionnaire** was used. The questionnaire was formed of four components as the following:

- 1- Socio-demographic factors:** age –sex-residence-education-marital status- the presence of children at home.
- 2- Work-related factors:** occupation, type of health facility, type of ward they are working in, years of experience, number of night shifts per month, the total working hours per week, and presence of private work.
- 3- Health-related factors** such as smoking history, chronic diseases, a history of having COVID 19

infection, and symptoms of chronic pain disorders as tension headache, low back, neck, and knee pain. Any pain that lasted more than three months and was either continuous or intermittent, in the past 30 days was considered as chronic pain (Merskey, 1986).

4- Pittsburgh sleep quality index (PSQI) (Suleiman et al., 2010).

The validated Arabic version of the Pittsburgh sleep quality index (PSQI) was used. The Global PSQI's internal consistency reliability is marginally acceptable (Cronbach's $\alpha = .65$). Moderate to high correlations ($r = .53$ to $.82$, $p < .01$) between five PSQI components and the overall PSQI score supported the reliability. The global PSQI correlates strongly with the Insomnia Severity Index ($r = .76$) and moderately with the related construct of the Medical Outcome Study Short Form-36 vitality subscale ($r = -.33$), indicating convergent validity. Pittsburgh sleep quality index contains 24 questions (19 self-rated and five rated by the bed partner). Only the 19 self-rated questions were included in the scoring. These questions are

combined to form 7 component scores which are:

- (a) Subjective sleep quality, (b) Sleep latency, (c) Sleep duration, (d) Habitual sleep efficiency, (e) Sleep disturbance, (f) Use of sleep medication, (g) Daytime dysfunction.

Each item is scored on a scale of 0 to 3, with 3 representing the negative extreme on the Likert Scale, and the overall score of the seven components is 0 to 21. A component score of more than or equal to 2 indicates that this component is of poor quality, while a total score of more than 5 indicates poor sleep quality (Garbarino, 1999).

Consent

An informed written, electronic consent was obtained from all participants after clarification of the objectives of the study, confidentiality of data, voluntary involvement, and withdrawal.

Ethical Approval

The Research Ethics committee (REC), Faculty of Medicine, Benha University, approved the study methodology (Rc.2./2021).

Data Management

Data were cleaned and coded then

analyzed using the Statistical Package for the Social Sciences (SPSS) version 25.0. as data was normally distributed, quantitative data were described in the form of Mean \pm SD. Student t-test was used two means comparisons and ANOVA for comparing more than two groups. Qualitative data were described

as frequency and percent. Correlation analysis was performed using Pearson's correlation coefficient (r). Logistic regression analysis was used for the prediction of poor sleep quality. If the p-value is ≤ 0.05 , differences were considered statistically significant.

Results

Table 1: Sociodemographic characteristics of the studied participants and overall (PSQI) score.

Variables		No (%)	PSQI Mean± SD	F or t Test	P
Age groups/ years	< 30	257 (73.2%)	8.72±4.06	3.440	0.033*
	30-40	67 (19.1%)	8.49±3.84		
	>40	27 (7.7%)	6.62±3.05		
Sex	Male	86 (24.5%)	8.84±4.03	.877	0.381
	Female	265 (75.5%)	8.41±3.96		
Residence	Rural area	246 (70.1%)	8.41±3.89	-.768	0.443
	Urban area	105 (29.9%)	8.77±4.19		
Presence of children	NO	89 (25.4%)	8.38±4.32	-.382-	0.703
	Yes	262 (74.6 %)	8.56±3.86		
Education	Nursing school	46 (13.1%)	6.82±3.08	4.384	0.005 **
	Nursing institute	187 (53.3%)	8.45±3.96		
	Nursing bachelor	89 (25.4%)	9.25±4.20		
	Post graduate	29 (8.3%)	9.37±3.98		
Health facility	Hospital	292 (83.2%)	8.31±3.91	4.553	.034*
	Isolation hospital	59 (16.8%)	9.52±4.18		
Departments	Emergency depart	58 (16.5%)	7.91±3.89	3.187	0.005**
	ICU	98 (27.9%)	9.12±4.20		
	Surgical depart	28 (8.0%)	7.14±3.43		
	Medical depart	49 (14.0%)	7.28±3.11		
	Pediatric depart	36 (10.3%)	10.22±3.38		
	Obs &Gyn depart	8 (2.3%)	8.37±4.30		
	Other departs	74 (21.1%)	8.72±4.32		
Experience/years	< 10	261 (74.4%)	8.74±4.03	3.490	0.032*
	10-20	57 (16.2%)	8.47±4.11		
	> 20	33 (9.4%)	6.81±2.87		
Night shifts (5.60±5.34)	NO	63 (17.9%)	7.09±3.50	10.101	.002**
	Yes	288 (82.1%)	8.83±4.01		
Private work	NO	293 (83.5%)	8.12±3.89	-4.240	.000**
	Yes	58 (16.5%)	10.50±3.85		

* Significant at the 0.05 level (2-tailed).
Obs &Gyn: Obstetrics and Gynecology

** Significant at the 0.01 level (2-tailed).
F or t: The used statistical tests (F test for ANOVA)

Table 1 showed that, most of the studied nurses were less than 30 years old (73.2%); 75.5% were females. The majority of them (70.1%) were from rural areas. Almost half of the studied group were married (56.1%); 74.6 % had children. Regarding educational level, 53.3% of participants graduated from the nursing institute, and 25.4% of them held a Bachelor of Nursing. Nurses from the ICU department accounted for 27.9% compared to 16.5%, 8%, 14%, 10.3%, and 2.3% from emergency, surgical, medical, pediatric, obstetrics, and gynecology departments, respectively. About three-quarters of participants had work experience < 10 years, and 83.5% of them were involved in private and governmental work. The mean working hours per week was (37.64 ± 31.72). Most nurses (82.1%) were night shifters and the mean night shifts per month were (5.60 ± 5.34).

Comparison between socio-demographic, work related factors, and the overall (PSQI) score showed that, the mean sleep quality score was significantly higher (poorer sleep quality) among the younger age group (< 30 years) ($p = 0.03$), with higher educational level (post graduate education) ($p = 0.005$), working in COVID-19 isolation facilities ($p = 0.03$), working in pediatrics and ICU departments ($p = 0.005$), had less than 10 years of experience ($p = 0.03$) and had more night shifts ($p = 0.002$) (Table 1).

Table 2: Relation between health related factors and overall (PSQI) score.

Variables		No (%)	PSQI Mean± SD	F or t	p
Drinking tea/coffee/cups	No	71(20.2%)	7.80±4.02	2.902	0.035*
	1-2	162(46.2%)	8.37±3.64		
	3- 4	91(25.9%)	8.80±4.30		
	More than 4	27(7.7%)	10.33±4.31		
Smoking history	non smoker	325(92.6%)	8.40±3.94	4.503	0.012*
	ex-smoker	10(2.8%)	7.80±2.89		
	Smoker	16(4.6%)	11.37±4.39		
Chronic diseases	NO	243(69.2%)	8.01±3.79	-3.624	.000**
	Yes	108(30.8%)	9.65±4.17		
Chronic headache	NO	213(60.7%)	7.74±3.83	22.004	.000**
	Yes	138(39.3%)	9.72±3.92		
Chronic neck pain	NO	229(65.2%)	8.01±3.70	11.235	.001**
	Yes	122(34.8%)	9.48±4.30		
Chronic low back pain	NO	191(54.4%)	7.26±3.55	47.029	.000**
	Yes	160(45.6%)	10.01±3.95		
Chronic knee pain	NO	241(68.7%)	8.28±3.80	2.692	.102
	Yes	110((31.3%)	9.03±4.32		
+ve history of COVID-19	NO	239(68%)	8.22±3.79	-2.068	0 .039*
	Yes	112(32%)	9.16±4.30		

*: Significant at the 0.05 level (2-tailed).

**: Significant at the 0.01 level (2-tailed).

F or t: The used statistical tests (F test for ANOVA).

Table 2 showed that most of the participants were nonsmokers (92.6%), and almost one-third (30.8%) had chronic diseases. About one-third of the studied group (32%) had COVID-19 infection. The overall PSQI-mean score was higher and indicated poorer sleep quality among smokers and tea/coffee drinkers more than 4 cups per day ($p = 0.01$, 0.04). Moreover, those suffering from chronic diseases or complaining of chronic pain (headache, neck pain, or low back pain) had poorer sleep quality ($p = 0.001$). Also, nurses who had COVID-19 infection revealed lower PSQI scores and poorer sleep quality ($p = 0 .04$) (Table 2).

Table 3: Pittsburgh Sleep Quality Index (PSQI) domains and overall score among the studied group.

PSQI domains		No	%
Subjective sleep quality	Not during past month	282	80.3
	Less than once/ week	27	7.7
	Once or twice / week	28	8.0
	three or more times / week	14	4.0
Sleep latency(difficulty)	NO	25	7.1
	Mild-	117	33.3
	Moderate	138	39.3
	Severe	71	20.2
Sleep duration/ hours	>7	110	31.3
	6-7	103	29.3
Mean \pmSD	5- >6	90	25.6
5.85\pm0.092	<5	48	13.7
Habitual sleep efficiency	>85	125	35.6
	75-84	71	20.2
	65-74	97	27.6
	<65	58	16.5
Sleep disturbance (difficulty)	NO-	10	2.8
	Mild	197	56.1
	Moderate	124	35.3
	Severe	20	5.7
Sleep medication use	Not during past month	282	80.3
	Less than once / week	27	7.7
	Once or twice / week	28	8.0
	Three or more times / week	14	4.0
Day time dysfunction	Not during past month	282	80.3
	Less than once / week	27	7.7
	Once or twice / week	28	8.0
	Three or more times / week	14	4.0
Overall score	Poor sleep quality (> 5)	293	83.5
	Good sleep quality(< 5)	58	16.5
Mean \pmSD			
8.52\pm3.98			

Assessment of sleep quality revealed that 83.5% (293/351) of studied subjects had poor sleep quality and significant sleep problems (total PSQI score of 5 or above). The mean PSQI score was (8.52 ± 3.98), the mean sleep duration / hours was (5.85 ± 0.092), and the habitual sleep efficiency mean was 81.66% (Table 3).

Table 4: Binary logistic regressions for the predictors of poor sleep quality

Variables	B	S.E.	Wald	Sig.	Exp(B)	95% C.I. for EXP(B)
Presence of chronic diseases	1.211	.404	8.962	.003**	3.356	1.519- 7.413
Presence of night shifts	1.684	.389	18.695	.000**	5.387	2.511- 11.559
Presence of private work	-1.729-	.686	6.352	.012*	.177	.046- .681
Work hours/week	-.008-	.004	3.973	.046*	.992	.984- 1.000
Constant	1.861	.751	6.144	.013*	6.428	

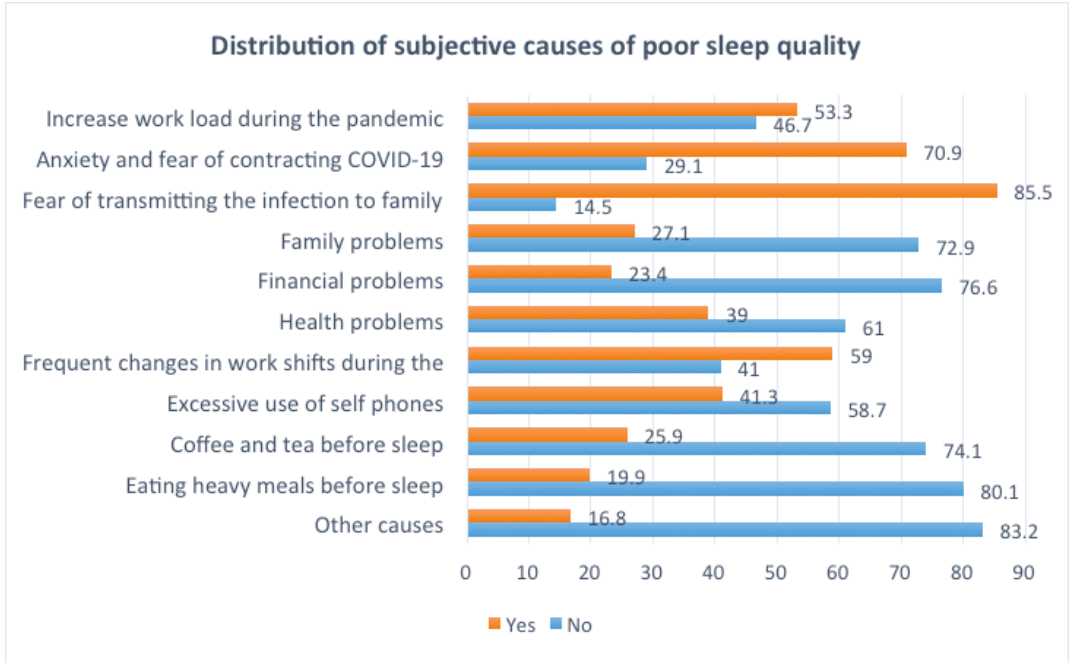
*:Significant at <0.05

** :Significant at <0.01

B represents the estimated regression coefficients for the explanatory variables, with the standard error (S.E.) given. The Wald statistics is the ratio of B to S.E. of the regression coefficient squared. The significance of each explanatory variable (Sig.) is given by the p-value. Exp (B) is the predicted change in odds for a unit increase in the explanatory variable.

Binary logistic regression analysis was conducted to detect predictors of poor sleep quality, which revealed that the presence of chronic diseases, night shifts, private work, and long working hours/week were significant predictors of poor sleep quality among the studied nurses (Table 4).

Figure 1: Distribution of subjective causes of poor sleep quality among the studied group.



The leading subjective causes of poor sleep quality among nurses were fear of transmitting the infection to family members, anxiety and fear from contracting COVID-19 infection, frequent changes in work shifts, and increased workload during the pandemic (Figure 1).

Discussion

For healthcare workers, particularly nurses, sleep disorder is a serious occupational health issue that affects their health, patient's safety, and job performance (Ahmed and Hamed, 2020).

The healthcare workers' mental health has always been influenced by

epidemics. Nurses and physicians can have poor sleep quality due to stress, depression, and other mental health issues (Salari et al., 2020).

According to recent studies, the prevalence of sleep disruptions during COVID-19 has increased compared to normal times (Li et al., 2020). In this context, a survey by Abdulah and

Musa (2020) found that 68.3% of Iraqi physicians exposed to COVID-19 suffer from sleep disruptions. In contrast, a similar study in the same region one year earlier, in 2019, found 45.5% had sleep disturbances (Azzez et al., 2019).

The present study aimed to assess the prevalence of poor sleep quality among nurses working in the Egyptian health care facilities during the COVID-19 pandemic and determine the socio-demographic, health-related, and work-related factors that affect their sleep quality.

According to the findings of the current study, young age nurses (less than 30 years), work experience of 10 years or less, higher educational level (post graduates), who are smokers, and drinking more than 4 cups of tea/coffee/day, experienced poor sleep quality (Table 1,2). Young age and few working years indicate limited experience and knowledge in managing patients during pandemics such as H1N1 influenza or COVID-19, which could be linked to increased anxiety (Fernandez et al., 2020). Opposite to the current work, Tarhan et al. (2018) on their work on the sleep quality among nurses and its influencing factors, detected that nurses in the older age group (41 years

or older) were 9.5 times more likely to have poor sleep quality than nurses in the younger age group (25 years or younger), implying that advanced age is a risk factor for poor sleep quality. The same results were obtained by Salari et al., 2020 in their study on the prevalence of sleep disturbances among physicians and nurses facing the COVID-19 patients. Also, Pérez-Fuentes et al. (2019) reported that increase nurses' age was associated with more inferior sleep quality. He reported that as nurses get older, they sleep for less time, and sleep quality deteriorates. On the other hand; Tu et al. (2020) found no significant relationship between socio-demographic variables (age, marital status, educational level, working years, etc.) and sleep disturbance.

The results of the present study reported higher overall PSQI-mean score and poorer sleep quality among coffee and tea drinkers (more than 4 cups per day). These results were supported by Watson et al., (2016) who conducted a study to determine if caffeine consumption differed between good and poor sleepers, they concluded that poor sleepers reported greater total caffeine consumption compared to good sleepers. This could

be explained by the fact that, increased caffeine consumption is associated with decreased total sleep time, increased naps, decreased time in bed, daytime sleepiness, and poor subjective sleep quality (Whittier et al., 2014).

The current work detected that nurses who worked in isolation hospitals, involved in private work, worked in the ICU department, and had night shifts were more likely to suffer poor sleep quality (Table 1). Day-shift nurses were less likely to have poor sleep quality. These results agreed with Tarhan et al. (2018), who concluded that nurses who work day shifts get better sleep than nurses who work night shifts, as they were 14.1 times poorer sleep quality than day-shift nurses. Feng et al., 2021 in their study on Chinese nurses reported that night shift work was significantly associated with poor sleep quality.

The present study showed that nurses who had COVID-19, chronic diseases as chronic headache, chronic neck pain, or chronic low back pain had a worse sleep quality (Table 2). In terms of the link between poor sleep quality and headache, Liu et al., 2019 found that the most strongly associated factor with sleep disorders among healthcare

workers was headache. They concluded that 44.6 percent of their study's participants had been suffering from headaches for more than three months and had not improved in the previous 30 days. The bidirectional link between headaches and sleep problems could explain this finding; while headache treatment is essential for resolving sleep issues; better sleep also reduces headache among healthcare workers. They also confirmed that other types of chronic pain negatively affect sleep, implying that sleep disturbances are more likely when there is chronic pain in various parts of the body (Liu et al., 2019).

About 83% of the studied nurses were complaining of poor sleep quality during the COVID-19 pandemic in Egypt (Table 3). The observed prevalence was slightly higher than that of another Egyptian study done by Ahmed and Hamed (2020) at Zagazig city, who reported that 73% of shift group nurses suffered from poor subjective sleep quality.

Also Tu et al. (2020), found a sleep disturbance prevalence of (60%) among nurses (95% CI: 50.1-69.1%) in their study on sleep quality and mood symptoms in conscripted frontline nurse

in Wuhan, China during COVID-19 outbreak. The results of current work was also higher than that obtained by Zhou et al. (2020) in their work on the prevalence and demographic correlates of poor sleep quality among frontline health professionals in Liaoning Province, China during the COVID-19 outbreak, who detected that the prevalence was (19.5%, 95% CI: 17.6-21.54%).

Egyptian nurses' high sleep disturbance prevalence during the COVID-19 pandemic can be explained by the fact that Egyptian nurses were under a lot of stress at work and had to work longer hours due to the rising number of COVID-19-infected patients in Egypt and a shortage of nursing staff. The heavy workload had a significant impact on their sleep quality, as did negative feelings such as fear of becoming infected and spreading COVID-19 to their friends, colleagues, and family. In COVID-19 isolation hospitals, many nurses were separated from their families and communities. This condition could lead to a lack of social support, which could lead to sleep disturbances (Zhou et al., 2020).

The mean overall PSQI score among studied nurses was 8.52 ± 3.98 , reflecting poor sleep quality (Table 3) which was

higher than the mean total PSQI score of a survey conducted in Istanbul on 152 nurses before COVID-19 pandemic, which was 6.65 ± 3.48 (Tarhan et al., 2018). This discrepancy can be explained by the fact that nurses during the COVID-19 pandemic experience more stress, leading to poor sleep quality.

Binary logistic regression analysis in the present study concluded that the presence of chronic diseases, night shifts, private work, and long working hours were significant predictors of poor sleep quality among the studied nurses (Table 4). This finding is in line with a study done by Dong et al. (2017) and Alamri et al. (2019), who detected that long working hours were related to poor sleep quality.

In contrast to a study was done in Amman on 186 nurses by Suleiman et al., 2010; who found no link between PSQI scores and socio-demographic variables like age group, gender, educational level, marital status, dependent children, and dependent adults. Furthermore, no significant link was observed between PSQI scores and work-related variables like nurse experience, hospital type, shift duration, and shift system. The only significant link was between PSQI

scores and monthly pay for nurses. This could be attributed to the presence of correlation between some dimensions of quality of work life. If employees are satisfied with their income and have no financial problems, find their work environment secure, have the necessary opportunity for growth and promotion, and are provided with job security, their quality of sleep is likely to increase as a result of these parameters (Momeni et al., 2016).

Conclusion and Recommendations:

The prevalence of poor sleep quality among Egyptian nurses during the COVID-19 pandemic is high, factors as lower educational level, young age, work experience less than ten years, multiple-night shifts, working in isolation hospitals, long working hours, private work in addition to the governmental one, and had COVID-19 infection were significantly associated with poor sleep quality among the studied group. This indicates the urgent need for well-organized work schedules for nurses, work place periodic health assessments and management of sleep disorders are essential, with more attention to wellness and coping programs at all health facilities, especially those involved in fighting COVID-19.

Funding

This work was not funded by any agencies.

Conflict of interest

We have no competing of interest to disclose.

Acknowledgment

We would like to thank all Egyptian nurses who participated in this study.

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