

PSYCHOLOGICAL IMPACT OF COVID-19 ON SLEEP AMONG FRONTLINE HEALTHCARE PROFESSIONALS: A CROSS-SECTIONAL STUDY

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ABSTRACT Background: The COVID-19 pandemic and the measures to control it has caused a huge impact on our environment, and has exposed the Healthcare Workers (HCWs) to unprecedented threat. In this study, we seek to assess the stress and sleep-related issues among health personnel directly dedicated to caring for COVID-19 patients. **Aim:** To study the psychological impact of COVID 19 on sleep among frontline HCWs. **Objective:** 1.To assess the level of psychological stress among frontline HCWs during COVID 19 pandemic using PSS (Perceived Stress Scale) questionnaire. 2.To determine the factors associated with perceived stress among frontline HCWs during COVID 19 pandemic. 3.To assess sleep quality, daytime sleepiness and insomnia using Pittsburgh Sleep Quality Index (PSQI), Insomnia severity index (ISI-7) and Epworth Sleepiness Scale (ESS). **Materials and Methods:** A cross-sectional study was conducted in India among 271 HCWs to evaluate the perceived stress and sleep disturbances of HCWs taking care of COVID-19 patients. The study was conducted during the COVID pandemic over a period of one month between June and July 2021, using a pre-designed, pre-tested, validated, and semi-structured questionnaire. The questionnaire included demographic data, work-related aspects, the Perceived Stress Scale (PSS), the Pittsburgh Sleep Quality Index (PSQI), the Epworth Sleepiness Scale (ESS), and the Insomnia Severity Index (ISI). The Kolmogorov-Smirnov test was employed to determine the continuous data sets which followed a normal distribution. **Results:** Out of the total 271 participants, 142 were PG (Post-Graduate) doctors and 129 were nursing staff. The overall mean age was 28.07 ± 3.634 years, of whom about 52% were females.Moderate to severe stress was found in a significant number of participants (54.4%). 54.61% had poor sleep quality, 50.55% had insomnia, and 19.18% had daytime sleepiness. Being a doctor, having many work sites,drug/substance/alcohol abuse for sleep, taking prophylaxis, admission of colleagues requiring ventilatory support if infected with COVID-19, paucity of medical supplies,bereavement, and any form of violence by attendees were all recognised as stress predictors. **Conclusion:** This study showed a high prevalence of perceived stress and sleep disturbances among HCWs during the COVID-19 pandemic. Early screening and identification of HCWs at risk are essential for protecting and maintaining the functionality of the health-care system. In the future, stress management should be an integral part of the curriculum of doctors so that they can serve humanity efficiently during such crisis times.

KEYWORDS COVID 19, frontline health care workers, psychological impact, stress, sleep

Introduction

In December 2019, the world witnessed the emergence of a previously unknown strain of the coronavirus disease (termed COVID-2019) or Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) in the Wuhan province of China. As a result, the World Health Organization was in a Global Public Health Crisis at the beginning of 2020[1].

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A densely populated country like India, heavily hit by the Covid-19 pandemic, has posed a severe threat to the health care system due to multiple reasons- paucity of medical professionals, inadequate supply of equipment, scattered and a smaller number of health centres, lack of awareness amongst the common population on dealing with the unforeseen crisis, have all lead to a situation of unforeseen magnitude[2]. This has caused acute uncertainty and trauma in the lives of medical health care workers, who are the first-line fighters treating patients against the disease.

The COVID-19 pandemic has posed a severe threat to India's health care system. This has caused acute uncertainty and trauma in the lives of medical health care workers. The physical and psychological effects of this pandemic on medical workers are numerous: a long and continuous work schedule, a lack of self-care, social ostracism, inability to balance professional and personal priorities, the need to wear enhanced droplet/airborne personal protective equipment such as a fit-tested N95 mask, fluid-resistant gown, and eye protectors[3][4]

The occurrence and development of sleep disorders, specifically insomnia, have been linked to exposure to different stressors. Insomnia has been described as a neurobiological and physiological mechanism in response to stress[5]. Chronic insomnia has an adverse impact on multiple levels, including the perception of subjective quality of life, mental health, and occupational and cognitive performance[6]. The stress response and sleep have a common pathway in the hypothalamic-pituitary-adrenal axis. Lack of sleep leads to abnormal changes in the HPA axis, resulting in neuroendocrine imbalance. Stress and insomnia provokes each other, creating a long-term impact on mental health[7]. Multiple studies have emphasised the need to focus on the psychosocial needs of healthcare workers. However, still, there has not been any significant research on mental health problems in medical workers after the maximum point of the COVID-19 epidemic in India has been reported.

In this study, we tried to assess sleep quality and psychological stress in postgraduate – medical students and nursing students who are the frontline healthcare workers dedicated to caring for COVID-19 patients at the height of the pandemic.

Aims and objectives

1. To study the psychological impact of COVID 19 on sleep among frontline healthcare workers.
2. To assess the level of psychological stress among frontline healthcare workers during the COVID 19 pandemic using the PSS questionnaire.
3. To determine the factors associated with perceived stress among frontline healthcare workers during the COVID 19 pandemic.
4. To assess the quality of sleep, insomnia and daytime sleepiness using the Pittsburgh Sleep Quality Index (PSQI), Insomnia severity index (ISI-7) and Epworth Sleepiness Scale (ESS).
5. To find the correlation between perceived stress and sleep quality among frontline healthcare workers.

Material and Method

This cross-sectional study was conducted at a tertiary care Medical College in Central India. The study was conducted to evaluate the sleep patterns and psychological stress among postgraduate medical students and nursing staff involved in managing

COVID 19 patients from June 2021 to July 2021. A pre-designed, structured, validated, printed questionnaire was administered to all study participants. Before being enrolled in the study, all participants were asked to provide their consent through a written informed consent form, and they were assured of the confidentiality of the information. The data of all participants was kept confidential, and the Institutional Ethics Committee (IEC) gave its ethical approval.

Inclusion criteria

- Frontline health care professionals, namely Junior Resident Doctors (PGs) and staff nurses are involved in caring for COVID 19 patients for at least 6 months.

Exclusion criteria

- Healthcare workers who were on leave at the time of the study.
- Significantly incomplete data on filling out questionnaires.

Out of 330 questionnaires received, only 271 were adequate for analysis. The socio-demographic details collected as a part of data collection included age, gender, marital status, present work area (ICU, ward, emergency, operation theatre), duty schedule(day/night duties per month), primary speciality, duration since exposure to COVID, history of COVID, history of admission of a colleague due to COVID, history of the death of family members due to COVID, any substance/drug abuse for sleep, any sort of violence from attendees during duty hours. In addition, the participants also completed the following questionnaires, which assessed their sleep quality, perceived stress, daytime sleepiness and insomnia:

The Pittsburgh Sleep Quality Index (PSQI)[8] The Pittsburgh Sleep Quality Index (PSQI) is a questionnaire that can assess sleep quality over a one-month interval. The global PSQI score has a range between 0 and 21, with higher scores having an indication of more severe sleep disorders. A global PSQI score ≥ 5 is indicative of poor sleep quality.

Perceived stress scale (PSS-10)[9] It measures the degree to which situations in one's life are appraised as stressful, using a 10-item scale during the past 1 month. Each of the items on the PSS-10 is rated on a 5-point scale, ranging from 0 (never) to 4 (very often) and individual scores range from 0 to 40. Accordingly, individual scores in the range of 0 to 13 would be considered low stress, and those scores from 14 to 26 would be considered moderate stress. In contrast, those scores from 27 to 40 would be considered high perceived stress.

Epworth Sleepiness Scale (ESS)[10] It is a self-administered questionnaire of 8 questions on a 4-point scale. The ESS score can range from 0 to 24. The higher the ESS score, the higher the person's average sleep propensity in daily life (ASP), or their 'daytime sleepiness'; scores 8- 9 suggest average daytime sleepiness, and scores above 10 suggest excessive daytime sleepiness, with scores 16 and above should seek medical attention.

Insomnia severity index (ISI-7)[11] The Insomnia severity index (ISI-7) measures seven items that point to the severity of insomnia's nighttime and daytime components. The index is scored on a five-point scale with '0' indicating no problem to '4' indicative of a very severe problem. A score between 0–7 points to the absence of insomnia, a score of 8–14 indicates subthreshold insomnia; a score of 15–21 shows moderate, and a score of 22–28 indicates severe insomnia.

Table 1 Socio-demographic characteristics of study population

Characteristics	Doctor n=142 (%)	Staff Nurse n=129 (%)	All Participants n=271 (%)	P-value*	Doctor			Staff Nurse		
					Medical	Surgical	P-value*	ICU	Ward	P-value*
Age	27.49 ± 2.746	28.71 ± 4.332	28.07 ± 3.634	0.006	27.36 ± 2.66	27.72 ± 2.89	0.455	28.86 ± 4.012	28.48 ± 4.829	0.629
Male	70 (49.3)	60 (46.5)	130 (48)	0.647	41 (46.1)	29 (54.7)	0.319	41 (51.9)	19 (38)	0.123
Female	72(50.7)	69(53.5)	141(52)		48(53.9)	24(45.3)		38(48.1)	31(62)	
Married	30 (21.1)	86 (66.7)	116 (42.8)	0.001	12 (13.5)	18 (34)	0.004	49 (62)	37 (74)	0.160
Single	112 (78.9)	43 (33.3)	155 (57.2)		77 (86.5)	35 (66)		30 (38)	13 (26)	
Toxic drug alcohol abuse	13 (9.2)	0 (0)	13 (4.8)	0.001	10 (11.2)	3 (5.7)	0.265	0 (0)	0 (0)	-
Received COVID Prophylaxis	51 (35.92)	7 (5.43)	58 (21.40)	0.001	40 (44.94)	11 (20.75)	0.003	3 (3.80)	4 (8)	0.429
COVID RT PCR positive	21 (14.8)	18 (14)	39 (14.4)	0.845	16 (18)	5 (9.4)	0.165	11 (13.9)	7 (14)	0.99
Admission due COVID	18 (12.7)	11 (8.5)	29 (10.7)	0.270	14 (15.7)	4 (7.5)	0.156	6 (7.6)	5 (10)	0.634
Admission of colleague due to COVID and requiring oxygen/ventilator system	54 (38)	18 (14)	72 (26.6)	0.001	39 (43.9)	15 (28.3)	0.065	14 (17.7)	4 (8)	0.121
Shortage in supply of emergency equipments during duty hours	59 (41.5)	13 (10.1)	72 (26.6)	0.001	40 (44.9)	19 (35.8)	0.287	8 (10.1)	5 (10)	0.981
COVID related bereavement	18 (12.7)	1 (0.8)	19 (7)	0.001	12 (13.5)	6 (11.3)	0.708	0 (0)	1 (2)	0.207
Violence during duty hours	12 (8.5)	13 (10.1)	25 (9.2)	0.644	8 (9)	4 (7.5)	0.765	8 (10.1)	5 (10)	0.981

*Chi-square test

Statistical Analysis

The data were collected and entered into MS excel 2010. Statistical analysis was performed using the SPSS 26 trial version. The one-sample Kolmogorov – Smirnov, Chi-Square, and Independent T-test were applied. If p-value <0.05 was considered statistically significant.

Results

A total of 271 out of 330 contacted individuals completed the questionnaire. The overall participation rate was 82%, with doctors (93%) more than nurses (73%). Table 1 summarises the socio-demographic characteristics of participants. Among the 271 participants, 142 were doctors and the rest were nursing staff (129). The overall mean age was 28.07 ± 3.634 years, with slight female predominance (52%). Among 271, 39 (14.4%) were infected with COVID-19, of which 29 were admitted.

72 individuals (26.6%) reported a shortage of emergency equipment, and 19 had COVID-related bereavement. The two groups, doctors and nurses, were comparable in gender ratio, COVID infectivity rate, and the case of admission due to COVID-19, and had statistically significant differences in age, marital status, drug abuse, COVID prophylaxis, admission of colleagues, shortage in supply of emergency equipment, and COVID-related bereavement.

The prevalence of perceived stress calculated using PSS was found in 52.4% of healthcare workers (Figure 1). Only 4.8% consumed agents for attaining sleep, all of them being doctors. 9.2% came across some form of violence. On grading the level of perceived stress, 47.6% of the population had mild to moderate stress in each group, and 4.8% had high stress levels (Table 2).

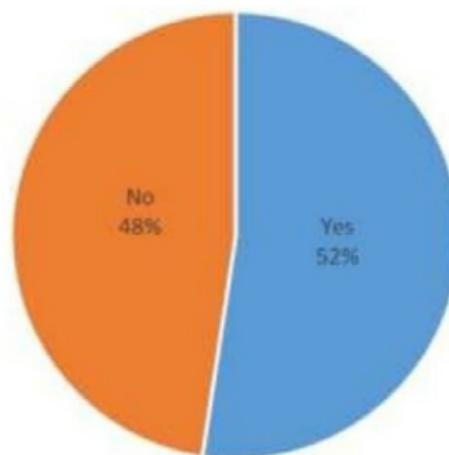


Figure 1 Prevalence of perceived stress among study population

*Using perceived stress scale

On analysing various parameters, as shown in Table 3, factors associated with higher perceived stress scale scores (PSS) are participants belonging to the doctor group, more workplaces, drug/substance abuse for sleep, consuming drugs related to COVID prophylaxis, admission of colleagues requiring ventilatory support, shortage of supplies, bereavement, and violence during duty hours. There was no significant effect of age, gender, workplace, or marital status on the PSS score.

Table 2 Level of perceived stress among study population

Perceived stress scale	Number of participants(Total-271)	Percentage
Low Stress	129	47.6
Moderate Stress	129	47.6
High Stress	13	4.8

Table 3 Association between prevalence of perceived stress and socio-demographic characteristics

Variable	Perceived Stress Scale		P-value	OR (95% CI)
	No Stress (n=129) (%)	Stress (n=142) (%)		
Age	28.14 ± 3.828	28.01 ± 3.462	0.777	-
Sex				
Female	63 (48.8)	78 (54.9)	0.316	-
Male	66 (51.2)	64 (45.1)		-
Profession				
Doctor	58 (45)	84 (59.2)	0.019	1.773 (1.095 – 2.871)
Staff Nurse	71 (55)	58 (40.8)		Reference
Marital Status				
Married	61 (47.3)	55 (38.7)	0.155	-
Single	68 (52.7)	87 (61.3)		-
Work Place				
One Place	79 (61.2)	65 (45.8)	0.005	Reference
Two Place	22 (17.1)	29 (20.4)		1.602 (0.841–3.051)
Three place	24 (18.6)	28 (19.7)		1.418 (0.750 – 2.679)
Four Place	4 (3.1)	20(14.1)		6.077 (1.978 – 18.673)
Past Medical History				
Toxic drug/alcohol abuse for sleep	2 (1.6)	11 (7.7)	0.017	5.332 (1.159 – 24.533)
Received COVID Prophylaxis	12 (9.3)	46 (32.4)	0.001	4.672 (2.343 – 9.317)
Infected by COVID	14 (10.9)	25 (17.6)	0.114	-
Admission due COVID	12 (9.3)	17 (12)	0.478	-
Admission of colleague due to COVID and required Oxygen/Ventilator support	16 (12.4)	56 (39.4)	0.001	4.599 (2.468 – 8.569)
Shortage in supply of emergency equipments during duty hours	17 (13.2)	55 (38.7)	0.001	4.165 (2.259 – 7.679)
COVID related bereavement	2 (1.6)	17 (12)	0.001	8.636 (1.954 – 38.159)
Violence during duty hours	4 (3.1)	21 (14.8)	0.001	5.424 (1.809 – 16.262)

Table 4 Comparison of sleep scale and stress scale among doctors and nurses

Quality Index Scale	Overall (n=271)	Doctor (n=142) Mean ± SD	Staff Nurse (n=129) Mean ± SD	P-value*
Pittsburgh sleep scale	7.01 ± 3.707	7.41 ± 3.732	6.57 ± 3.642	0.062
Perceived stress scale	14.35 ± 6.570	16.23 ± 7.512	12.29 ± 4.552	0.001
Epworth sleep scale	8.27 ± 3.930	8.32 ± 3.814	8.22 ± 4.068	0.835
Insomnia severity scale	8.55 ± 4.108	8.78 ± 4.358	8.29 ± 3.815	0.331

*Independent t test

Table 5 Correlation between Perceived Stress Scale and other sleep scales

Scales	r-value*	P-value
Perceived stress scale Vs Pittsburgh sleep scale	0.608	0.001
Perceived stress scale Vs Epworth sleep scale	0.410	0.001
Perceived stress scale Vs Insomnia severity scale	0.483	0.001

*Pearson correlation coefficient

There was no statistical significance in the comparison between the two groups (doctors and nurses) based on the Pittsburgh sleep scale, Epworth sleep scale, and Insomnia Severity Scale. Still, statistical significance was found on the perceived stress scale (Table 4).

As summarised in Table 5, PSP scores had a positive correlation with the scores of sleep-related scales like PSQI, ISI, and ESS. These results were statistically significant ($p < 0.05$). These findings suggest that perceived stress significantly impacts sleep quality, insomnia, and daytime sleepiness among healthcare workers.

54.61% reported poor sleep quality, with clinical insomnia reported in more than half of the study population (50.55%) and daytime sleepiness among 19.18% of participants (Figure 2).

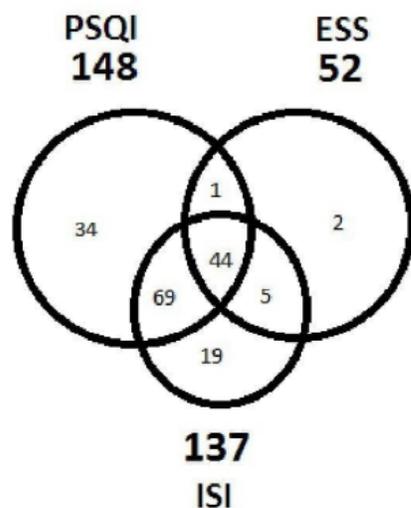


Figure 2 Distribution of study population affected based on different sleep scoring scales

This study provides insight into the stress a medical professional has to go through and its detrimental effects on the professional and personal life. This is the first study of its kind, and we have not seen any similar study done in this COVID era. Therefore, measures to combat all these stressors to decrease burnout in medicos are of utmost importance as it will eventually help them provide medical health care facilities in a better way.

Discussion

The present study examines the perceived stress, sleep quality, daytime sleepiness and insomnia among frontline Health Care Workers (HCWs). The prevalence of stress among doctors is 59.2% in the study and is lower than in two previous studies[12,13]. The mean PSS score in the study was 14.35 ± 6.570 . It was higher than the normal population but lower than similar studies[12,14].

HCWs suffer from immense stress and sleep-related issues during COVID times due to numerous factors, namely: the restrictions on interacting with others during working hours, exhaustion due to prolonged use of personal protective equipment, the continued vigilance relating to infection control procedures, prolonged work shifts, and the unavoidable separation from and concern about family members due to the fear of infecting family members and beloved ones [4].

The present study found significantly higher stress among doctors compared to staff nurses, in contrast to comparable studies done in China, Taiwan and Jordan[14,15,16]. The study also found a higher stress level among Postgraduate doctors/Junior Residents since they are assigned COVID duties in addition to their routine departmental duties, research responsibilities, and training/academic activities. The study also revealed that stress was independent of age, contrary to a similar study[17]. PSS showed no significant correlation with gender or marital status, which aligns with a similar study done among HCWs[12]. The study also found that the perceived stress increased significantly with the number of workplaces. The present the study also pointed out that the more stressed people were more inclined to use prophylaxis.

Stress is closely related to the quality of sleep, and this has been studied by various previous types of research that utilized the PSS and PSQI as research tools[18,19]. There was a significant association between PSS and PSQI, ISI and ESS, as shown in the table, contrary to a similar study[14]. The results showed that 54.6% of respondents had poor sleep quality compared to 61.6% in a study in China[20]. The mean ESS was 8.27 ± 3.930 compared to 5.73 ± 3.16 in a study from Spain[21]. Also, 50.6% of respondents had insomnia, which is higher than in a similar study among health workers in Taiwan[22].

Poor sleep quality, stress, and mental health issues among HCWs have been found to impair their cognitive abilities and clinical decision-making [23]. This, in turn, increases the likelihood of the occurrence of medical errors that may cause undue risk to the patients. Also, it has been proven that acute stress during disasters can have an everlasting effect on the overall well-being of HCWs[24,25].

Compared to all other studies that investigated the effect of COVID-related stress on HCWs, this is the only study that evaluated the impact of parameters like shortage of supply of emergency equipment during duty hours, colleagues being infected with COVID virus, COVID-related bereavements and the subsequent handling of such difficult situations with the kith and kin of the bereaved.

This study strongly recommends that frontline HCWs, in order to cope with the stress and sleep-related issues, should be trained in meditation and relaxation techniques, along with the necessary psychotherapy and counselling.

Conclusion

Early identification of predictors of stress is the need of the hour and is of paramount importance. Early screening for stress predictors and routine psychological problems is essential for protecting the health care system. In addition, optimal psychological interventions can improve frontline healthcare workers' physical and mental fitness. Therefore, management of stress among healthcare workers should be a priority during these times.

Limitations of the Study

Lack of follow up as it was a cross-sectional study, single centre-study.

Ethical Approval

The study was approved by the Institutional Ethics Committee (IEC) with the approval number of SAIMS/IEC/2021/25.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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