

THE EFFECT OF SHIFT WORK ON SLEEP QUALITY IN HEALTHCARE EMPLOYEES: A CROSS-SECTIONAL STUDY

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Abstract

Background: Sleep is an important pillar of health and it helps to maintain various body functions. It is regulated by the circadian pacemaker in the hypothalamus. Shift work leads to disruption of sleep and circadian rhythm which may lead to various disorders thereby decreasing the quality of life. Hence understanding the importance of sleep quality plays a vital role in maintaining normal body functions. The aim is to assess the effect of sleep quality among healthcare employees working during the day versus shift duty.

Materials and Methods: The study was a cross-sectional study. Healthcare employees between the age group of 24 to 38 years in the Parent Institute were divided into 2 equal groups consisting of 130 employees working on day duty and 130 employees working on shift duty. The study was carried out for 2 months. To assess the quality of sleep, the Pittsburgh Sleep Quality Index (PSQI) questionnaires were given to both groups. PSQI scores of both groups were compared using Mann Whitney U test. **Result:** The study group consisted of 130 (68 male and 62 female) employees with a mean age of 29.4 + 3.9 years while the control group consisted of 130 (72 male and 58 female) employees with a mean age of 30.5 + 3.7 years. The study suggests the PSQI in the study group was about 8 and in the control group it was about 4. The median PSQI was significantly higher in the study group with a P value <0.001 as compared to the control group indicating poor quality of sleep among the study group. **Conclusion:** Healthcare employees working on shift duty show poor sleep quality primarily due to Shift work sleep disorders as compared to employees working in the daytime.

INTRODUCTION

Sleep is considered one of the pillars of health alongside exercise and diet.^[1,2] Sleep helps maintain various body functions like metabolism, immunity, hormone function, and cardiovascular functions.^[3] According to the “National Sleep Foundation” and “The American Academy of Sleep Medicine”, adults should sleep for 7-9 hours per day.^[2,3] Sleep regulation occurs in the brain and is regulated by the suprachiasmatic nuclei (SCN) in the hypothalamus thereby regulating the sleep/wake schedule. Shift workers sleep during the day and work at night, disrupting the sleep regulation of the body.^[4,5] Healthcare employees work in shifts to provide patient care round the clock. The term shift work refers to work schedules that divide the 24 hours into roughly comparable segments and use three or more time slots for full 24-hour coverage. Healthcare employees can work permanent shifts or alternate between early morning, afternoon, and night

shifts.^[4,5] The most common health issue faced by shift workers is sleep disruption.^[5,6] Disruption of sleep is linked to a higher risk of a variety of disorders like obesity, hypertension, diabetes, cardiovascular and cerebrovascular disease.^[3,7,8]

Shift work among healthcare employees has an impact not only on sleep quality but also on the work performance and safety of patients.^[9-13] These effects of shift work are collectively called “Shift Work Sleep Disorder (SWSD)”. SWSD is defined as “difficulty in falling asleep, remaining asleep, or non-restorative sleep for at least one month” that is linked to a “work time that occurs during the habitual sleep phase.”^[14] Moreover, the COVID-19 pandemic has resulted in elevated levels of sleep disturbance among healthcare employees globally.^[15-17]

The existing research suggests a positive relationship between shift duty and sleep quality; however, there is a significant gap in the literature, with very few studies specifically focusing on healthcare employees. Given the critical role that healthcare

employees play in the delivery of healthcare services, the direct impact on patient outcomes, and the healthcare employees' well-being is inextricably linked to the efficient operation of the healthcare system. Many existing studies used objective measures such as actigraphy or polysomnography.^[18,19] The questionnaire-based approach, on the other hand, adds a valuable subjective perspective, capturing healthcare employees' personal experiences and perceptions of their sleep quality. The questionnaire-based approach can be useful for mass screening Shift Work Sleep Disorder and the factors influencing poor sleep quality like high stress levels and environmental factors in healthcare settings. It is critical to identify these specific challenges to tailor interventions and policies that address the root causes of sleep disturbances in this occupational group.^[20,21] To encourage adaptability and protect the health status of both healthcare employees and patients, it is necessary to assess the effect of sleep disruption among healthcare employees working in shifts. The study's goal is to assess the effect of sleep quality among healthcare employees who work during the day versus shift duty.

MATERIALS AND METHODS

Study Design and Participants: The study was conducted at the Parent Institute Seth G.S. Medical College and KEM Hospital, Mumbai. It was a "Cross-sectional" study which continued for 2 months from May 2023 to July 2023. The subjects working in the Parent Institute were included in the study. Healthcare employees between the age group of 24 to 38 years were included in the study and divided into 2 equal groups.

For the calculation of sample size, based on the study²⁰ the prevalence of general sleep disorder was assumed to be 34% in shift workers and 30% in day workers with a level of confidence of 95% & power of 80%, the minimum sample size calculated was 123 in each group. So a total of 130 subjects were included in each group. The formula used for the calculation of sample size was:

$$n = \frac{Z_{\alpha/2} + Z_{\beta}}{2} \cdot \frac{P_1(1-P_1) + P_2(1-P_2)}{(P_1 - P_2)^2}$$

One group (Control group) consisted of 130 healthcare employees working in the daytime; whereas the other group (Study group) consisted of 130 healthcare employees working in rotating shift duty. A total of 260 subjects were included in the study.

Inclusion criteria

The healthcare employees working for at least 7 hours per day for 6 days in a week in the daytime at the parent institute.

The healthcare employees working for two-morning shifts, two evening shifts, and two-night shifts for at least 7 hours per day for 6 days in a week at the parent institute.

Exclusion criteria

Subjects who were aware of their sleep issue and receiving therapy. Subjects who refused to provide consent. Subjects taking medications for hypertension or for lowering lipid levels, Subjects with known cardiac or respiratory problems. Women who were pregnant or nursing. Subjects having any past medical history like skeletal anomalies. Subjects with a past history of any surgery. Subjects with insomnia and depression were all excluded from the study.

Data Collection: A total of 260 healthcare employees from the Parent Institute between the age group of 24 to 38 years were chosen and included in the study. They were selected by non-random sampling. Informed consent was taken in the local language understood by the subject.

Questionnaire: The Pittsburgh Sleep Quality Index (PSQI) is a self-reported questionnaire that assesses the quality of sleep. The questionnaire consists of 19 items that are grouped into seven components that use a scale from 0 to 3 with a total score ranging from 0 to 21 was used to assess sleep quality. The final score is the sum of the scores for the seven items. If the final score is ≤ 6 , it indicates poor sleep quality; and a score of ≤ 5 indicates good sleep quality.²¹

Ethics: The study was carried out in accordance with the principles stated in the ICH- GCP Guidelines, Declaration of Helsinki, 2013, and the ICMR's Ethical Guidelines for Biomedical Research on Healthy Participants, 2006. Study approval was taken from the Institutional Ethics Committee (EC/OA-53/2023) of the Parent Institute.

Statistical Analysis: The data was entered using MS-Excel-2021 and analyzed using SPSS-16 software. Descriptive analysis for numerical data consists of mean with standard deviation (SD) (For normally distributed data) and median with range (For Non-normally distributed data) for PSQI.

The Kolmogorov-Smirnov test was performed to determine if the data distribution was normal or non-normal. An unpaired t-test was used to compare the numerical data that were normally distributed (age) between the two groups. The Mann-Whitney U test was used to compare the numerical data that was non-normally distributed (PSQI) between the two groups. The Chi-square test was used to compare the proportions of the two groups by gender. P values under 0.05 were considered statistically significant.

RESULTS

260 healthcare workers participated in the study and answered the questionnaire completely. Employees on shift duty (study group) and daytime employees (control group) were divided into 2 groups of 130 each for the study.

The control group consisted of 130 subjects with a mean age of 30.5 ± 3.7 , while the study group consisted of 130 subjects with a mean age of 29.4 ± 3.9 years.

The control group included 72 males and 58 females and the study group included 68 males and 62 females. There was no significant difference between the groups with respect to age and gender ($P > 0.05$). [Table 1]

The median PSQI in the control group was 4 and, in the study group was 8. The median PSQI was significantly higher in the study group as compared to the control group with a P -value < 0.001 , indicating poor quality of sleep among the study group. [Table 2]

Table 1: Sociodemographic information of the healthcare employees working in shifts and day duty.

	Age	Gender	
		Male	Female
Control Group (N=130)	30.5 + 3.7 (24-37)	72 (55.4%)	58 (44.6%)
Study group (N=130)	29.4 + 3.9 (25-37)	68 (52.3%)	62 (47.7%)
P value	0.526*	0.619***	
Significance	Not significant	Not significant	

(*Unpaired t test/ ***Chi square test)

Table 2: PSQI scores of healthcare employees working in shifts and day duty.

	PSQI
Control Group (N=130)	4 (1-9)
Study group (N=130)	8 (5-13)
P value	< 0.001 **
Significance	Significant

**Mann Whitney U test)

DISCUSSION

This study included healthcare employees working during the day as well as employees working on shift duty. Moreover, the study also revealed that healthcare employees working on shift duty have significantly poor sleep quality with a PSQI score of 8 as compared to healthcare employees working during the day with a PSQI score of 4. This shows that sleep disruption is common in healthcare employees. Studies have shown that shift duties lead to altered regulation of sleep/wake schedule leading to symptoms of sleep deprivation and insomnia that are consistent with nightmares, sleepwalking, and night terrors.^[15] Sleep deprivation also leads to changes in mood and increased fatigue.^[8,22] It is shown that increasing distress due to work affects sleep quality.^[22] Studies done during the COVID-19 outbreak, showed that front-line healthcare workers experienced more sleep disturbances and poorer sleep quality than non-healthcare professionals.^[15] There have been changes in mood profiles in healthcare employees leading to a significant decrease in vigor and an increase in fatigue.⁸ Thus, implementing preventive measures is extremely important, particularly those aimed at improving physician turnover, optimizing work schedules, and improving work organization. Studies using regression models have shown that gender, advanced age, being a healthcare worker, and a higher level of stress, and anxiety were the main predictors of sleep disturbances.^[23] The evening chronotype emerged as a risk factor, whereas morning chronotype individuals had a lower proclivity to sleep and psychological problems.^[23] A study on dockyard workers showed that Daytime sleepiness was more common among workers who worked on-call night shifts and that poor sleep quality was more common among night-shift workers.^[21] Study suggests that workers' cognitive efficiency may suffer as a result of

circadian rhythm desynchronization, lack of sleep, and fatigue caused by night work.^[24] High-demanding and competitive work has shown sleep insufficiency and poor sleep quality.^[11] Healthcare employees especially those working on shift duty are in highly demanding and stressful environments each day which could be the contributing factor to poor sleep quality. Studies have shown that office workers with good sleep quality have better decision-making performance as compared to office workers with poor sleep quality.^[25] Therefore, good sleep quality is more important among healthcare employees for better decision-making and patient care. One should also understand that when sleep disruption interferes with a healthcare employee's ability to perform their daily duties, they should speak with a sleep specialist.^[4] The Sleep health programmes have shown a positive and stable effect on objective and self-reported sleep parameters on army personnel.¹⁹ This study shows a positive relationship between shift work and poor sleep quality among healthcare employees. It sheds light on the difficulties that this occupational group faces as a result of their work schedules and highlights the potential impact on their sleep patterns. Therefore, the implementation of sleep health programmes is important for healthcare employees to improve their quality of sleep. This study gives insights on various clinical implications which are as follows

1. Healthcare Worker Well-Being: Sleep is essential for a healthcare employee's general well-being. Shift workers may experience increased stress, exhaustion, and burnout as a result of persistent sleep problems. This might affect their physical and emotional health, possibly increasing absenteeism and lowering job satisfaction.
2. Patient Safety and Quality of Care: Poor sleep among healthcare employees working on a shift duty could affect cognitive function and cause a drop in awareness. Because of this, patient safety

and the standard of care given may be compromised. Healthcare professionals may commit more mistakes or perform less competently when handling crucial responsibilities.

3. **Impact on Overall Health:** An increased risk of mood disorders including depression and anxiety is linked to poor sleep quality. Due to the nature of their employment, healthcare workers already experience significant levels of stress; nevertheless, getting little sleep may worsen these problems and result in a deterioration in mental health.
 - Shift work has been associated with a variety of physical health issues, such as cardiovascular disease and metabolic abnormalities. The need for initiatives to enhance work schedules and sleep hygiene among healthcare workers may be a contributing factor to these health problems.
 - Also measures like Sleep Health Programmes should be considered for better mental health and to improve occupational safety and health.
4. **Productivity and Efficiency:** Sleep-deprived healthcare employees may operate at a lower level of efficiency and productivity. Longer patient wait times and delays in the provision of care in the healthcare system could result from this.
5. **Implementation of Interventions:** Based on our findings, interventions might be put in place to help shift-duty workers in the healthcare system get better sleep. Shift scheduling optimization, sleep hygiene education, and the creation of welcoming workplace settings that place a priority on employee well-being can be implemented.
6. **Educational Initiatives:** Healthcare organizations could use our research to create managerial and employee education programmes that emphasize the value of sleep and how it affects patient care. These initiatives could raise public awareness of sleep-related problems and encourage the adoption of better sleeping habits.

Limitations: The study doesn't reveal if there are any benefits in terms of circadian adjustment to shift work. The study is insufficient to draw any causal linkages or conclusions as it is a cross-sectional study. Polysomnography was not done in this study, leading to a scarcity of objective data. A study can be done in future on a larger population with polysomnography for drawing out causal linkages. External factors such as family responsibilities, lifestyle choices, or secondary employment can all have an impact on sleep quality which are not considered in the study.

CONCLUSION

This study found that healthcare employees working on shift duty have a significant amount of poor sleep

quality at night as compared to healthcare employees doing day duty who have adequate sleep quality at night.

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