Original Article

Sleep Quality and Daytime Sleepiness among the Clinicians Working in a Tertiary Care Center in Sikkim, India

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ABSTRACT

Background: Doctors in India have increased workload and are at risk for poor sleep and excessive daytime sleepiness which have not been explored much. **Methods:** One hundred doctors selected by convenience sampling from different departments of the hospital were assessed cross-sectionally. Physical parameters which were assessed included height, weight, blood pressure, and diabetes status. Other variables assessed included durations of duty hours and social media usage. Sleep quality and daytime sleepiness were assessed with the Pittsburg Sleep Quality Index (PSQI) and Epworth Sleepiness Scale (ESS), respectively. **Results:** Mean age of the participants was 35.3 years with a SD of 6.21. In all, 42% were female. The overall prevalence of poor quality of sleep was 28.3%. Among the participants, junior and senior residents were the most affected; 45% of the junior residents were having a poor quality of sleep. Daytime sleepiness was significantly more common among the junior residents as compared with doctors of other designations ($P = 0.02$). The mean duration of duty hours was highest for the junior residents. Male participants were more likely to be obese and to have systemic hypertension. No significant difference was found for social media usage among different designations or gender. **Conclusion:** Poor sleep quality and excessive daytime sleepiness are highly prevalent among the doctors, especially those who are lower in the hierarchy. Interventions for physical and psychological morbidity among the doctors and strict implementation of guidelines governing duty hours and call schedule of junior physicians are recommended.

Key words: *Daytime sleepiness, doctors, Sikkim*

Key messages: *Clinicians are suffering from poor quality sleep and daytime sleepiness. The clinicians who are lower in the hierarchy are likely to get more affected. Regular screening for physical and psychological morbidity among clinicians is warranted and timely intervention is needed. Proper guidelines governing duty hours and implementation is the need of the hour.*

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Sleep is defined based on both changes in the behaviour of a person who is asleep and the related physiological changes in the brain electrical activity. The behavioural criteria include closed eyes, lack of mobility or slight mobility, reduced reactivity to an external stimulus, elevated arousal threshold, impaired cognition, and a reversible unconscious state. The physiological criteria are based on the changes in the electroencephalography, electromyography, and electrooculography.[1]

The function of sleep is an area which is still being explored. Research on sleep deprivation has shown impaired performance consequent of which is 'decreased motivation' and frequent 'micro-sleeps'. There is impairment of attention, concentration, vigilance, and memory.[1] Prolonged sleep deprivation may lead to increased sympathetic compared to parasympathetic tone, resulting in decreased β cell responsiveness, which results in impaired glucose tolerance and negative effects on cardiac function, regulation of blood pressure, and kidney function.[2] The restorative function of sleep also includes removal of a neurotoxic product which accumulates in the central nervous system when one is awake.[3]

Any profession which involves high demand is usually stressful. Stress causes not only physiological activation but also psychological activation, which is incompatible for falling asleep. Stress causes activation of the sympathy-adreno-medullary (SAM) and hypothalamo-pituitary-adrenocortical (HPA) systems which negatively affects sleep.[4] Doctors belong to one of the most stressful professions. They are required to meet clinical commitments and also need to fulfil the administrative responsibilities entrusted on them. With the increasingly litigious environment, which is usually unforgiving; constant change in medical knowledge which they have to keep themselves updated and bureaucratic requirements which also keep changing, doctors remain under constant stress, which usually results in sleep disturbance, substance abuse, mental illness, and suicide.[5]

Sikkim with a population of slightly more than 6 lakhs has a single tertiary healthcare centre. This center caters to the needs of not only the population of Sikkim but also from nearby bordering states. The physical and mental health status of the doctors serving here has never been assessed. We felt the need to fill up this gap starting with the assessment of the quality of their sleep and excessive daytime sleepiness.

Aim of the study

To assess the quality of sleep among the doctors working in a tertiary healthcare center and to find out the effect of the disturbed sleep on daytime sleepiness.

MATERIALS AND METHODS

This was a cross-sectional study done within a period of six weeks. Data collection started on 4 April 2018 and completed on 13 May 2018. The sampling was done by convenience sampling technique, and the sample size was 100. The participants were the doctors from all the clinical department of the Sikkim Manipal Institute of Medical Sciences. The participants included in the study were those who expressed their willingness after they were informed about the details of the study and gave their written consent. Joining a new institution or joining after a time lag is usually stressful and may affect the quality of sleep, so those who recently joined the institution as a new recruit or recently joined the department after their leave was over were excluded from participation. Also, those who were already diagnosed with sleep disorders or were on any medication which can alter the sleep were not included. Those who were above 50 years of age were excluded from the study to avoid interference of age-related sleep problems. Approval form the Institution Ethical Committee was obtained before the commencement of collection of data.

Data were collected in a predetermined format which included age, gender, weight and height blood pressure (BP), diabetes status, position in the hierarchy in the department, working hours, and hours spent in social media. The participants were then administered the Pittsburgh Sleep Quality Index (PSQI) questionnaire and the Epworth Sleepiness Scale (ESS). Body Mass Index (BMI) was calculated as defined by the World Health Organization (WHO) and the participants were classified as per the BMI given by WHO.[6]

The PSQI is a self-rated, 19-item questionnaire which helps in evaluating the subjective quality of sleep over the last 1 month. The questions are combined to seven clinically derived component scores, each score between 0 and 3. The seven components scores are added to get a global score (0-21). A cut-off score of 5 is used to identify sleep disorders with 89.6% sensitivity and 86.5% specificity.[7,8]

The ESS is a self-administered questionnaire where the respondents rate their usual chances of dozing off or falling asleep during different activities. There are eight questions which are answered on a 4-point scale (0-3). The total score is 24. The higher the score, the more is the chance of daytime sleepiness. The total score on ESS is also interpreted as 0-5: Lower Normal Daytime Sleepiness, 6-10: Higher Normal Daytime Sleepiness,

11-12: Mild Excessive Daytime Sleepiness, 13-15: Moderate Excessive Daytime Sleepiness and 16-24: Severe Excessive Daytime Sleepiness.[9,10]

Statistical analysis

Descriptive analysis of data was done where categorical data were expressed as percentage and continuous data as mean with standard deviation (SD). Normality of data was checked by the Shapiro-Wilk test. PSQI score was dichotomized into normal quality (≤5)) and poor quality (>5), and ESS score was also recoded into another variable with five gradings (lower normal daytime sleepiness, higher normal daytime sleepiness, mild excessive daytime sleepiness, moderate excessive daytime sleepiness, severe excessive daytime sleepiness). ANOVA was used to test the difference in PSQI score, when used as a continuous variable, among the different designations. Kruskal Wallis test was used to find the association between different designations and ESS score when used as a continuous variable. Values of $P < 0.05$ were regarded as statistically significant.

RESULTS

One hundred doctors participated in the study. The mean age of the participants was 35.32 (SD = 6.21) years. The mean age and other characteristics of the group as per the designation is given in Table 1.

Among the participants, 42% (n = 42) were females. 5% (n = 5) had diabetes mellitus, and 13% (n = 13) had systemic hypertension. According to the BMI division, 43% (n = 43) of the participants were overweight, 3% (n = 3) were obese, and 1% (n = 1 was underweight. There was a significant difference between systolic and diastolic blood pressure and BMI across the two genders. Male participants were more likely to be overweight and obese and to have systemic hypertension. For systolic BP, F (1,98) = 10.43, P = 0.002. For diastolic BP, F (1,98) = 8.01, P =0.006. Chi-square test of independence was done to examine the relation between gender of the participants and different BMI groups. It was found male gender was significantly associated with overweight and obese category, χ^2 (3) = 11.33, P = 0.01. On exploratory data analysis it was found that there was no significant difference in the PSQI score between participants having diabetes mellitus and those who did not have, F (1,98) =0.612, P = 0.68 and also between the participants who had systemic hypertension and those who did not have, F (1,98) = 0.54, P = 0.81. We also did not find any significant difference in the ESS score between the two groups of those who had and did not have diabetes mellitus, F (1,98) = 1.38, P = 0.24. Similarly, no difference was found in the ESS scores of the participants who had systemic hypertension and those who did not have, F (1,98) = 0.605, P = 0.43 respectively.

Table 1: Characteristic of participants

	Faculty (n=69)		SR (n=11)		JR (n=20)	
	Mean	SD	Mean	SD	Mean	SD
Age (years)	37.75	5.10	33.36	6.29	28.0	2.67
BMI	24.64	3.15	24.20	2.25	22.94	3.12
SBP	120.39	10.83	120.18	9.85	118.20	12.91
DBP	78.04	7.89	78.36	6.91	77.56	6.19
Duty hours	8.54	1.39	8.55	1.81	10.05	2.14
SMU	1.93	1.89	1.72	1.25	1.62	1.13
PSQI score	4.32	2.85	4.91	3.33	5.65	3.77
ESS score	7.28	4.10	8.18	3.92	9.30	2.49

SR – Senior Residents, JR – Junior Residents, BMI – Body Mass Index, SBP – Systolic Blood Pressure, DBP – Diastolic Blood Pressure, SMU – Social Media Usage in hours, PSQI – Pittsburgh Sleep Quality Index, ESS – Epworth Sleepiness Scale

There was no significant difference found in the mean score of either PSQI or ESS as per the different grades of BMI, F (3,93) = 0.92, P = 0.43 and H (3) = 1.07, P = 0.78, respectively.

The mean daily duration of duty hours was highest for the junior residents (10.05 ± 2.14 hours) and the lowest for the faculty (8.54 ± 1.38 hours).

Social media usage

The mean duration of social media usage was highest for the faculty, followed by the senior residents. There was no significant difference between the different designations and social media usage, F (3,93) = 0.82, P = 0.48. No gender difference was found with regard to social media usage, F (1,98) = 0.15, P = 0.69.

Sleep quality

The mean PSQI score for the participants was 4.65 ± 3.11. The overall prevalence of poor sleepers across different designations was 28%. The PSQI score was above 5 for the junior residents (5.65 ± 3.77) [Table 2]. Forty-five percent (n = 9) of the junior residents reported poor sleep quality Though the mean PSQI score for the senior residents was below 5, however,- 27.3% (n = 3) of the senior residents also reported poor quality of sleep. The members of the faculty group had mean score <5. There was no statistical difference in the mean score of PSQI by different designations [Table 3].

Daytime sleepiness

The mean ESS score was 7.78 with SD of 3.87. In all, 46% of the participants (n = 46) reported higher normal daytime sleepiness, 11% (n = 11) reported mild excessive daytime sleepiness, while 7% (n = 7) and 4% (n = 4) reported moderate and severe daytime sleepiness respectively. Among the different designations, ESS mean score was the highest for the junior residents (9.3 ± 2.5) and the

lowest for the faculty (7.28 ± 4.10) [Table 2]. Twenty percentage (n = 4) of the junior residents reported mild excessive daytime sleepiness and 15% (n = 3) reported moderate excessive daytime sleepiness; 9.1% (n = 1) reported moderate and an equal number reported severe daytime sleepiness. Kruskal Wallis test compared the daytime sleepiness of different designations. A significant result was found, H (2) = 6.02, P = 0.049, indicating that the groups differed from each other. Follow-up pairwise comparisons indicated that the junior residents had significantly higher daytime sleepiness than the other two groups [Figure 1]. There was no gender difference with regard to the severity of daytime sleepiness, χ^2 (4) = 1.19, P = 0.88.

A low positive but significant correlation was found between PSQI score and ESS score, rho (98) = 0.244, P = 0.013. Eighteen percentage (n = 5) of poor sleepers reported mild excessive daytime sleepiness and equal percentage 17.9% (n = 5) reported moderate excessive daytime sleepiness. Higher normal daytime sleepiness was reported by 46.4% (n = 13) of the participants having poor sleep.

DISCUSSION

This study intended to find the sleep quality and daytime sleepiness among the clinicians in a tertiary care center. Though we found a prevalence of 28% of poor sleepers (PSQI > 5), poor sleep quality and daytime sleepiness were more among the doctors who were lower in the hierarchy. In all, 45% of the junior residents and approximately 27% of the senior residents reported poor sleep quality. The junior residents were more likely to have excessive daytime sleepiness compared to participants of other designations.

Surani *et al*. reported a prevalence of 36.8% of "poor sleepers" in a sample of 334 junior physicians.[10] We found a slightly higher percentage (45% of the junior residents) of "poor sleepers." Our study center is in a geographically difficult area, and it is a single tertiary center, so the number of patients attending the hospital at regular and odd hours is higher compared to the centers in the plain area. These patients are not only referred from the primary health centers but also from the nearest hospitals as these patients are usually in conditions which need lifesaving care. So, the amount of stress experienced by the junior doctors, who are the patient's first contact, is paramount. Besides, the academic pressure in terms of preparation for various presentations during the postgraduate training program also adds to the stress. Surani *et al*.[11] and Rodríiguez-Muñoz *et al*.[12] also reported that female physicians are more likely to be poor sleepers. In this study, though the mean scores of both PSQI and ESS were slightly higher in females, we did not find any significant difference in the mean PSQI score between the two genders.

We found an overall prevalence of 5% (n = 5) among the participants who had diabetes mellitus also found that male doctors were more likely to be overweight and obese and to have systemic hypertension when compared to female counterparts. Possible explanation can be unhealth eating by male doctors, eating in nearby restaurants and fast food outlets provides options to choose among number of food items which is easier than cooking, whereas females are more conscious even when buying food from such outlets.[13] Also because of the

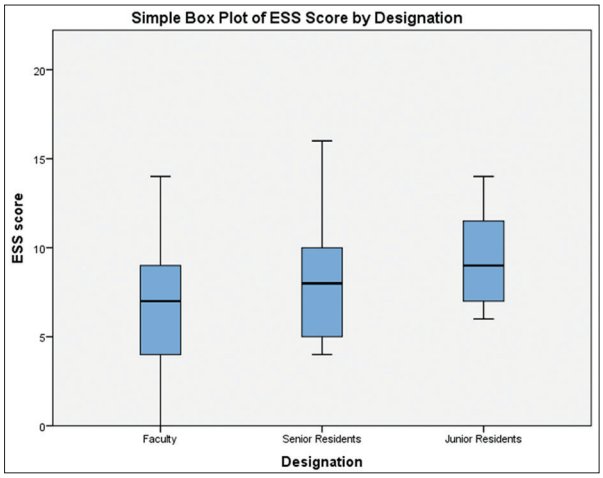

Figure 1: Epworth sleepiness scale score of different designations

Table 2: Mean PSQI and ESS score of participants according to designation

	n	Mean	Std. deviation	Std. error	95% confidence interval for mean	
					Lower bound	Upper bound
PSQI score						
Faculty	69	4.32	2.85	0.34	3.63	5.00
Senior Resident	11	4.91	3.33	1.00	2.67	7.15
Junior Resident	20	5.65	3.77	0.84	3.88	7.42
Total	100	4.65	3.12	0.31	4.03	5.27
ESS score						
Faculty	69	7.28	4.10	0.49	6.29	8.26
Senior Resident	11	8.18	3.92	1.18	5.55	10.82
Junior Resident	20	9.30	2.49	0.56	8.13	10.47
Total	100	7.78	3.87	0.39	7.01	8.55

PSQI – Pittsburgh Sleep Quality Index, ESS – Epworth Sleepiness Scale

Table 3: One-way Analysis of variance in PSQI score by designation

	Sum of squares	df	Mean square	*F*	Sig.
PSQI score					
Between Groups	28.305	2	14.153	1.469	0.235
Within Groups	934.445	97	9.633		

PSQI – Pittsburgh Sleep Quality Index

geographical location the options for outdoor activities are limited. We did not find that presence of overweight or obesity or systemic hypertension has any significant association with either PSQI or ESS scores. Sharma *et al*. also reported a high prevalence of cardiovascular risk factors among doctors in a tertiary center; attributed it to a sedentary lifestyle, inadequate fruit and vegetable intake, excessive alcohol consumption and stress; and recommended a comprehensive health promotional and prevention program.[14]

The study has certain limitations. The sampling was done by convenience sampling, which may result in selection bias. The sample size was small, which may have led to the failure of finding any significant association between the different physical parameters measured in the study and PSQI and ESS scores and this is in contradiction to findings in other studies which have found that hypertension, diabetes, and obesity have significant bearing on the sleep quality and excessive daytime sleepiness.[15,16] The PSQI questionnaire used in the current study assessed subjective sleep quality over the last 1-month period, so this study was not in a position to differentiate between acute and chronic poor sleepers. Some information in PSQI questionnaire requires subjects to recall and report events up to a month prior to administration, and this can lead to recall bias, which could over- or underestimate the true picture of the burden of poor sleep quality. Since this study was based on PSQI, which is a self-administered questionnaire that assesses subjective sleep quality, it could have led to the possibility of biases related to the accuracy of reported information. Various studies conducted among non-health care workers have shown significant differences between subjectively reported and objectively measured sleep quality.[17] The duration of social media usage was assessed through self-reports and any validated measures was not used which is another limitation of this study.

CONCLUSION

Poor sleep quality and excessive daytime sleepiness are highly prevalent among the doctors in the only tertiary care center of Sikkim and the doctors who are lower in the hierarchy are more likely to be affected. Hypertension, diabetes mellitus, obesity and long duration of duty hours may have a negative role on the sleep cycle and consequently, on the sleep quality of the doctors, which can be established in future studies with larger samples.

There is a need for public health policies for screening for sleep quality and physical or psychiatric morbidity which can affect the sleep quality and may result in excessive daytime sleepiness among doctors. Behavioural and educational interventions for improving sleep quality are essential for ensuring the proper sleep and lifestyle of doctors. Necessary actions should also be taken to establish proper policies and guidelines governing duty hours, call schedule, and workload of junior physicians. Further studies employing objective measures are required to validate the relationship of various factors leading to impaired sleep quality.

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Conflicts of interest

There are no conflicts of interest.

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