Sleep patterns and its association with self-reported academic performance among MBBS students of a medical college in West Bengal, India

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Abstract: *Background:* Regular, adequate sleep is necessary for proper functioning of body and mind. Sleep disturbances among undergraduate medical students are common, and can affect the academic performance of these students. *Objectives:* To assess the sleep patterns and its association with perceived academic performance among the of undergraduate MBBS students of a medical college in West Bengal, India. *Methodology:* The study was conducted among 214 undergraduate medical students of a Bankura Sammilani Medical College, West Bengal. Subjects, selected by stratified random sampling, were interviewed using pretested, validated, structured schedule. Analysis was done using IBM SPSS 22 trial version. *Results:* About 14.5% subjects perceived inadequate amount of sleep throughout the day. Students rated the quality of sleep as very poor (2.3%), poor (6.1%), average (34.1%), good (40.7%), very good (16.8%). The subjects perceived their academic performance as very poor (4.7%), poor (14.4%), average (63.6%), good (16.4%) and very good (0.9%). Time taken to fall asleep, time of waking up in the morning, feeling difficulty going back to sleep after waking up mid-sleep, feeling sleepy during academic hours, feeling sleepy during study hours, perceived duration and quality of sleep had statistically significant association with academic performance reported by the students. *Conclusion:* Irregular, inadequate and poor quality of sleep are common among undergraduate medical students, and are often associated with poor academic performance

Keywords: Sleeping habits, Academic performance, Education, Medical, Graduate.

Introduction

Sleep is defined as unconsciousness from which the person can be aroused by sensory or other stimuli [1]. The average length of each sleep cycle is about 90 minutes [2]. On an average, an adult requires 6-8 hours of sleep daily for normal physiological functioning. Adequate sleep and restfulness are required for normal cognitive functioning. Quality of sleep also affects the mental and physical health of the individual [3]. A good amount of sleep is required for processing of short-term memory to long term memory. An active consolidation of the memories occurs during sleep leading to qualitative reorganization of the memories [4]. Sleep also induces the healing mechanism of the body to recover from various injuries faster [5].

Sleep deprivation is a major problem among young adults in general and medical students, in particular, in India as well as all over the world. Long working hours, stress, procrastination, caffeine and alcohol consumption and cigarette smoking can be singled out as the reason of sleep deprivation among this subset of population. Lack of adequate sleep results in decreased alertness and cognitive functioning. The most effected structure is the prefrontal cortex which is responsible for higher cognitive functioning like working memory, logical and analytical reasoning and creativity [6]. Study shows that a single night of sleep deprivation resulted in decreased memory retention leading to the implication that the hippocampus may also be affected [7].

Sleep deprivation is emerging as a major problem that can affect various sectors of the society. An increasing level of awareness about the health benefits of healthy sleeping is

required to cope up with this problem. Worldwide, as well as in India, many studies have been conducted on the sleep patterns of students, but very few link the academic performances with the patterns of sleep of undergraduate medical students. In this context, this study was conducted with an objective of assessing the sleep patterns of undergraduate MBBS students of a medical college in West Bengal, India, and its association with perceived academic performance, as reported by the students.

Material and Methods

An institution based cross-sectional, observational, analytical study was conducted on the undergraduate medical (MBBS) students of Bankura Sammilani Medical College (BSMC), Bankura, West Bengal, to explore their sleep patterns and its association with academic performance, as perceived by them, in between the months of June and August, 2022. Students having at least one year of academic exposure to MBBS curriculum were considered as study population.

As observed in the study by Lawson HJ, Wellens-Mensah JT and Nantogma SA, about 56.2% students were found to have poor sleep quality [8]. So, assuming the prevalence of poor sleep quality among medical students as 56.2%, significance level of 0.05, absolute precision of 10%, the sample size was 95, using the formula n= $z^2 PQ/L^2$ [where z = 1.96 considering 5% level of significance, P = prevalence of poor sleep quality, Q = 100 – P, L = absolute precision]. Taking nonresponse rate of 10%, sample size was 105. Considering design effect of 2, the minimum sample size calculated was 210. Stratified random sampling was considered as preferred sampling techniques. Students were selected from 2nd Professional, 3rd Professional Part-I and 3rd Professional Part-II batches since they had academic exposure of more than one year. The students were stratified based on their academic year and also their genders. Samples were randomly selected from each stratum following the probability-proportional-to-size (PPS) protocol. The attendance registers of each batch, having all students' names enlisted, were used as the sampling frame for the same purpose. Finally, a total of 214 students were included as study participants.

After obtaining written informed consent, the selected students were approached individually and were briefed about the research, and were ensured regarding the anonymity and confidentiality about the information collected. Then, necessary information was collected from the students using predesigned, pretested, self-administered, structured questionnaire. Before collecting the responses, they were checked for completeness.

Study variables included the age and gender of the students, their current place of stay, coffee/tea drinking pattern, addiction pattern, usual bedtime on weekdays and weekends, use of mobile or social media/OTT at bedtime, reading habit at bedtime, time taken to fall asleep, waking time in the morning, perceived adequacy of sleep, perceived quality of sleep, feeling sleepy during daytime, study hours etc., perceived academic performance, perceived pressure due to academic and personal life, relevant drug history etc. Since, the sleeping pattern of a person may vary time to time, their usual experiences were considered during data collection.

Students rated their perceived quality of sleep in a 5-point Likert scale; score of 1 being very poor and score of 5 being very good. For the purpose of analysis (in Table 2), perceived quality of sleep was categorized into dichotomous variable as unsatisfactory (with responses very poor and poor) and satisfactory (with responses average, good and very good). Similarly, students rated their perceived quality of academic performance in a 5-point Likert scale; score of 1 being very poor and score of 5 being very good. For the purpose of analysis (in Table 3), perceived academic performance was categorized into dichotomous variable as unsatisfactory (with responses very poor and poor) and satisfactory (with responses average, good and very good).

Data were entered in Microsoft Excel Spreadsheet and were checked for completion, duplication or validity. Analysis was done using IBM SPSS Trial version 22. The results were expressed in tabular form with frequency and percentage. Chi-square tests were done to find out association between perceived quality

of sleep with different factors, and between perceived academic performance with different sleep related factors.

Results

Analysis of the data revealed the mean age of the study subjects was 21.84 years (SD = 1.045 years), and their median age was 22 years (IQR = 2 years). Majority of the subjects (71.9%) belonged to 20-22 years age group. Almost 60.3% of the subjects were male. The students of 2nd Professional MBBS, 3rd Professional MBBS Part–I and 3rd Professional MBBS Part–II comprised about 35.5%, 37.4% and 27.1% of the study subjects. Most of them (70.5%) were staying at students' hostel, while about 72.9% subjects were sharing their room with other students.

Table-1: Distribution of subjects according to addiction patterns, drug history and bedtime practices (N = 214)	
Variables	**Frequency (%)**
Tea/coffee drinking habit	
Present	200 (93.5)
Absent	14 (6.5)
Tea/coffee drinking after 7 PM*	
No	41 (20.5)
Sometimes	123 (61.5)
Everyday	36 (18.0)
Smoking in last one month	
Yes	44 (20.6)
No	170 (79.4)
Average no. of cigarette/bidi per day**	
1 – 5	36 (81.8)
6 – 10	5 (11.4)
> 10	3 (6.8)
Alcohol consumption in last one month	
Yes	40 (18.7)
No	174 (81.3)
Average frequency of drinking alcohol in a week***	
1 – 3 days/ week	39 (97.5)
4 – 7 days/ week	1 (2.5)
Drug history in last one month	
Yes	65 (30.4)
No	149 (69.6)

Variables	**Frequency (%)**
Taking sleeping pills in last one year	
Not taken	189 (88.3)
Self-prescribed/ Over the counter	15 (7.0)
Prescribed	10 (4.7)
Usual bedtime on weekdays	
Before 10 PM	1 (0.4)
10 – 11 PM	7 (3.3)
11 PM – 12 AM	29 (13.6)
After 12 AM	177 (82.7)
Usual bedtime on weekends	
Before 10 PM	2 (0.9)
10 – 11 PM	4 (1.9)
11 PM – 12 AM	19 (8.9)
After 12 AM	189 (88.3)
Making phone calls at bedtime	
No call	79 (36.9)
< 15 mins	60 (28.1)
15 – 30 mins	33 (15.4)
> 30 mins	42 (19.6)
Using OTTs on mobile at bed time	
Does not use	77 (36.0)
< 15 mins	18 (8.4)
15 – 30 mins	33 (15.4)
30 – 60 mins	37 (17.3)
> 60 mins	49 (22.9)
Reading storybooks at bedtime	
Yes	43 (20.1)
No	171 (79.9)
Reading study books at bedtime	
Yes	53 (24.8)
No	161 (75.2)
* Subjects with habit of tea/coffee drinking (n = 200), ** Subjects with smoking history (n = 44), *** Subjects with history of alcohol consumption (n = 40)	

The findings regarding addiction pattern, drug history and bedtime habits of the students are presented in Table 1. It was found that most of the subjects (93.5%) had habit of drinking tea/coffee. Among them, about 61.5% subjects used to drink tea/coffee after 7 PM sometimes, while 18% used to drink tea/coffee after 7 PM everyday. About 20.6% subjects had smoking history in last one month. Among them, number of cigarette/ bidis smoked daily was 1-5 in 81.8% subjects, 6-10 in 11.4% subjects and more than 10 in

6.8% subjects. Most of the subjects (81.3%) had no history of alcohol consumption in last one month. Among the 40 subjects with history of alcohol consumption in last one month, 97.5% subjects used to drink 1-3 days/week. Almost 30.4% subjects had history of drug (other than sedatives) intake for acute or chronic conditions in last one year. Almost 4.7% subjects had taken sleeping pills prescribed by doctors, while 7.0% subjects had bought sleeping pills over-the-counter, without any prescription. The different bedtime practices among the students showed the proportion of subjects going to bed after 12 AM on weekdays and weekends were 82.7% and 88.3% respectively. Almost 19.6% subjects used to make phone calls over 30 minutes after going to bed, while 22.9% subjects used social media/OTT for more than 60 minutes after going to bed. About 20.1% subjects read storybooks at bedtime, and 24.8% subjects read study books at bedtime.

When we explored the sleeping pattern among the students, we found out that 36.0% subjects fell asleep within 15 minutes of going to bed, while 11.7% subjects took more than an hour to fall asleep. Majority of the subjects (32.3%) usually woke up between 7-8 am, while 25.7% subjects usually woke up after 9 AM. Most of the subjects (71.9%) usually took naps in the noon/ afternoon/ evening hours. About 52.3% subjects had woken up in the middle of the sleep at night in last one month and 23.4% subjects usually found it difficult to go back to sleep after waking up in the middle of sleep. As many as 58.4% subjects told

they felt sleepy during academic hours, and 41.1% usually felt sleepy during afternoon/ evening i.e. during their study hours. About 14.5% subjects thought the duration of sleep throughout the day was inadequate, while 12.1% thought they had excess amount of sleep. When asked to rate the quality of sleep, as perceived by the students, the subjects rated the quality of sleep as very poor (2.3%), poor (6.1%), average (34.1%), good (40.7%) and very good (16.8%).

The study subjects perceived their academic performance as very poor (4.7%), poor (14.4%), average (63.6%), good (16.4%) and very good (0.9%). About 50.9% subjects believed there is relationship between sleeping habit and academic performance. Almost 77.1% subjects experienced pressure due to academic activities, while 63.6% subjects had experience pressure due to different issues in their personal lives.

We tried to assess the association of different factors with perceived quality of sleep using Chi-square test, and the findings are presented in Table 2. The different factors to have statistically significant association with perceived quality of sleep among the students were: sharing room with others at bedtime, habit of drinking tea/coffee after 7 PM, history of smoking in last one month, number of cigarette/bidis smoked per day, frequency of alcohol consumption in a week and history of taking sleeping pill in last one year.

Table-2: Association between perceived quality of sleep with different factors (N = 214)				
Variable	**Perceived quality of sleep**		**Chi square value, df**	**P value**
	Satisfactory	**Unsatisfactory**		
Age group				
20 – 22 years	143 (92.9%)	11 (7.1%)	1.147, 1	0.284
23 – 25 years	53 (88.3%)	7 (11.7%)		
Gender				
Male	119 (92.2%)	10 (7.8%)	0.183, 1	0.669
Female	77 (90.6%)	8 (9.4%)		
Student of				
2nd Professional MBBS	72 (94.7%)	4 (5.3%)		
3rd Professional MBBS Part-I	71 (88.8%)	9 (11.3%)	1.818, 2	0.403
3rd Professional MBBS Part-II	53 (91.4%)	5 (8.6%)		
Staying at				
Students' hostel	141 (93.4%)	10 (6.6%)		
Rent/Mess	38 (86.4%)	6 (13.6%)	2.297, 2	0.317
Home	17 (89.5%)	2 (10.5%)		

Variable	Perceived quality of sleep		Chi square value, df	P value
	Satisfactory	Unsatisfactory		
Sharing room with				
Other student(s)	146 (93.6%)	10 (6.4%)		
Others	8 (72.7%)	3 (27.3%)	6.193, 2	**0.045**
None	42 (89.4%)	5 (10.6%)		
Tea/coffee drinking habit				
Present	184 (92.0%)	16 (8.0%)	0.671, 1	0.413
Absent	12 (85.7%)	2 (14.3%)		
Tea/coffee drinking after 7 PM*				
No	40 (97.6%)	1 (2.4%)		
Sometimes	117 (95.1%)	6 (4.9%)	17.487, 2	**< 0.001**
Everyday	27 (75.0%)	9 (25.0%)		
Smoking in last one month				
Yes	37 (84.1%)	7 (15.9%)	4.042, 1	**0.044**
No	159 (93.5%)	11 (6.5%)		
Average no. of cigarette/bidi per day**				
1 – 5	33 (91.7%)	3 (8.3%)		
6 – 10	2 (40.0%)	3 (60.0%)	9.491, 2	**0.009**
> 10	2 (66.7%)	1 (33.3%)		
Alcohol consumption in last one month				
Yes	34 (85.0%)	6 (15.0%)	2.772, 1	0.096
No	162 (93.1%)	12 (6.9%)		
Average frequency of drinking alcohol in a week***				
1 – 3 days/ week	34 (87.2%)	5 (12.8%)	5.812, 1	**0.016**
4 – 7 days/ week	0 (0.0%)	1 (100.0%)		
Drug history in last one month				
Yes	57 (87.7%)	8 (12.3%)	1.840, 1	0.175
No	139 (93.3%)	10 (6.7%)		
Taking sleeping pills in last one year				
Not taken	175 (92.6%)	14 (7.4%)		
Self-prescribed/ Over the counter	14 (93.3%)	1 (6.7%)	6.356, 2	**0.042**
Prescribed	7 (70.0%)	3 (30.0%)		
Usual bedtime on weekdays				
Before 10 PM	1 (100.0%)	0 (0.0%)		
10 – 11 PM	7 (100.0%)	0 (0.0%)	0.912, 3	0.823
11 PM – 12 AM	27 (93.1%)	2 (6.9%)		
After 12 AM	161 (91.0%)	16 (9.0%)		
Usual bedtime on weekends				
Before 10 PM	2 (100.0%)	0 (0.0%)		
10 – 11 PM	3 (75.0%)	1 (25.0%)	1.858, 3	0.602
11 PM – 12 AM	18 (94.7%)	1 (5.3%)		
After 12 AM	173 (91.5%)	16 (8.5%)		
Making phone calls at bedtime				
No call	70 (88.6%)	9 (11.4%)		
< 15 mins	58 (96.7%)	2 (3.3%)	3.822, 3	0.281
15 – 30 mins	31 (93.9%)	2 (6.1%)		
> 30 mins	37 (88.1%)	5 (11.9%)		

Variable	Perceived quality of sleep		Chi square value, df	P value
	Satisfactory	Unsatisfactory		
Using OTTs on mobile at bed time				
Does not use	70 (90.9%)	7 (9.1%)		
< 15 mins	18 (100.0%)	0 (0.0%)		
15 – 30 mins	30 (90.9%)	3 (9.1%)	3.088, 1	0.543
30 – 60 mins	35 (94.6%)	2 (5.4%)		
> 60 mins	43 (87.8%)	6 (12.2%)		
Reading storybooks at bedtime				
Yes	37 (86.0%)	6 (14.0%)	2.146, 1	0.143
No	159 (93.0%)	12 (7.0%)		
Reading study books at bedtime				
Yes	48 (90.6%)	5 (9.4%)	0.096, 1	0.757
No	148 (91.9%)	13 (8.1%)		
* Subjects with habit of tea/coffee drinking (n = 200), ** Subjects with smoking history (n = 44), *** Subjects with history of alcohol consumption (n = 40)				

Table-3: Association between perceived academic performance with different sleep-related factors (N = 214)				
Variable	Perceived academic performance		Chi square value, df	P value
	Satisfactory	Unsatisfactory		
Time taken to fall asleep				
< 15 mins	68 (88.3%)	9 (11.7%)		
15 – 30 mins	64 (80.0%)	16 (20.0%)	9.826, 3	**0.02**
30 – 60 mins	26 (81.3%)	6 (18.8%)		
> 60 mins	15 (60.0%)	10 (40.0%)		
Time of waking up in the morning				
Before 7 AM	26 (78.8%)	7 (21.2%)		
7 – 9 AM	111 (88.1%)	15 (11.9%)	12.778, 2	**0.002**
After 9 AM	36 (65.5%)	19 (34.5%)		
Practice of napping at noon/ afternoon/ evening hours				
Yes	125 (81.2%)	29 (18.8%)	0.038, 1	0.845
No	48 (80.0%)	12 (20.0%)		
Waking up in the middle of sleep at night				
Yes	86 (76.8%)	26 (23.2%)	2.495, 1	0.114
No	87 (85.3%)	15 (14.7%)		
Feeling difficulty in going back to sleep after waking up mid-sleep				
Yes	35 (70.0%)	15 (30.0%)	4.951, 1	**0.026**
No	138 (84.1%)	26 (15.9%)		
Feeling tired after waking up in the morning				
Yes	36 (73.5%)	13 (26.5%)	2.230, 1	0.135
No	137 (83.0%)	28 (17.0%)		
Feeling sleepy during class (academic) hours				
Yes	94 (75.2%)	31 (24.8%)	6.175, 1	**0.013**
No	79 (88.8%)	10 (11.2%)		

Variable	Perceived academic performance		Chi square value, df	P value
	Satisfactory	Unsatisfactory		
Feeling sleepy during study hours (afternoon/evening)				
Yes	65 (73.9%)	23 (26.1%)	4.698, 1	**0.03**
No	108 (85.7%)	18 (14.3%)		
Rating of duration of sleep, as perceived				
Inadequate	26 (83.9%)	5 (16.1%)		
Adequate	133 (84.7%)	24 (15.3%)	13.937, 2	**< 0.001**
Excess	14 (53.8%)	12 (46.2%)		
Perceived quality of sleep				
Very poor	2 (40.0%)	3 (60.0%)		
Poor	8 (61.5%)	5 (38.5%)		
Average	53 (72.6%)	20 (27.4%)	18.792, 4	**< 0.001**
Good	80 (92.0%)	7 (8.0%)		
Very good	30 (83.3%)	6 (16.7%)		

Association between perceived quality of academic performance and different sleep-related factors were assessed using Chi-square test, and the findings are presented in Table 3. It was observed that time taken to fall asleep, time of waking up in the morning, feeling difficulty going back to sleep after waking up mid-sleep, feeling sleepy during academic/class-hours, feeling sleepy during study (afternoon/ evening) hours, duration of sleep as perceived and perceived quality of sleep had statistically significant association with perceived academic performance reported by the students.

Discussion

Sleep is an integral part of healthy life and regular, adequate sleep is necessary for optimal functioning of the body and mind. We attempted to explore the sleep patterns of the undergraduate medical students and its association with their perceived academic performance.

Sleep habits and related factors: The study revealed the mean age of the students was 21.84 ± 1.045 years, which was similar to the finding in a study by Paul AM, Vikram NRG and Sumadevi VS, where the mean age of the undergraduate students and interns was 21.32 ± 1.684 years [9]. In another study by Giri PA, Baviskar MP and Phalke DB, the mean age of the undergraduate students was 22.4 ± 0.5 years [10]. We found that drinking tea/coffee after 7 PM had association

with perceived quality of sleep. Students often take hot beverages to combat sleepiness during evening and late hour studies. Drake C, Roehrs T, Shambroom J and Roth T found in their study that caffeine intake 0, 3 or even 6 hours before the bedtime significantly disrupts sleep [11]. We found significant association of perceived sleep quality with smoking habit, average number of bidis/cigarettes smoked daily, frequency of alcohol consumption. In the study by Giri PA, Baviskar MP and Phalke DB, the global Pittsburg quality of sleep score was significantly correlated with addiction to coffee, smoking and alcohol addiction [10].

Sleep disturbance was found to be significantly higher among smokers, compared to nonsmokers, as found in a study by Liao Y, Xie L, Chen X et al [12]. Smokers had shorter sleep period, as observed in a study by Jaehne A, Unbehaun T, Lutz UC et al [13]. Although majority of the subjects did not take any sleeping pill, 7.0% subjects took self-prescribed medication and 4.7% took medication after consulting a doctor, in last one year. Unsatisfactory quality of sleep was more among those who took prescribed sleeping medication and the association was statistically significant, which was probably because subjects having poor sleep quality had to consult doctors for the same. Paul AM, Vikram NRG and Sumadevi VS observed in their study that about 3.1% subjects had to

take medicine (prescribed or over-the-counter) for sleep in last one month [9]. We found that majority of the students go to bed after 12 AM on weekdays or weekends (82.7% and 88.3% respectively); most of them wake up after 8 AM (52.3%). Nojomi M, Bandi MFG and Kaffashi S overserved in the study only 25.2% subjects go to bed after 12 AM and only 6.7% wake up at 7 AM or after [14]. In the study by Shrestha D, Adhikari SP et al. when asked to rate the quality of sleep, students' responses were fairly bad (6.6%), very good (27.1%) and fairly good (66.1%) [15]. These findings were similar to our study where 8.4% students rated their sleep as very poor or poor, while 57.5% students rate their sleep as very good or good.

Academic performance: There are few studies that attempted to find the association of academic performance with different factors, including sleep patterns and disorders. Mandal A et al. observed in their study that sleep disorders had association with poor performance by the students in a Medical college in West Bengal, India [16]. In another study by Yassin et al., different sleep disorders (insomnia, circadian rhythm disorder etc.) were found to be associated with poor academic performance by undergraduate medical students in Jordan [17].

In our study, unsatisfactory academic performance was found to have association with long time taken to fall asleep, waking up late in the morning, experiencing difficulty going back to sleep after waking up mid-sleep, feeling sleepy during class/ academic hours or study hours (i.e. afternoon or evening). Students who rated their quality of sleep as very poor or poor had unsatisfactory level of performance. Surprisingly, those who perceived their duration of sleep as excess, had unsatisfactory academic performance. Paudel K et al. in their study conducted in Nepal,

showed that undergraduate medical students with poor sleep quality had higher rate of failure in examination [18]. A study conducted on medical students by Agu AU et al. in Nigeria revealed negative correlation of academic performance with sleep latency, quality of sleep and the findings are in accordance with that in our study [19]. Poor quality of sleep and moderate daytime sleepiness were associated with poor academic score, as observed in a study in Sudan, by Zafar M et al [20].

Limitations of the study: The effect of transition from non-medical curriculum to medical curriculum on sleep habits and in-turn, its effect on academic performance among the students of 1st Professional MBBS curriculum could not be assessed in our study. Also this study, being cross-sectional in design, could not explore the changes in the sleep habits throughout the academic years.

Conclusion

The role of regular, good quality sleep for proper functioning of body and mind is undeniable. Irregularity of sleep, inadequate amount and poor quality of sleep are common among undergraduate medical students, and are often associated with poor academic performance, as found in this study and other researches.

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