

## RESEARCH ARTICLE

### Effect of sleep on academic performance among male and female medical students

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#### ABSTRACT

**Background:** Sleep is an active, repetitive, and reversible behavior serving functions such as repair and growth, learning or memory consolidation, and restorative processes, which can occur throughout the brain and the body. Therefore, sleep deprivation would result in detrimental consequences of nervous system includes deficits in cognition such as vigilance, attention, memory, as well as complex real-world tasks and depression. **Aims and Objectives:** The aim of the study was to study the sleeping hours, stress levels, and academic performance among male and female medical students and to determine the correlation between sleeping hours and the student's academic performance. **Material and Methods:** A total of 100 medical students (50 males and 50 females) studying the 2<sup>nd</sup> and 3<sup>rd</sup> year MBBS are enrolled in the survey. Closed-ended questionnaire was used as an instrument for this study. The questionnaire consists of three parts, i.e., general, stress scale, and study skill. In general part, data on student's sleeping hours and academic achievements were collected. Student's academic performance refers to the aggregate marks percentage that they attained in their university examination. **Results:** Most of the study population are average sleepers and all are in good health condition. We observed better academic performance in female students when compared to male students ( $76.06 \pm 7.13$  vs.  $67.38 \pm 3.44$ ;  $P = 0.005$ ). There is a significant positive correlation between sleeping hours and academic performance in female student ( $P < 0.0001$ ). Female students with long sleeping hours were obtained better percentages in their academic results; in contrast, no significant relationship was observed between academic performance and sleeping hours in male students ( $P = 0.34$ ). **Conclusion:** This study concludes that there is a significant positive linear relationship between sleeping hours and academic performance in female medical students while there is no such relationship in male medical students. A minimum of 7–8 h of sleep per day is suggestive to the students for memory and learning.

**KEY WORDS:** Sleep; Academic Performance; Medical Students; The Medical Student Stressor Questionnaire; General Health Questionnaire 12

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#### INTRODUCTION

Sleep is one of the basic needs of human being and is essential for memory and learning. It is important for our physical, intellectual, and emotional health.<sup>[1]</sup> Sleep is an active, repetitive, and reversible behavior serving different functions such as repair and growth, learning or memory consolidation,

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and restorative processes. All these occur throughout the brain and the body. Therefore, sleep deprivation would result in detrimental consequences of nervous system includes deficits in cognition such as vigilance, attention, memory, as well as complex real-world tasks and depression.<sup>[2]</sup> The integrity of learning and memory process is fundamental in academic performance, particularly in individuals who are in developmental phase. There are several parameters to be used as a measurement for school achievement, such as Grade Point Average (GPA) and school behavior.

The previous studies evaluated health-related variables on academic performance and found that sleep had the largest effect on semester GPA compared to the other health-related variables such as nutrition intake, mental health, stress, and time management.<sup>[3]</sup> There was a significant relationship between sleep habits and higher GPA. Long sleepers (sleep  $\geq 9$  h/day) were found to achieve higher GPAs than short sleepers (sleep  $\leq 6$  h/day). The lower GPAs of the short sleepers may have been the result of a decreased ability to focus on activities related to education.<sup>[4]</sup>

The parameters to be involved in the present study include measuring of sleeping hours, stress level, study skills, and GPA among the male and female medical students of our college.

## MATERIAL AND METHODS

### Study Design

This is a questionnaire-based survey study conducted at our medical college between August and September 2018. This study was approved by the institutional ethics committee of our institute with EC application ID: IEC/2018/004. A total of 100 medical students (50 males and 50 females) studying the 2<sup>nd</sup> and 3<sup>rd</sup> year MBBS were enrolled in the survey. A written informed consent was obtained from all the study participants.

### Inclusion Criteria

Students aged between 19 and 25 years with comfortable sleeping environment and leading a healthy lifestyle and willing to participate in the survey.

### Exclusion Criteria

Students with sleeping disorders such as insomnia on medication or those who will take beverages containing caffeine at night were excluded from the study.

### Assessment

Closed-ended questionnaire was used as an instrument for this study. The questionnaire consists of three parts, i.e., general,

stress scale, and study skill. General Health Questionnaire 12 (GHQ 12) and The Medical Student Stressor Questionnaire (MSSQ) were used in this study. In general part, data on student's sleeping hours and academic achievements will be collected. Student's academic performance refers to GPA.

### Definition/Classification of Sleepers<sup>[5]</sup>

- Short sleepers: Sleeps  $\leq 6$  h/day
- Average sleepers: Sleeps 7–8 h/day, and
- Long sleepers: Sleeps  $\geq 9$  h/day.

### Statistical Analysis

Data were collected on predefined case pro forma and analyzed using the SPSS version 20.0. (IBM, Armonk, NY, USA). Descriptive statistics were performed for sleeping hours, stress level, study skills, and academic performance (percentage of marks) among subjects. Continuous data are expressed in mean and standard deviation, whereas categorical data are expressed in frequencies with percentages. Independent Student's *t*-test and Fisher's exact tests were performed to test the significance between groups among quantitative and qualitative variables, respectively. One-way analysis of variance (ANOVA) test was used to compare academic performance among three groups of sleepers.  $P \leq 0.05$  was considered as statistically significant.

## RESULTS

In this study, we have studied 50 male and 50 female medical students. Mean age of the overall study group is 19.24 ( $\pm 0.58$ ) years. About 97% of the students are in the 2<sup>nd</sup> year MBBS, whereas 3% studying the 3<sup>rd</sup> year MBBS. All of the study subjects are single and most of them (96%) are residing at college hostel. Majority of the students (87%) have been selected to study medicine on their own interest, and the percentage of the selection of medicine on their own interest is significantly more in female students than in male students (98% vs. 78%;  $P = 0.002$ ) [Table 1].

Table 2 shows that majority of the students are average sleepers in both male and female groups (88% and 90%, respectively). Almost all of the students are in good health condition based on GHQ-12 scale. Only 20% of the students are found having mild stress and rest of all are having no stress. Academic performance is significantly higher in female students than in male students ( $71.06 \pm 7.13$  vs.  $67.38 \pm 3.44$ ;  $P = 0.005$ ).

The present study showing a significantly higher academic performance [Figure 1] in long sleepers than in average and short sleepers ( $87.67 \pm 17.04$  vs.  $68.87 \pm 3.62$  vs.  $64.17 \pm 2.64$ ;  $P < 0.0001$ ). Table 3 shows that sleep is associated with academic performance in medical students which indicates that sleep is more important for memory and learning.

**Table 1: Demographic data of the study population**

Variable	Overall (n=100) (%)	Male (n=50) (%)	Female (n=50) (%)	P-value
Age (in years)	19.24±0.58	19.45±0.75	19.02±0.16	0.0007*
Male: female	50:50	50	50	--
Year of study				
2 <sup>nd</sup> MBBS	97 (97)	47 (94)	50 (100)	NS
3 <sup>rd</sup> MBBS	3 (3)	3 (6)	0	
Marital status				
Single	100 (100)	50 (100)	50 (100)	--
Married	0	0	0	
Type of residency				
Hostel	96 (96)	47 (94)	49 (98)	0.31
Parental home	3 (3)	2 (4)	1 (2)	
Rented accommodation	1 (1)	1 (2)	0	
Motivation to study medicine				
Own interest	87 (87)	39 (78)	49 (98)	0.002*
Parental influenced choice	3 (3)	2 (4)	0	
Randomly choice	10 (10)	9 (18)	1 (2)	

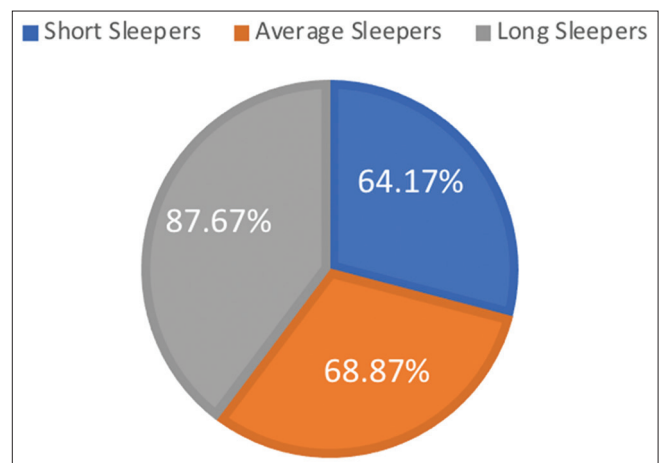
\*Indicates statistically significant (P<0.05)

**Table 2: Comparison of sleeping hours, health status, and stress levels**

Variable	Overall (n=100) (%)	Male (n=50) (%)	Female (n=50) (%)	P-value
Sleeping hours				0.75
Short sleepers	7 (7)	5 (10)	2 (4)	
Average sleepers	89 (89)	44 (88)	45 (90)	
Long sleepers	4 (4)	1 (2)	3 (6)	
Health status				NS
Good health	99 (99)	49 (98)	50 (100)	
Balanced health	1 (1)	1 (2)	0	
Stress levels				0.32
No stress	80 (80)	38 (76)	42 (84)	
Mild stress	20 (20)	12 (24)	8 (16)	
Moderate stress	0	0	0	
Severe stress	0	0	0	
Academic performance in percentage	--	67.38±3.44	71.06±7.13	0.005*

\*Indicates statistically significant (P<0.05)

Table 4 shows that sleep has no effect on academic performance in male students, whereas sleep is showing a significant improvement in academic performance of female students. Sleep has a significant association with academic performance among female medical students (P < 0.0001). Academic performance of male and female medical students in different sleep categories is shown as a graphical representation in Figure 2.



**Figure 1: Academic performance of different categories of sleepers**

**DISCUSSION**

In our study, majority of the students are studying the 2<sup>nd</sup> year MBBS (97%) and most of them are residing in college attached hostel (96%). Majority (87%) of the students are motivated on their own interest to study medicine. The percentage of own interest is more in female students than in male (98% vs. 78%; P = 0.002). Most of the study population are average sleepers and all are in good health condition. We observed better academic performance in female students when compared to male students (76.06 ± 7.13 vs. 67.38 ± 3.44; P = 0.005). There is a significant positive correlation between sleeping hours and academic performance in female students (P < 0.0001). Female students with long sleeping hours were obtained better percentages in their academic results. There is no significant relationship between academic performance and sleeping hours in male students (P = 0.34). Sleep is associated with academic performance in medical

**Table 3:** Comparison of academic performance among three groups of sleepers

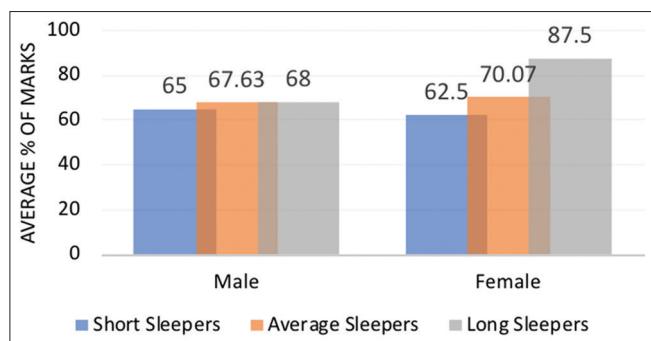
Variable	Academic performance (in %)	Analysis of variance
Short sleepers (n=7)	64.17±2.64	F=29.67
Average sleepers (n=89)	68.87±3.62	P<0.0001*
Long sleepers (n=4)	87.67±17.04	

\*Indicates statistically significant (P<0.05)

**Table 4:** Comparison of academic performance among male and female medical students

Variable	Academic performance (in %)		
	Overall (n =100)	Male (n=50)	Female (n=50)
Short sleepers (n=7)	64.17±2.64	65.00±2.94	62.50±0.71
Average sleepers (n=89)	68.87±3.62	67.63±3.47	70.07±3.40
Long sleepers (n=4)	87.67±17.04	68.00±0.1	87.50±0.71
Analysis of variance result	F=29.67 P<0.0001*	F=1.12 P=0.34	F=32.54 P<0.0001*

\*Indicates statistically significant (P<0.05)



**Figure 2:** Academic performance: Male versus female students

students which is suggestive of minimum of 7–8 h/day or more hours of sleep are required for memory and learning.

Adequate sleep optimally impacts mental functioning and, therefore, impacts students’ performance on examinations and conjointly percentage or grades of the result.<sup>[6-8]</sup> The current study demonstrates that short sleeping hours are associated with low academic performance in medical students. These findings agree with those of a study conducted on medical students demonstrating that 38.9% of students had poor sleep quality according to the Pittsburgh Sleep Quality Index.<sup>[9]</sup> Studies assessing the impact of sleep on academic performance focus primarily on teens, adolescents, and undergraduate students. Few studies have explored sleep habits in populations of students who are pursuing health-care degrees. Those studies found that sleep complaints were common in medical students and poor sleep habits were correlated with changes in academic performance.<sup>[9]</sup>

In this study, we observed a statistically significant higher academic performance in female medical students than in male students ( $P = 0.005$ ). Adolescents with depression were vulnerable to educational underachievement.<sup>[10]</sup> A biological study asserts that males had larger average brain sizes than females and, therefore, would have higher average IQ.<sup>[11,12]</sup> However, in contrary, we found higher percentage of marks in female student. There is a significant positive correlation between sleeping hours and academic performance in female students ( $P < 0.0001$ ). Female students with long sleeping hours were obtained better percentages in their academic results. The research conducted by Eliasson *et al.* was showed no association between sleeping hours and CGPA.<sup>[13]</sup>

Academically successful students report scheduling regular daily time slots to compare their homework and studying. Disciplined students are keen to achieve higher grades in their academic performances. Self-regulated students often motivated themselves by imagining the consequences of failing to study, such as the reactions of friends, classmates, and family members. Consequently, they have achieved better academic achievements.<sup>[14]</sup>

There is no significant relationship between academic performance and sleeping hours in male students ( $P = 0.34$ ) in our study. Sleep is associated with academic performance in female medical students who are suggestive of minimum of 7–8 h/day or more hours of sleep are required for memory and learning. Increasing public knowledge of the positive effects of adequate sleep and to improve health, wellness, productivity, quality of life, and public safety could be a national health objective reflected in Healthy People 2020.<sup>[15]</sup>

**Limitations of the Study**

However, this study was conducted with a small sample size at single center. Other multi-centric studies using larger samples could help in generalizing the results of our present work.

**CONCLUSION**

The current study findings conclude that there is a significant positive linear relationship between sleeping hours and academic performance in female medical students while there is no such relationship in male medical students. Sleep has an impact on academic performance in female students, whereas it showed no impact in male students. A minimum of 7–8 h of sleep per day is suggestive to the students for memory and learning.

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