

## THE RELATIONSHIP BETWEEN SLEEP QUALITY AND ACADEMIC PERFORMANCE AMONG UNDERGRADUATE MEDICAL STUDENTS - A CROSS-SECTIONAL STUDY

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### Abstract

**Background:** Good sleep is necessary for good health. Poor night time sleep can harm not only physical and mental health but also the cognitive abilities of the students. We aimed to determine the relationship between poor sleep quality and academic performance among undergraduate medical students in India.

**Material & Methods:** A cross-sectional study was conducted using the questionnaire method among undergraduate medical students studying at a tertiary care teaching hospital in Kerala state of India. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). Academic performance was assessed by the student's self-reported grade point average (GPA), which was then compared with the various parameters of sleep quality.

**Results:** After omitting the incomplete entries the final sample size attained was 218. Mean (SD) GPA was 2.2 (0.6). Median PSQI was 5.0 and poor sleep quality was prevalent among 90 (41.3%) of the students significant difference was seen in the academic performance between the good sleepers and the poor sleepers. Poor habitual sleep efficiency (<65%) is strongly correlated with poor academic grades ( $p < .003$ ). **Conclusion:** The prevalence of poor sleep quality among medical students in India and its negative impact on academic performance is alarming. Sleep education programs to improve the sleep quality of medical students in India remain a need of the hour.

## INTRODUCTION

Sleep is an active, repetitive and reversible phenomenon during which several behavioural, physiological and neurocognitive processes occur.<sup>[1,2]</sup> Poor sleep adversely affects physical and mental health and higher intellectual functions, including learning and memory.<sup>[3]</sup> As various studies prove, the positive effects of sleep depend on sleep quality. Sleep quality is defined as one's satisfaction with the experience, which integrates aspects of sleep initiation, maintenance, quantity, and awakening refreshment.<sup>[4]</sup>

Good quality sleep promotes memory consolidation by strengthening the synaptic connections which were active during the awake state. In contrast, lack of sleep drifts our focus, attention and vigilance, making the knowledge acquisition process difficult.<sup>[5,6,7]</sup> Sleep deprivation is known to reduce one's ability to learn new things by forty per cent.

Sleep deprivation studies in laboratory settings and the comfort of home have documented significantly more fatigue, sleepiness and poor cognitive performance among persistent poor sleepers.<sup>[7,8,9]</sup>

Poor sleep is highly prevalent among the general population worldwide.<sup>[10,11,12]</sup> Medical students suffer from poor sleep quality,<sup>[13,14,15,16,17]</sup> which is significantly higher than that among students pursuing other courses and the general population.<sup>[18,19]</sup> Hectic academic schedules, frequent examinations, poor academic achievement, emotional stress, and behavioural factors like internet addiction and consumption of stimulant beverages and caffeine have been identified as risk factors by many studies.<sup>[20,21,22,23,24]</sup>

The impact of poor sleep quality on academic performance among medical students has been a subject of interest over the past few years. While several studies demonstrated a positive correlation between the two variables,<sup>[25,26]</sup> another set failed to

find a significant relationship.<sup>[27,28]</sup> The aim of our study was to find out the relationship between poor sleep quality and academic performance among undergraduate medical students.

## MATERIALS AND METHODS

A cross-sectional study was conducted in the Department of Physiology, Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, which is a tertiary-care teaching hospital, during the period between 2nd February 2022 to 31st January 2023. Institutional review board and ethical clearance for the study were obtained with Institutional review board and ethical clearance: Ref. no. IRB/I/15/2022. All undergraduate medical students in the first through seventh semester of the M.B.B.S course who were willing to participate were invited to join the study. Since eighth and ninth-semester students had to do overnight clinical postings along with their classes, they were exempted assuming that their sleep pattern would be altered otherwise. Data was collected using questionnaire method after obtaining the informed consent. Study proforma had two sections. The first section collected demographic profile of the population while the second section consisted of the Pittsburgh Sleep Quality Index (PSQI) questionnaire which is validated questionnaire to measure the sleep quality among university students.<sup>[29]</sup> It includes nineteen questions which categorize the seven different parameters of sleep including sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime sleepiness into seven component scores. Individual component scores are added up to obtain the Global PSQI score. Good sleepers have global PSQI score less than or equal to five ( $PSQI \leq 5$ ) indicating good sleep quality and the poor sleepers have PSQI score more than five ( $PSQI > 5$ ). Academic performance was obtained from the self-reported percentage of marks students obtained during the fall of the academic year. The percentage marks were converted to grade point averages and recorded as numerical variables. It was then converted to a categorical variable by subdividing into three groups viz good (GPA=3.01-3.50) average (GPA= 2.51-3.00) and poor (GPA= 2.00-2.50). Global PSQI score and the seven individual components of PSQI compared with the academic performance of the students.

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do overnight clinical postings along with their classes, they were exempted assuming that their sleep pattern would be altered otherwise. Sleep quality was measured using Pittsburgh Sleep Quality Index (PSQI) which is validated questionnaire to measure the sleep quality among university students.<sup>[29]</sup> It includes nineteen questions which categorize the seven different parameters of sleep including sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleeping medication, and daytime sleepiness into seven component scores. Individual component scores are added up to obtain the Global PSQI score. Good sleepers have global PSQI score less than or equal to five ( $PSQI \leq 5$ ) indicating good sleep quality and the poor sleepers have PSQI score more than five ( $PSQI > 5$ ). Academic performance was assessed using the self-reported percentage of marks the students obtained during the fall of the academic year. Data was collected using questionnaire method. The study proforma had two sections. The first section collected demographic profile of the population while the second section contained the Pittsburgh Sleep Quality Index (PSQI) questionnaire and the marks obtained by the students during the fall of the semester. To avoid the shift of sleep pattern due to exam stress, the questionnaires were given only after making sure that there were no examinations neither in the coming month nor in the previous month.

Demographic data were categorized and frequencies and percentages were calculated. The percentage marks were converted to grade point averages and recorded as numerical variables. It was then categorized into good (GPA=3.01-3.50) poor (GPA= 2.00-2.50), average (GPA= 2.51-3.00) respectively. Global PSQI score and the seven individual components of PSQI were compared with the academic performance of the students. Chi square was calculated for correlation between PSQI score and GPA. A p value of  $\leq 0.05$  was taken as significant.

## RESULTS

Eighty-one percentage of the total students responded to the questionnaire. After omitting incomplete entries, the final sample size attained was 218. Seventy-three percent of the participants were females. The mean (SD) age of the population was 20.6 (1.2), ranging from 18 to 23 years. The mean (SD) GPA was 2.2 (0.6) (Table 1). Median PSQI was 5.0 and poor sleep quality was prevalent among 90 (41.3%) of the students. No significant difference was observed between the academic performance of the good sleepers and the poor sleepers (Table 2). When the individual parameters of PSQI were compared with the GPA, it was observed that the students having good habitual sleep efficiency scored higher academic grades than those with poor habitual sleep efficiency and the difference was statistically significant ( $p < .003$ ). (Table 3).

**Table 1: Population characteristics**

	Mean ± SD	Median (IQR)
AGE	20.61±1.19	21
GPA	2.18±.63	2.4
PSQI	5.02±2.09	5.02

SD: Standard Deviation, IQR: Inter Quartile Range

**Table 2: Relationship of Global PSQI with Grade point Average (GPA)**

		GPA				P
		3.01-3.51	2.51-3.01	2.00-2.50	Total	
Global PSQI score	≤5 (good sleepers)	45 35.1%	57 44.5%	26 21.1%	128 20.3%	
	>5 (poor sleepers)	40 44.4%	40 44.4%	10 11.11%	90 100.0%	
Total		85 39%	97 44.5%	36 16.5%	218 100.0%	0.127

**Table 3: Relationship between habitual sleep efficiency and Grade Point average**

		Grade Point Average				P
		3.01-3.51	2.51-3.01	2.00-2.50	Total	
Habitual Sleep Efficiency	Good (>75%) (n=194)	62 31.8.0%	62 31.8%	71 36.4%	195 100.0%	<.003*
	Poor (<65%) (n=24)	6 26.1%	8 34.8%	9 39.1%	23 100.0%	
Total		68 31.7%	70 32.6%	80 37.2%	218 100.0%	

## DISCUSSION

Our study is the first of its kind to assess the relationship between poor sleep quality and academic performance among undergraduate medical students in Kerala state India. The study failed to find any association between the overall sleep quality and the students' academic performance. Among the different parameters of good quality sleep, habitual sleep efficiency showed a strong positive correlation with the academic performance. Students having habitual sleep efficiency less than sixty five percentage (<65%) obtained lower academic grades than those those having habitual sleep efficiency more than seventy five percentage (75%).

A cross-sectional study among medical students at the University of Karachi by G. Maheswari and Shoukat,<sup>[30]</sup> also obtained similar results, where poor habitual sleep efficiency was associated with lower academic grades. Excessive sleepiness during independent study time and class time was reported among Pharmacy students having poor sleep efficiency in another study by Megan L ZeeK et al.<sup>[31]</sup> Excessive daytime sleepiness as a sequele of poor night-time sleep results in lack of attention in the class and poor understanding of subjects among the students.

Sleep quality assessed using PSQI scores showed no significant association between poor sleep quality and the students' academic performance. This is consenting to the results obtained by the study conducted by Rostam Jalali et al,<sup>[32]</sup> among the students of Kermanshah University of Medical Sciences, where the sleep quality of 106 undergraduate medical students selected from different streams of medical coursework was

assessed, and compared with their academic performance. The study found no significant association between sleep quality and the students' academic performance. Another cross-sectional study conducted by Fernanda Vieira Queiroz de Almeida et al,<sup>[32]</sup> including 102 medical students at the University of Brazil, also failed to obtain any significant association between sleep quality and academic performance among undergraduate medical students. Our result is in contrast to the results obtained by Hyder Osman Mirghani et al., where medical students with better sleep quality had significantly higher academic grades,<sup>[33]</sup> Analyzing both results, we suggest the presence of confounding factors that could alter the association between overall sleep quality and academic performance among undergraduate medical students. Marc. A. Armand and Federica Biassoni, in their cross-sectional study among medical students at the University of Singapore, found that good sleep quality was associated with higher academic performance grades only in the presence of higher levels of psychological well-being.<sup>[34]</sup> The role of mental well-being as a potent modulator influencing the association between academic performance and sleep quality was brought out in this study. Socioeconomic factors, including household income and poor perception of the quality of life, were seen to affect the relationship between poor sleep quality and academic performance in many other studies conducted among high school and university students. However, its role as a potential confounding factor among medical students has yet to be studied in detail.

Limitations of the study: This study is appropriately interpreted with certain restrictions. Since it is a cross

sectional study the causal relationship between poor sleep efficiency and academic performance could not be determined. The study was conducted among the students of a single medical college and the generalisability cannot be ensured. Also several factors could affect the performance of a student on the day of examination which we were not able to control.

## CONCLUSION

The extent of poor sleep quality among undergraduate medical students is of concern to the educators. Sleep hygiene education programs have been shown to improve sleep quality among medical students at the University of Chicago<sup>35</sup>. Two important facts, number one; the greater proportion of poor sleepers among medical students and number two ; the positive relationship between habitual sleep efficiency and academic performance that were observed in our study necessitates the inclusion of sleep hygiene education programs in Indian medical education system. Further research analysing the possible impact of poor sleep quality on medical students' physical, psychological, intellectual and social well-being remains the need of the hour.

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