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Association Between Sleep Patterns and Academic Performance among Medical Students

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KEY WORDS

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ABSTRACT

Abstract

Sleep is a vital biological process, essential for humans and their normal functioning. Disruptions in sleep patterns, whether it is poor quality or insufficient quantity of sleep, can have adverse effects on an individual's mental and physical well-being. Sound sleep is essential for memory consolidation, a key factor for academic excellence. Understanding the varying sleep patterns is crucial to evaluate their influence on cognitive performance and overall health of individuals. To assess the association between sleep patterns and academic performance among medical students. A cross-sectional study was conducted among medical students from different medical institutions across Pakistan. The questionnaire was circulated online to assess the relationship between sleep patterns and academic performance of medical students. Gathered data was analyzed using IBM SPSS statistics. The study involved 400 medical students from, comprising 284 females and 116 males. Significant associations were found between early bedtimes, waking up times, sleep quality, and attentiveness levels in class with the academic output. However, no conclusive link was established between average sleeping time and academic performance. The results of this study suggest that sleep patterns are remarkably associated with students' academic performance, highlighting the importance of healthy sleeping habits. Hence, awareness needs to be raised about the significance of healthy sleep routine. Promoting good sleep practices is essential for enhancing overall well-being and educational outcomes.

Introduction

Sleep, an essential physiological process, serves as a pre-requisite for normal functioning of the human body. During the sleep, human body undergoes energy conservation, cellular and neural repair processes that help revitalize the body for the next day (Tononi & Cirelli,

2014). Research shows that any disturbances in quality or quantity of sleep can have adverse effects on mental and physical health, ranging from high blood pressure and cardiovascular diseases to depression (Basics, 2019).

Sleep is influenced by multiple environmental and psychosocial factors including age, gender, job demands, lifestyle changes and other life stresses. For example, medical students often find themselves compromising on sleep to extend their hours to complete work and study. Literature recommends an average of 7 to 9 hours of sleep at night for optimal adult functioning (Basics, 2019). Adequate sleep is crucial for memory consolidation and cognition, which are vital for academic excellence (Deak & Stickgold, 2010). Hence, insufficient, or disturbed sleep results in paucity of attention and limited cognition, hindering overall academic performance.

As awareness grows, it becomes evident that there is a strong link between the quality of sleep and academic performance in university students. Particularly in the stressful field of medicine, which demands unparalleled attention and dedication, a fatigued mind cannot perform optimally. Several studies conducted in the Middle East and Africa have concluded that sleeping habits are negatively associated with academic performance in medical undergraduates (Alotaibi, Alosaimi, Alajlan, & Abdulrahman, 2020; Alsofyani, Almalki, Alqarni, & Alzahrani, 2018; Lawson, Wellens-Mensah, & Attah Nantogma, 2019). This study aims to analyze the relationship between sleeping patterns and academic output among medical students studying in various public and private medical colleges across Pakistan.

Materials and Methods

The cross-sectional study was conducted over a period of 5 months. Ethical approval was obtained from the ethical committee, Islamic International Dental College, Riphah International University (Ref. No. IIDC/IRC/2021/001/010). The sample size was calculated using WHO calculator. 400 medical and allied health sciences undergraduate students were recruited from various private and public medical colleges and universities, and health sciences institutes across Pakistan, via the convenience sampling method.
The inclusion criteria outlined male and female health sciences undergraduate students currently enrolled in MBBS, BDS or allied sciences programs anywhere in the country. The exclusion criteria excluded individuals who belonged to non-medical fields and those who suffered with chronic sleep related disorders.

The rationale of the study was clearly explained to the participants. A self-designed questionnaire was circulated online and used as a research instrument to assess the correlation between sleep patterns and self-reported academic performance of medical students. Participation was deemed voluntary and full confidentiality was maintained. The collected demographics included gender, age, and field of health sciences and year of medical education. The questionnaire comprised of 3 sections – and included questions regarding students' sleeping and waking up schedules, which was compared with their academic performance (attentiveness level in class and exam grades).

The collected data was coded and entered into a database program prior to the final analysis using the IBM SPSS statistics version 25. Percentage analysis was performed, and binary logistic regression was applied for association analysis between sleep pattern and academic performance.

Results

A total of 400 medical and allied health sciences students from private and public medical colleges and universities from across Pakistan completed the online questionnaire. Participants included 284 females and 116 male students aged between 16-25 years. Most of the students were in the age group of 20-23 (65.5%). With regards to sleeping habits, approximately half of the participants slept between 10 pm to 12 am and woke up between 5-7 am. Students widely differed in the average number of hours they slept; 25.5% got 5-6 hours of sleep, 31.8% managed to sleep for 6-7 h and 27.8% got between 7-8 hours of sleep. Regarding sleep quality, the vast majority rated their sleep from normal to very good (91.5%). The following bar charts provide an overview of the sleep patterns and sleep quality of the participants.

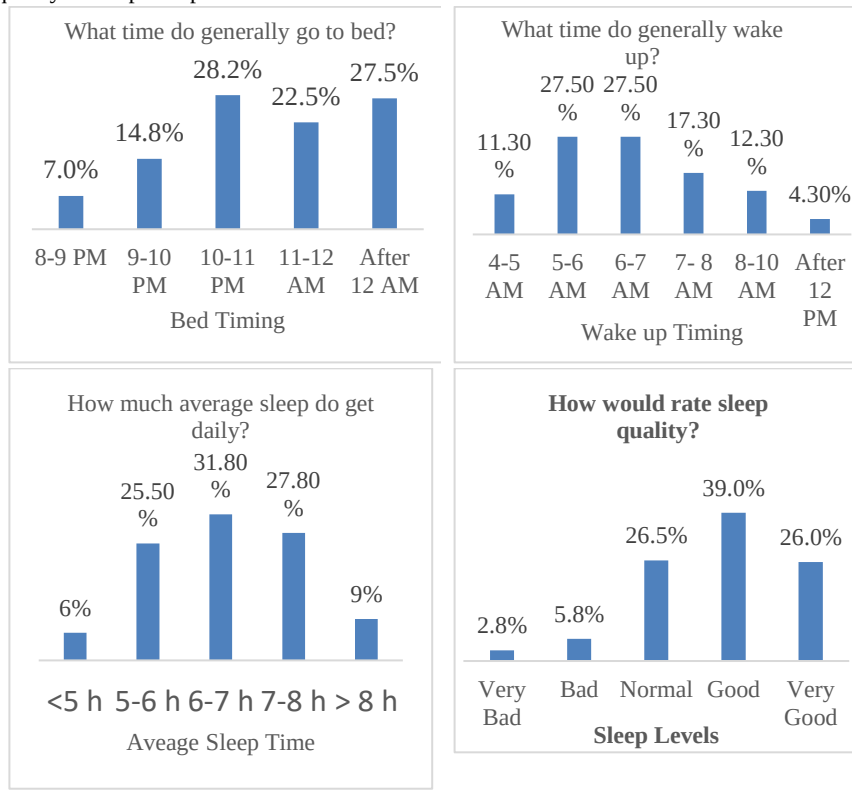

*Figure 1.*Bar chart shows different patterns of participants

In terms of attentiveness in class, 36.3% considered themselves more attentive, and 26.8% considered themselves most attentive. Regarding their performance in class tests, 47% rated it as good, while 37% considered it average. Moreover, 23.5% of participants scored above 80% in their last exam, and 28.7% scored between 60-70%. The vast majority (59.8%) of participants claimed they were able to effectively follow their planned self-study schedule, while 40.3% reported difficulties in doing so.

The study found several demographic factors associated with academic performance. Female students tended to have higher academic performance scores (>70%) compared to male students. Younger students (age "16-19") also had higher academic performance, while older students ("age greater than 23" and "20-23 years") had lower odds of high academic performance.

The study suggests that certain sleep patterns and sleep-related factors, such as going to bed early (8-9pm), waking up early (4-6 am) and not feeling sleepy during morning lectures, are associated with good academic performance with p-values of 0.038, 0.001 and <0.001 respectively. Students who have better sleep quality tend to have higher academic performance scoring above 70% (p-value = 0.027). However, the average sleep duration was not found to be significantly associated with academic performance in this analysis.

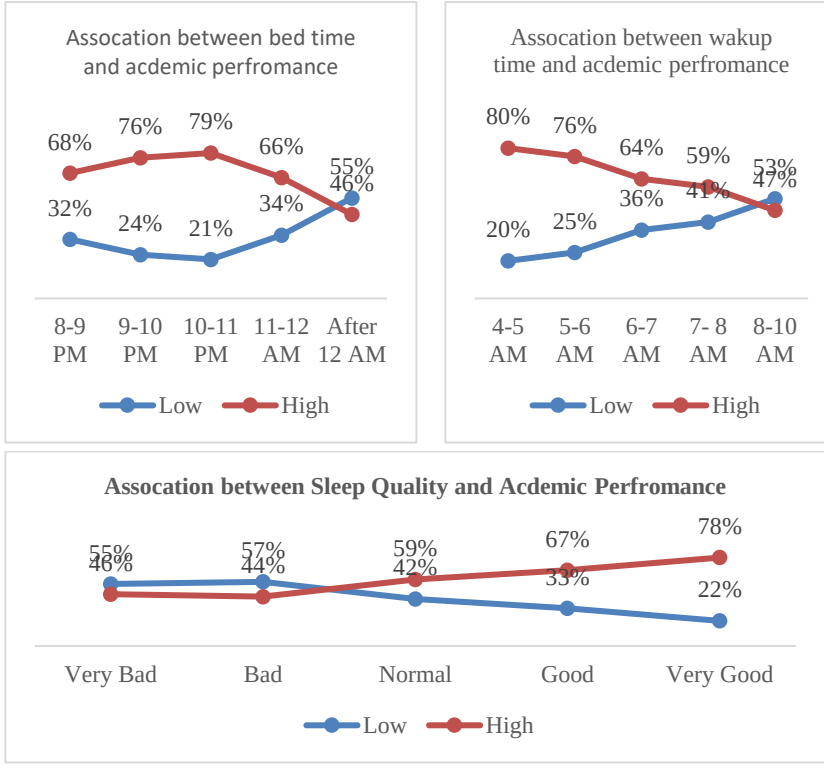

Figure 2. Line plot shows the association between academic performance and sleep pattern.

The results suggest that both attentiveness in class and the ability to effectively follow a self-study schedule are positively associated with high academic performance. Students who were more attentive in class (p value = 0.003) and could follow their self-study schedule (p value = <0.001) were more likely to achieve higher academic performance scores (>70%).

Table 1. Association between Sleep Pattern and Class Attentiveness with Academic Performance

Variables	Academic performance		p-value
	Low (<70%)	**High (>70%)**	
1. What time do you generally go to bed?			
8-9 pm	9(32.1%)	19(67.9%)	0.407
After 12 am	60(54.5%)	50(45.5%)	0.038
2. What time do you generally wake up?			
5-6 AM	27(24.5%)	83(75.5%)	0.050
8-10 AM	26(53.1%)	23(46.9%)	0.001
3. How much average sleep do you get daily?			
<5 h	9(37.5%)	15(62.5%)	0.420
> 8 h	18(50%)	18(50%)	0.209
4. How would you rate your sleep quality generally?			
Bad	13(56.5%)	10(43.5%)	0.409
Good	52(33.3%)	104(66.7%)	0.164
Very Good	23(22.1%)	81(77.9%)	0.027
5. Do you feel sleepy during your morning lectures?			
Sometimes	63(36%)	112(64%)	0.014
Never	28(20.9%)	106(79.1%)	<0.001
6. How much attentive do you think you are in class?			
Less	18(56.3%)	14(43.8%)	0.901
Neutral	57(54.8%)	47(45.2%)	0.816
More	38(26.2%)	107(73.8%)	0.026
7. Are you able to follow the planned schedule of self-studies effectively?			
No	80(49.7%)	81(50.3%)	
Yes	58(24.3%)	181(75.7%)	<0.001

The gathered data provides valuable insights into the participants' demographics, sleep patterns, academic performance, and study habits, which can be instrumental in understanding factors influencing their educational experiences.

Discussion

Resonating with prior similar studies, one of the major cause of poor academic performance and inattentiveness in classrooms is comprised quality and quantity of sleep in college and university students (Eliasson, Lettieri, & Eliasson, 2010). The innate desire to excel academically, coupled with immense psychosocial burden to perform, often results in medical undergraduates studying late at night at the cost of their sleep. When the body does not get enough sleep, it is manifested as fatigue, tiredness and lethargy throughout the

day (Basics, 2019). Resultantly, the students are trapped in a vicious cycle where neither their sleep is fulfilled, nor their academic requirements are met.

The present study found a significant association between sleeping habits and academic performance. Medicine undergraduates who efficiently managed to get a good sound sleep were attentive in their classes and performed markedly better than those who compromised their sleep owing to various reasons. Present literature supports a strong link between both quality and quantity of sleep with medical students' academic performance.(BaHammam, Alaseem, Alzakri, Almeneessier, & Sharif, 2012; Lawson et al., 2019; Okano, Kaczmarzyk, Dave, Gabrieli, & Grossman, 2019) Prolonged but disturbed sleep, as well as sound but shorter sleeping times, are associated with suboptimal functioning of human body – including the brain – and resultantly impairs cognitive abilities that eventually leads to poor academic output.

Regarding sleeping habits, the study revealed that medical students who slept after midnight and woke up after 7am had a high likelihood of poor academic performance. This finding is in line with prior study conducted by Zeek et al, piloted on student pharmacists which concluded that those students who woke up earlier are more productive throughout the day and have better academic performance than their counterparts, and vice versa (Okano et al., 2019; Zeek et al., 2015). A study conducted in New York reported neural evidence showing that alpha power, the brain's rhythmic electrical activity associated with a focused state of mind that aids cognition and creativity, was highest during early morning classes and significantly decreased as the day progressed (Dikker et al., 2020).

Likewise, the significance of sleep quality cannot be underestimated when it comes to attaining a fresh mindset, which, in turn, plays a pivotal role in enhancing academic performance. 56.5% of students who rated their sleep as bad scored below 70%, whereas 77.9% of students who rated their sleep quality as very good scored above 70%. A couple of studies conducted in Saudi Arabia which used Epworth Sleepiness Scale and Pittsburgh Sleep Quality Index to measure sleep quality also concluded that sleep disturbances remarkably influenced academic performances (Alsaggaf, Wali, Merdad, & Merdad, 2016; Bahammam, Al-Khairy, & Al-Taweel, 2005).

Interestingly however, no significant association was found between average sleep duration and academic performance of medical undergraduates. A study conducted on Biomedical college students in Malaysia also failed to establish a substantial link between the total hours of sleep (≤6 hours or >6 hours) and cumulative GPA (excellent or below excellent).(Nihayah et al., 2011) This is in sharp contrast with previous studies that have concluded that an average of eight hours of night sleep is mandatory for students at all levels to perform optimally during the next day (Zeek et al., 2015; Zuckerman, 2015). Furthermore, the students who rarely or occasionally experienced drowsiness during morning classes and demonstrated high level of attentiveness were found to have significantly higher odds for outstanding academic achievement.

The current study's findings regarding the correlation between demographic factors and academic performance are noteworthy. Female students and younger age groups exhibited

higher odds of achieving better academic performance compared to their male and elder counterparts. This observation aligns with the perception that women in medicine are often seen as more empathetic than their male counterparts (Hojat et al., 2002). This empathetic nature contributes to a stronger desire to provide excellent patient care, and it is reinforced by a solid academic foundation. The combination of higher academic performance and inherent empathy in female medical students may lead to more compassionate and patient-centered care in their future medical practices.

A notable aspect of this study is that the subjects did not belong to one institute or a city, rather the questionnaire was circulated online which helped us collect data from various public and private medical colleges across Pakistan. Previous similar studies conducted in the country were limited to single medical colleges in cities like Lahore and Karachi, and thus their results could not be generalized to entire medical student population in Pakistan (Maheshwari & Shaukat, 2019; Waqas, Khan, Sharif, Khalid, & Ali, 2015).

However, it is important to acknowledge certain limitations in our study. Sleep quality was assessed by subjects' own evaluation of their sleep rather than utilizing widely accepted scales like the Pittsburgh Sleep Quality Index. The study did not take in account other key factors that are believed to have a strong association with academic performance such as stress levels, psychological morbidity, and mode of teaching. Current literature highlights a highly significant relation between mental health and academic output (Shah, Hasan, Malik, & Sreeramareddy, 2010; Sreeramareddy et al., 2007). Higher academic outputs have also been linked with newer teaching methodologies like the PBL (Problem Based Learning), known for fostering positive work and study environment and promoting active learning (Nandi, Chan, Chan, Chan, & Chan, 2000). Hence, these shortcomings open vistas for further research studies.

Conclusion

The results of this study are suggestive of the fact that sleep habits greatly influence medical students' academic performance, highlighting the importance of healthy sleep patterns. However, to comprehensively understand the impact of net sleep duration, further research is required. Awareness needs to be raised about the significance of healthy sleep routine. By doing so, we can improve both the overall well-being and academic performance of students, fostering a generation of learners who are better equipped to succeed in their studies and lead fulfilling lives.

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