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Original Article

# Quality and Quantity of Sleep and its Effects on Academic Performance Among Medical and Nonmedical Students

**Mommana Ali Rathore, Majid Khan, Zara Irfan, Eeman Amir**

Department of Community Medicine, Army Medical college/National University of Medical Sciences (NUMS) Rawalpindi, Pakistan

## ABSTRACT

***Objective***: To assess the impact of sleep quality and quantity on the academic performance of medical and non-medical students.

***Study Design***: Comparative cross-sectional study.

***Place and Duration of Study***: Various universities in Rawalpindi and Islamabad from Jun to Aug 2022.

***Methodology***: The study included medical and non-medical students of either gender, aged 18–24 years. A structured, validated questionnaire, comprising two sections, was used. The first part consisted of demographic information. The second part comprised the Pittsburgh Sleep Quality Index, a measure of the quality and pattern of sleep.

***Results***: A total of 356 participants were divided into two groups: medical and non-medical. Out of 192 medical students, 98(50.5%) reported excellent sleep, 60(30.9%) reported good sleep, and 36(18.6%) reported poor sleep. Out of 194 medical students, 88(45.4%) were excellent in academics, 60(30.9%) were good, and 46(23.7%) had poor performance. Out of 164 non-medical students, 62(37.2%) reported excellent sleep, 70(42.7%) reported good sleep, and 32(19.5%) reported poor sleep. Among these 164 non-medical students, 84(51.2%) had excellent, 41(25.0%) had good, and 39(23.8%) had poor academic performance. A significant association ($p$<0.05) was found between the Pittsburgh Sleep Quality Index score and academic performance.

***Conclusion***: The majority of medical and non-medical students slept for less than 7 hours each night. Students who got excellent sleep performed well in both groups.

**Keywords**: Academic performance, Medical students, Sleep quality.

***How to Cite This Article:*** *Rathore MA,Khan M, Irfan Z, Amir E. Quality and Quantity of Sleep and its Effects on Academic Performance Among Medical and Nonmedical Students. Pak Armed Forces Med J 2024; 74(3): 607-611. DOI:https://doi.org/10.51253/pafmj.v74i3.10030*

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## INTRODUCTION

Sleep deprivation has a direct influence on cognitive and physical performance, as well as a considerable effect on Pakistani students' academic performance.[1] Sleep patterns have two components: quality and quantity (length), both of which are crucial for restful, healthy sleep. It supports the maintenance of executive cognitive processes, memory processing, sensorimotor integration, and concentration.[2,3]

There have been studies done to evaluate sleep disruptions in medical students, and the findings differ depending on the students' educational backgrounds and geodemographic regions.[4] Nearly 90% of Chinese medical students reported being sleepy during class time,[5] and this figure rose to 35.5% for Malaysian students, who were more likely to be clinical students. Seventy percent of students in Hong Kong reported sleep deprivation, with a mean night-time sleep duration of 6.6–1.2 hours. 16% of Malaysian medical students, 80% of Indian students, and 77% of Pakistani medical students reported experiencing poor sleep quality and sleeping for less than six hours each night.[6] Furthermore, 49% of students at a medical college in Islamabad reported sleeping less than required sleep, which led to them feeling drowsy during lectures (42%), reporting daytime weariness (30%), and waking up feeling unrefreshed and lethargic (26%).[7] These statistics show that a significant number of medical and non-medical students in Pakistan, like those in other parts of the world, are going through a transitional period and are exposed to biological, personal, and psychosocial influences that make them vulnerable to insufficient sleep, irregular sleep-wake schedules, and sleep disturbances, which can negatively impact their academic performance.[8]

The Pittsburgh Sleep Quality Index's Global Sleep Quality score (GSQ) and grade point percentage average show a substantial inverse relationship, supporting the idea that both medical and non-medical students do worse academically when they have poor sleep quality.[9] Most studies primarily focus on either medical students or non-medical students, and there is a dearth of literature that compares these two groups in terms of sleep and academic

**Correspondence: Dr Mommana Ali Rathore,** Department of Community Medicine, Army Medical College, Rawalpindi Pakistan

*Received: 07Mar 2023, revision received: 20 May 2023; accepted: 23 May 2023*

performance.[10] So in this study, a sample of medical and non-medical students was investigated to determine if lack of sleep and/or poor sleep quality were associated with poorer academic performance in both groups of students. It was predicted that participants with higher levels of sleep deprivation and poorer sleep quality would perform worse academically than those with lower levels of sleep deprivation (as measured by grade point average [GPA], percentages, and course failures) as compared to participants with average or better sleep patterns.

## METHODOLOGY

The comparative cross-sectional study was conducted at the Universities of Rawalpindi and Islamabad from June to August 2022. Permission was obtained from the Ethical Review Board of the Institute (ERC/ID/208). The sample was calculated using the RAOSOFT sample size calculator, with a 30% prevalence.[11] Students were selected through a non-probability convenience sampling technique.

**Inclusion Criteria** Medical and non-medical students belonging to either gender and aged 18–25 years were included.

**Exclusion Criteria**: Students with respiratory disorders, sleep disorders, or a history of diagnosed depression or anxiety are excluded. Students taking any sort of sleeping pill were also excluded.

A total of 356 students in the universities of Rawalpindi and Islamabad were questioned about their sleep quality and quantity, along with their demographic details. During the data collection process, each participant provided informed consent and received assurances about the strict anonymity of their questionnaire responses. The data was collected online using Google Forms. A structured question-naire, consisting of two sections, was used for data collection. The first section was composed of demographic information such as age, gender, weight, history of previous medication for sleep disorders, history of disorders such as hypertension, anxiety, and respiratory disorders, and percentage of the marks for the assessment of academic performance in the last held exams. The second part consisted of the Pittsburgh Sleep Quality Index (PSQI).[9] The participants were questioned about their daily sleep schedules and patterns and assessed via the PSQI scale. With scores ranging from 0 to 21, it evaluates the quality of sleep on seven different factors, including subjective sleep quality, sleep latency, sleep length, habitual sleep efficiency, sleep disruptions, usage of sleeping medications, and daytime dysfunction. The combined score of all seven components is referred to as the PSQI global score. A global PSQI score of 5 or more indicates poor sleep quality.

The first variable of the study, “sleep quality,” was assessed by dividing sleep quality into three categories: good (0–7), average (8–14), and poor (15–21) based on the PSQI scale. The study also divided the second variable, "academic performance," into three categories: good (70–80% and above), average (58–69%), and poor (50–57%) performance, based on self-reported academic scoring in the most recent exams.[12]

The data was analysed using Statistical Package for Social Sciences (SPSS) version 25.00. Frequency and percentages were calculated for categorical variables. Chi square test was applied to find an association between sleep and academic performance. The independent sample t-test was applied to assess differences between the sleep characteristics of medical and non-medical students. The *p*-value of $<0.05$ was considered significant.

## RESULTS

The number of medical students was 192(53.90%), and the number of non-medical students was 164(46.10%). The average total hours of sleep were 5.87±1.56 per night. Overall, total hours of actual sleep ranged from 4-12. The study's key finding was that almost 75%(269 students) slept less than 8 hours per day, as opposed to only 24.2%(87 students), who had the required sleeping hours. Among those with sleep less than 8 hours, 41%(146) were medical students, while 34.5%(123) were non-medical students. The time taken to go to sleep (sleep latency) was between 16 and 30 minutes for 140(39.3%) and between 31 and 60 minutes for 109(30.6%) students. Most of these 138(39%) were medical students. A significant association was found between the medical and non-medical students regarding sleep latency ($p<0.001$). Out of 192 medical students, 52(26.8%) reported good sleep, 53(27.3%) reported average sleep, and 87(44.9%) reported poor sleep. Out of 192 medical students, 62(31.9%) were good in academics, 70(36%) were average, and 60(30.9%) had poor performance. Of the 164 non-medical students, 37(22.5%) reported having good sleep, 60(36.5%) had average sleep, and 67(40.8%) had poor sleep. Among these 164 non-medical students, 70(42.6%) had good academic performance, 45(27.4%) had average performance, and 49(29.8%) students had poor academic performance.

Academic performance categories were found to be significantly associated ($p$<0.001) with PSQI categories. Gender and field of study were also significantly associated with PSQI groups. Across students of different academic years and academic achievement, there was no discernible variation in the quality of their sleep, as shown in Table-I. The mean global PSQI score was 6.6+3.2 for the total sample (6.3+2.9 for medical and 6.9+3.6 for non-medical students), with no significant difference in scores between the two groups (Table-II).

**Table I: Association of Demographic Characteristics of Study Participants with Pittsburgh Sleep Quality Index Score (n=356)**

| Parameters | Medical Students (n=192) | Non-medical Students (n=164) | *p*-value |
|---|---|---|---|
| **Gender** | | | |
| Male | 66(34%) | 115(70.1%) | 0.047 |
| Female | 128(66%) | 49(29.9%) | |
| **Weight** | | | |
| Less than 90 Kg | 190(97.9%) | 156(95.1%) | 0.679 |
| More than 90 Kg | 4(2.1%) | 8(4.9%) | |
| **Current year/semester of program** | | | |
| 1st year/semester | 5(2.6%) | 28(17.1%) | 0.262 |
| 2nd year/semester or higher | 189(97.4%) | 136(82.9%) | |
| **Medication history** | | | |
| Yes | 8(4.2%) | 6(3.7%) | 0.785 |
| No | 184(95.8%) | 158(96.3%) | |
| **Went to bed at night** | | | |
| At or before midnight | 111(57.8%) | 94(57.3%) | 0.186 |
| After midnight | 83(43.2%) | 70(42.6%) | |
| **Time taken to fall asleep (Sleep latency)** | | | |
| Less than 30 minutes | 145(75.5%) | 115(70.1%) | <0.001 |
| More than 30 minutes | 47(24.5%) | 42(29.8%) | |
| **Hours of sleep per night** | | | |
| Less than 6 hours | 82(42.8%) | 54(32.9%) | <0.001 |
| More than 6 hours | 110(57.2%) | 110(67%) | |

**Table-II: Pittsburgh Sleep Quality Index Scoring and Academic Performance (n=356)**

| PSQI Scoring | Medical Students (192) n(%) | Non-Medical Students (164) n(%) | *p*-value |
|---|---|---|---|
| Good Sleep | 52(26.8%) | 37(22.5%) | 0.071 |
| Average Sleep | 53(27.3%) | 60(36.5%) | |
| Poor Sleep | 87(44.9%) | 67(40.8 %) | |
| **Academic Performance in the last Professional Exams** | | | 0.866 |
| Good | 62(31.9%) | 70(42.6%) | |
| Average | 70(36%) | 45(27.4%) | |
| Poor | 60(30.9%) | 49(29.8%) | |

## DISCUSSION

This study indicated that more than half of the study sample of both medical and non-medical students had inadequate sleep as well as average academic performance. These results support the work of other researchers who have demonstrated the importance of sleep for one's health as well as for one's ability to learn and function. Students who slept for five hours or more each day performed better academically. However, additionally, this study revealed that many college students have bad sleeping patterns, emphasising the need to consider both the quantity and quality of sleep.

Most of the students (both medical and non-medical) in this study experienced the negative impacts of less sleep on their academic performance and cognitive abilities. The researchers believe that having this knowledge will help inspire students to promote healthy habits while in college. During academic years, getting enough sleep has been seen as crucial to success in both academic and personal endeavours. A comparable study, carried out by Piro *et al*. at the University of Duhok, discovered that students with sleep disorders performed worse academically in college. It is reasonable to believe that poor academic performance in students with sleep problems is caused by the daytime tiredness, low attention levels, and decreased memory and decision-making that accompany a lack of adequate sleep. Other studies demonstrated a connection between poor sleep, exam-day stress, and academic achievement.[3,12] Exam marks were negatively connected with both stress and sleep quality.[13,14] The longer term of medical education (5 years), which is longer than any other undergraduate program, may be responsible for the increased frequency of poor sleep quality in medical students. Because they have less free time and are more susceptible to academic stress than students in other academic fields, medical students may have had trouble sleeping. While most research established a link between good sleep and academic success, the Alsofyani *et al.* study of medical students at Taif University (n=299) revealed no connection between good sleep and academic performance.[15] That suggests that other elements, such as the students' personalities, time management, focus, and attendance, can also affect academic achievement.

In the present study, almost half of the participants had an average quality and quantity of sleep. Most students, both medical and non-medical,

routinely slept for fewer than the necessary seven hours per night, with evenings before exams being particularly restless. A significant association has been found between higher course grades and semester GPAs and the longer duration of sleep on nights prior to examinations.[7] Students taking excellent sleep showed excellent performance in their examinations, which is true for both categories of students in this study as well. Poor sleep quality among both medical and non-medical students is linked to emotional anxiety and subpar academic performance.[3] The general health and psychological well-being of students depends on getting enough sleep. In particular, sleep loss significantly impacts cognitive activities that rely on mental or cognitive processes.[16]

The survey also revealed that a sizable portion of medical students had trouble falling asleep. A cross-sectional assessment of over 50,000 Norwegian college and university students revealed that, in comparison to those who slept seven to nine hours, both sleeping less than five hours and more than ten hours were linked to failing test.[17] Medical students' short sleep duration and poor sleep quality may be attributed to their heavy workload, professional attitudes and practices, and lack of knowledge about proper sleep hygiene. Such activities may have negative effects on cognitive and behavioural functioning.[18] A study revealed that there was a discernible difference in poor sleep quality between the male and female participants, although both reported having difficulty falling asleep.[19]

In general, the results demonstrate that medical students across the world sleep close to midnight and wake up earlier than the general population. Due to their rigorous academic schedule, which includes acquiring clinical skills and adjusting to a constantly changing hospital environment, medical students generally feel fatigued by the end of day as compared to non-medical students.

## LIMITATION OF STUDY

The accuracy of the students' responses to the self-administered questionnaires was the main limitation of this study. The study focused on student self-reports for grade point average rather than independently checking them against college records. The variables that contribute to sleep disorders, as well as how they relate to other health issues, require more research on a larger scale.

## CONCLUSION

Sleep deprivation is a grave issue and should be addressed with the utmost priority. The findings support the idea that students with healthy sleep habits and no sleep problems do better academically. Nonetheless, it appears that medical students have a greater frequency of poor sleep habits and sleep disorders, which has an impact on their academic performance.

**Conflict of Interest:** None.

**Authors' Contribution**

Following authors have made substantial contributions to the manuscript as under:

MAR & MK: Conception, data acquisition, data analysis, drafting the manuscript, approval of the final version to be published.

ZI & EA: Study design, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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