



Research Article

Daytime Sleepiness and Sleep Quality among Undergraduate Medical Students in Sialkot, Pakistan

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ABSTRACT

Background/Objective: Daytime sleepiness and poor sleep quality are common among medical students, and are expected to affect their academic performance. The common problems are duration of sleep, delayed onset of sleep, and daytime sleepiness. The objective of this study is to determine the prevalence of daytime sleepiness and sleep quality and associated risk factors among medical students in a medical college in Sialkot, Pakistan.

Methods: In this cross-sectional study, 154 medical students were selected through stratified random sampling techniques. Pittsburgh Sleep Quality Index (PSQI) was used to assess the sleep pattern and Epworth Sleepiness Scale (ESS) was used to measure daytime sleepiness. The association of sleep quality and daytime sleepiness and the risk factors were determined through regression analysis.

Results: The results showed that students who suffered from poor sleep quality was 64%; abnormal sleep latency was 51%, narcoleptic 43.2%, and sleep disturbance 31%. In the multivariate analysis after adjustment of covariates, in terms of sleep habits, females and second academic year students were more than two times likely to have a sleep disorder [Odds Ratio (OR) = 2.33; 95% Confidence Interval (CI), 1.66–2.91 and OR = 2.33; 95% CI, 2.74–7.34, respectively]. Regarding narcolepsy, female participants (OR = 2.03; 95% CI, 1.24–16.7), stress during examination (OR = 1.90; 95% CI, 1.07–47.05), poor sleep after physical activity (OR = 1.76; 95% CI, 1.10–30.00), and second academic year students (OR = 2.07; 95% CI, 1.85–2.54) were two times more at risk of severe narcolepsy.

Conclusion: The majority of students suffered from poor sleep quality and daytime sleepiness. Female sex and academic years were the major predictors of poor sleep quality and daytime sleepiness. There is a need for awareness and counseling among students to help reduce the burden of sleep disorder.

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1. INTRODUCTION

Normal sleep is essential for good health and good quality of life [1–3]. Duration of sleep varies between different species, and humans need only 8 h of sleep. Good sleep is important for learning, critical thinking, and working [4,5]. A study showed that high school students commonly face sleep disturbances because of their high burden of studies [6].

According to research, sleep is classified into three categories: monophasic (6 h duration every 24 h), biphasic (twice every 24 h), and polyphasic (many times sleep per day).

Graduate students have suffered sleep disorders because of their complex study schedule [7]. A previous study found that 50% of students had daytime sleep episodes because of insufficient sleep

at night, which leads to poor academic performance and increased risk of accidents [8].

Medical students suffered more from sleep disorders owing to a heavier burden of studies compared with students of other branches of science [9]. Long working hours are one of the most important factors causing sleep disorders among medical students [10]. Sleep disorders affect the mental and physical health of medical students, which leads to reduced working abilities [11].

Sleep disorders among medical undergraduates not only lead to physical and psychological morbidities, but also affects learning, memory, and cognition [12]. A study conducted in a Nigerian university showed that 32.5% of medical students were sleep-deprived [13]. Similarly, a study conducted in a medical college in Pakistan showed that poor sleeping habits were common among medical students, and this also affected their lifestyle [14].

Globally, medical students are more susceptible to sleep disturbances and problems. In a previous study carried out in China, results found that most of the students have a poor quality of sleep [10]. Another study reported that the majority of medical students

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had experienced daytime sleepiness in a class and male students were more affected. A study conducted in India showed that 30.6% of these students reported daytime sleepiness [15].

A previous study found that only 47% of medical students had a refreshing sleep at night compared to law students, and that insomnia was a more common problem among medical students [15].

As medical students progress from their 1st year to the final year, there is an increased burden of study. Students become more involved in clinical work starting from their 3rd year and have different working time schedules, which lead to more sleep disorders [16]. Sleep disorders result in decreased morale, reduced motivation, depression, and anxiety, which in turn affect their academic performance [17]. There are very few reports available in Pakistan that could help determine sleep quality and daytime sleepiness among medical students. There are more than 150 medical colleges operating within the country, and there are more than 50,000 students studying in these medical colleges. The results of this study will help in revision of the curriculum of medical programs and increase awareness among the medical students regarding sleep problems. The objective of this study is to determine the prevalence of daytime sleepiness and sleep quality among medical students at a medical college in Sialkot, Pakistan.

2. MATERIALS AND METHODS

2.1. Study Design, Study Site, Sampling Technique, and Sample Size

This cross-sectional study was conducted at Khawaja Muhammad Safdar Medical College (Sialkot, Pakistan), a public sector medical college that enrolls roughly 100 students each year. The sample size was calculated using the World Health Organization (WHO) sample size calculator, by keeping the proportion of poor sleep quality 11% from a previous study [18], using 95% Confidence Interval (CI) and 5% margin of error. The total sample size was 154 participants, who were selected using a stratified random sampling technique. For a total of 5 years of medical education, 31 students were selected from each year of the curriculum.

2.2. Inclusion Criteria, Exclusion Criteria, and Study Variables

The participants consisted of all undergraduate students of the medical college, who willingly consented to participate in the study. Those who have any chronic mental disorder were excluded from the study.

The variables were age, sex, academic year, sleep hours, narcolepsy by Epworth Sleepiness Scale (ESS); sleep habits by Pittsburgh Sleep Quality Index (PSQI), sleep habits during exams, sleep habits and extracurricular activities, stress and sleep habits, sleep and physical activity, and satisfaction with sleep habits.

2.3. Data Collection Tool

Sleep quality and daytime sleepiness were measured using a semi-structured questionnaire, which is based on the objective of the study. It consists of two sections: sociodemographic characteristic

and sleep disorder of participants. A self-administered Performa was used for collection of data. Performa contains standard sleep scales (i.e., ESS and PSQI) [2,5]. The participants were given instructions prior to data collection.

In the PSQI scale, which is a validated scale, a score of 0–4 indicates a “Good” sleep habit, whereas a score of or greater denotes a “Poor” sleep habit; it is also used to determine Sleep latency. If it takes the respondent up to 15 min to fall asleep, it is rated “Normal”; if it takes 16–30 min, then it is “Mild disturbance”; 31–60 min, “Moderate disturbance”; and >60 min, “Severe disturbance.”

Epworth Sleepiness Scale is a validated scale used for determining Narcolepsy. Day dozing is Lower Normal if the ESS score is 0–5, Higher Normal if the ESS score is 5–9, Mild Narcolepsy if the ESS score is 10–12, Moderate Narcolepsy if the ESS score is 13–15, and Severe Narcolepsy if the ESS score is >16.

2.4. Data Analysis Procedure

Data were analyzed using SPSS version 22 (SPSS Inc., Chicago, IL, USA). Data from the questionnaire were encoded into the database by the data encoder. Questionnaire forms and the database were checked for completeness daily. Data were entered twice and then cleaned for any missing variables. The process was supervised by the principal investigator on a regular basis. Quantitative variables such as age, family size, total household income, mean, and standard deviation were calculated. Categorical variables such as sex, years of education, and occupation were described using frequencies and percentages. Association between the poor sleep quality and associated risk factors were determined using logistic regression (binomial and multinomial) analysis. Independent variables, which are presented with $p \leq 0.05$, were included in the multivariate analysis. Narcolepsy was classified into four categories: normal, mild, moderate, and severe. Multinomial regression analysis was performed to determine the association of daytime sleepiness (normal is the reference category, and mild, moderate, and severe are risk categories) with sociodemographic characteristics.

The study was approved by the Khawaja Muhammad Safdar Medical College ethical committee (approval code: IRB-UGS-2019-179). After the study was explained, verbal and written informed consent was obtained from the study participants. Counselling was done after the interview, providing basic information regarding the prevention of sleep disorders.

2.5. Operational Definitions

2.5.1. Sleep habits

Sleep habits were determined using the PSQI (used to assess the sleep pattern) scale, in which a PSQI score of 0–4 is considered “Good” whereas a score of 5 or greater is “Poor.”

2.5.2. Sleep problems [difficulty in falling asleep (Sleep Latency)]

This is also determined by using the validated PSQI scale. If it takes an individual up to 15 min to fall asleep, it is considered “normal”;

16–30 min, “mild disturbance”; 31–60 min, “moderate disturbance”; >60 min, “severe disturbance.”

2.5.3. Narcolepsy

Narcolepsy is determined using the ESS (used to measure daytime sleepiness). Day dozing is Lower Normal if the ESS score is 0–5, Higher Normal if the ESS score is 5–9, Mild Narcolepsy if the ESS score is 10–12, Moderate Narcolepsy if the ESS score is 13–15, and Severe Narcolepsy if the ESS score is >16.

3. RESULTS

Most (68%) of the study participants were females, and the majority (57%) of students were in the age range of 21–24 years (Table 1). According to the ESS, 20% of the participants suffered from mild narcolepsy and only 3% had severe narcolepsy (Table 2). According to the PSQI scale, in terms of quality of sleep, 16.9% were severely impaired and 26% were mildly impaired (Table 3). After adjusting for age, sex, academic year, stress during examination, and after physical activity all are associated with poor sleep (Table 4).

The age group of 17–20 years was associated with severe narcolepsy (28%; OR = 1.28; 95% CI, 1.76–33.76). Female participants were more than two times (OR = 2.03; 95% CI, 1.24–16.74) associated with severe narcolepsy. All academic years from 1st year to

Table 1 | Sex and age distribution among study participants (n = 154)

Variables (n = 154)	n	Percentage
Sex		
Female	106	68.8
Male	48	31.2
Age (mean ± SD) (years)	(20.99 ± 1.83)	
17–20	63	40.9
21–24	89	57.8
Older than 24	02	1.3

SD, standard deviation.

Table 2 | Classification of narcolepsy among study participants (n = 154)

Narcolepsy (ESS score)	n	Percentage
Normal (0–7)	87	56.49
Mild narcoleptic (8–9)	32	20.8
Moderate narcoleptic (10–15)	29	18.8
Severe narcoleptic (15+)	6	3.9
Total	154	100

Table 3 | Classification of sleep quality among study participants

Sleep quality (PSQI score)	n	Percentage
Normal (0–3)	61	39.6
Mild (3–7)	40	26
Moderate (7–12)	27	17.5
Severe (12–23)	26	16.9
Total	154	100

Table 4 | Association of sleep quality with risk factors among study participants

Variables	Crude OR (95% CI)	p	Adjusted OR (95% CI)	p
	Poor sleep		Poor sleep	
Age (years)				
17–20	1.19 (0.60–2.34)	0.10	0.91 (0.28–2.94)	0.09
21–26	1		1	
Sex				
Female	1		1	0.02
Male	1.66 (1.56–2.38)	0.03	2.33 (1.61–2.91)	
Academic year				
1st	1		1	
2nd	2.37 (0.78–7.17)	0.13	2.33 (2.74–7.34)	0.04
3rd	2.07 (0.68–6.31)	0.11	2.12 (0.54–8.24)	0.08
4th	1.56 (1.50–4.85)	0.02	1.60 (1.32–7.96)	0.03
Final	2.37 (2.78–7.11)	0.01	2.32 (3.46–11.54)	0.03
Stress during examination				
Yes	0.66 (0.24–1.78)	0.10	0.72 (0.24–2.17)	0.12
No	1		1	
Sleep habit after physical activity				
Worst	0.60 (0.24–1.49)		0.63 (0.24–1.67)	0.05
Better	1	0.06	1	

final year were more than one time (OR = 1.48; 95% CI, 1.17–1.57) associated with Narcolepsy (Table 5).

4. DISCUSSION

Our study found that poor sleep quality was highly prevalent among the study participants. The prevalence rate was higher than those (32–57%) reported by other studies using the same instrumentation (PSQI questionnaire) [12]. Moreover, there was a higher prevalence in male respondents, daytime sleepiness, and increased sleep latency. Overall, 56.3% males have poor sleep latency as compared to 48.1% in females. This result was in agreement with previous studies that were conducted in Karachi, in which the prevalence rate of sleep disorders ranged from 20% to 30% [19–23].

Our study showed that narcolepsy prevalence is 43.5%, and it is dominant in females (45.3%). It was higher compared to that in another study that was also conducted on medical students [24]. This can be attributed to differences in study design as well as ethnic, cultural, and geographical variability between studied populations. Evaluating the causes of narcolepsy requires a holistic approach and confirmation with objective tests. Our study results showed that the prevalence rate of sleep disturbance is 60.4%. Like poor sleep quality, sleep disturbances are dominant in males (64.6%). It is higher compared with the prevalence rate in a previous study [2]. Examinations are an integral part of any study; medical examinations are relatively far more difficult. Professional examinations are stressful psychologically as well as physically. Our results showed that about 44% of students have altered sleep because of extracurricular activities. This result is far lower than that reported in previous studies, which was about 60% [18].

Table 5 | Association of narcolepsy^a and its risk factors among study participants

Variables	Crude OR (95% CI) (p)			Adjusted OR (95% CI) (p)		
	Mild	Moderate	Severe	Mild	Moderate	Severe
Age (years)						
17-20	0.51 (0.14-1.80) (0.13)	1.09 (0.30-3.91) (0.05)	3.33.48 (0.30-36.11) (0.9)	0.23 (0.02-2.56) (0.15)	0.94 (0.08-10.52) (0.10)	1.28 (1.76-33.76) (0.0213)
21-26	1	1	1	1	1	1
Sex						
Female	0.56 (0.14-2.18) (0.15)	0.90 (0.23-3.40) (0.09)	2.00 (1.29-13.73) (0.05)	0.61 (0.14-2.65) (0.07)	0.56 (0.12-2.49) (0.09)	2.03 (1.24-16.74) (0.01)
Male	1	1	1	1	1	1
Academic year						
1st	1	1	1	1	1	1
2nd	0.26 (0.04-1.49) (0.08)	1.07 (0.67-1.49) (0.13)	0.09 (0.02-2.55) (0.09)	0.24 (0.01-5.29) (0.04)	1.44 (0.06-32.05) (0.16)	2.07 (1.85-2.54) (0.03)
3rd	0.40 (0.08-1.84) (0.07)	0.89 (0.57-1.38) (0.18)	0.09 (0.05-16.36) (0.08)	0.38 (0.02-6.46) (0.12)	0.97 (0.05-16.77) (0.11)	1.29 (0.00-14.75) (0.05)
4th	0.57 (0.13-2.36) (0.08)	1.03 (0.66-1.61) (0.16)	1.00 (0.57-17.50) (0.05)	0.32 (0.02-3.81) (0.17)	0.84 (0.08-8.87) (0.09)	1.30 (0.01-6.91) (0.14)
Final	0.91 (0.24-3.40) (0.09)	1.77 (1.81-3.88) (0.01)	1.07 (1.06-18.82) (0.02)	0.71 (0.08-5.83) (0.08)	1.56 (1.20-12.15) (0.04)	1.26 (1.01-5.49) (0.03)
Stress during examination						
No	1	1	1	1	1	1
Yes	2.00 (0.20-19.61) (0.08)	1.61 (1.15-17.01) (0.05)	2.80 (1.14-53.70) (0.04)	1.18 (0.09-15.36) (0.11)	1.16 (1.01-1.85) (0.02)	1.90 (1.07-47.05) (0.03)
Sleep habit after physical activity						
Worst	1.09 (0.23-5.16) (0.12)	1.17 (0.01-1.85) (0.05)	1.80 (1.06-9.66) (0.05)	1.07 (0.19-5.87) (0.06)	1.81 (1.04-15.23) (0.04)	1.76 (1.10-30.00) (0.02)
Better	1	1	1	1	1	1

^aNarcolepsy classified as normal, mild, moderate, or severe. Normal is reference category.

Stress is a major factor in the prevalence of sleep problems. This study showed that 136 students (88.3%) have observed alteration in their sleep pattern and habits. Overall, 88 of 136 students have a poor sleep quality. Consistent with previous studies [25], poor sleep quality is associated with poor mental activity, which leads to depression and anxiety. Our study showed that physical activity improves sleep quality, that is, 74.6% students think their sleep improves after physical activity (e.g., sports, jogging, yoga). This finding correlates with the results of previous studies, which also show that sleep quality improves after physical activity [21].

Our study showed that 67% of students are satisfied with their sleep habits, and this correlates with international studies showing a satisfaction rate of about 60-75% [26]. This satisfaction rate shows that the awareness level is not good among students, because out of these 103 students (67%), 58 (56.3%) have poor sleep quality.

These findings should be interpreted in consideration of the study limitations. First, this is a cross-sectional study, which did not determine the causality. Second, information bias is present because the survey was based on subjective measures of sleep quality. This high prevalence rate can be attributable to poor awareness among students. As such, there is a need to remind students about the importance of sleep. Good sleep is beneficial to students because it improves their mental status, as well as social and academic performance. Moreover, workshops and seminars on sleep disorders improve the academic performance of students and helps reduce chronic disorders. In turn, this will

enable students to perform better and achieve better scores in professional examinations.

5. CONCLUSION

Medical students have a high prevalence of poor sleep quality and daytime sleepiness largely because of the high burden of studies and their very irregular schedules. There is a need to revise the curriculum policies, and counseling services should be provided at the college level to improve the mental health of students.

CONFLICTS OF INTEREST

The authors declare they have no conflicts of interest.

AUTHORS' CONTRIBUTION

NMB study conceptualization, data curation, writing (review & editing) of the manuscript. MZ writing (review & editing) the manuscript.

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ETHICAL APPROVAL

The study has been approved by the Khawaja Muhammad Safdar Medical College ethical committee. The approval code is IRB-UGS-2019-179.

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