

ASSESSING SLEEP QUALITY AMONG MEDICAL AND DENTAL STUDENTS IN KHYBER PAKHTUNKHWA PROVINCE OF PAKISTAN: A CROSS-SECTIONAL SURVEY

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ABSTRACT

Objectives: To determine the prevalence of poor sleep and factors associated with it among medical and dental students in Khyber Pakhtunkhwa province of Pakistan.

Materials and Methods: A population-based analytical cross-sectional study was carried out from May to September 2022, consisting of 385 undergraduate students from 21 medical and dental colleges. A non-probability convenience sampling technique was employed to assess sleep quality with the help of Pittsburgh Sleep Quality Index (PSQI). Factors associated with poor sleep were determined using binary logistic regression.

Results: Among the total, 263 (68.3%) students had poor sleep quality on the PSQI scale. Poor sleep was more likely (OR [95%CI]) among females (2.3 [1.3-3.9]), age ≥ 21 years (2.5 [1.1-5.8]), pre-clinical phase (3.1 [1.4-6.5]), BDS students (2.0 [1.1-3.5]), disrupted circadian rhythm (4.2 [2.0-8.6]), and hostelites (1.7 [1.0-2.9]) at significance of $P < 0.05$. Participants' per day sleep was 5.9 hrs (SD=1.2 hrs). Regarding PSQI components, the worst performance was noticed in sleep duration (M=1.60, SD=0.95). Of the total, 47 (12.2%) were taking sleep medications, 377 (97.9%) had bedtime phone usage and 242 (62.8%) had no familiarity with "Sleep hygiene".

Conclusion: Findings revealed that poor sleep was prevalent in more than half of the participants. Average sleep duration was suggestive of sleep deprivation indicating for immediate interventions to prevent its potential consequences.

Key words: Sleep Quality, sleeping habits, sleep deprivation, medical students

INTRODUCTION

Insomnia disorder, as defined by DSM-5, is difficulty falling or staying asleep despite having a suitable environment and adequate opportunity to sleep. This problem occurs 3 or more times a week for at least three months leading to daytime impairment¹. According to WHO SAGE-INDEPTH survey about 17% of the population suffer from severe sleep problems². Sleep curtailment is even more severe

in medical students due to their academic demands and are increasingly reported by several studies globally^{3,4}.

Our life habits have been transformed in recent decades with modernization and it has affected people of every age group, particularly young adults³. Sleep deprivation is one of them for a variety of reasons. This decrease in average sleep duration has brought many implications for medical education^{3,5}. Past research has shown insomnia leads to absenteeism twice as much as good sleepers⁶. A study in Morocco found that 97.3% of medical and pharmacy students were using electronic devices at bedtime and 35% of them reported poor sleep⁷.

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Lack of sleep poses a risk of developing other sleep disorders in individuals including daytime sleepiness, obstructive sleep apnea, and insomnia⁸. Factors that are found to be affecting medical students' sleep are male gender, excessive internet use, anxiety⁸, drinking caffeine, life stresses⁹, exams¹⁰, working on rotating shifts¹¹, and bedtime usage of blue-light emitting devices^{4,12}. Keeping in view the recent COVID-19 pandemic, another survey showed that 74% of medical students had poor sleep quality¹³.

After literature search, we did not find any study on a large scale in the Khyber Pakhtunkhwa (KPK) region that included students from multiple colleges to provide an accurate depiction of the problem. Moreover, the results of these past studies are highly inconsistent and contrary to each other. We intend to conduct a more inclusive study in multiple colleges with enough sample size to accurately assess the overall sleep quality of medical students given the potential adversities of poor sleep. The findings would help us in improving their lives and more specifically their academic performances and attendance.

MATERIALS AND METHODS

A population-based analytical cross-sectional study was carried out in the province of Khyber Pakhtunkhwa (KPK), Pakistan from May to September 2022, in which undergraduate students from 21 different medical and dental colleges, both from private and public sectors, participated. Ethical approval for this study was taken from the Institutional Research and Ethical Review Board (IREB) of Khyber Medical College Peshawar under reference number 333/DME/KMC. Written informed consent was taken from all the participants for participation and publication of this study. Complete anonymity was ensured to them.

Regular students residing in Pakistan of both genders and all professional years were included through a non-probability convenience sampling technique. Students with pre-existing medical ailments were excluded from the study.

The sample size was calculated using the formula, $n = z^2 p(1-p) / d^2$ and was obtained to be 374. The confidence interval was kept at 95%, the prevalence of poor sleep was taken as 58% from a past study in Pakistan¹⁶ and the margin of error at 5%. We distrib-

uted a total of 400 self-administered questionnaires among students of multiple colleges which were kept intentionally greater than the sample size keeping in view the factors of poor response rate and validity of certain filled questionnaires. Three hundred ninety-one forms were returned with a response rate of 97.8%. Six forms were further dropped because they were either incompletely filled or inappropriately filled. Finally, 385 forms were considered for the analysis. Among these responses, 274 (71.2%) were MBBS students and 111 (28.8%) were BDS students.

A self-reported questionnaire was designed to carry out the study. It had three parts. The first part consisted of questions about demographic data which included gender, age, institute name, year of study, discipline, and residence. The second part comprised the PSQI global scale. And the third part had questions about variables of interest that could affect sleep quality which included; circadian rhythm disruption, bedtime phone usage, daytime naps, and "sleep hygiene" familiarity.

PSQI is a self-reported questionnaire that is developed for the assessment of sleep quality. It is a validated tool that is utilized both for clinical and research purposes all over the world. It has also been translated into many languages, befitting those who do not understand the English language. It contains a total of 18 questions, which sum up into 7 components namely, subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medication, and daytime dysfunction. Each component has been assigned a score ranging from 0 to 3. They are added up in the end yielding the highest score of 21. A higher score on the scale represents poor sleep. Acquiring a score greater than 5 means poor sleep while a score equal to or less than 5 is considered good sleep¹⁴.

Data analyses were performed using IBM SPSS Statistics v24 software (IBM Corp, Armonk, NY, USA). Continuous data were presented in the form of means and standard deviations while categorical data was in the form of frequencies and percentages. Binary logistic regression was employed to assess the predictive capability of the included variables on the likelihood that the respondents had poor sleep quality. Odds ratios (OR) were found at a 95% confidence interval (CI). The chi-square test was also used to establish associations between categorical

variables. A $P < 0.05$ was considered significant for both regression analysis and chi-square test.

RESULT

The demographic characteristics of the participants are shown in Table 1. Total sample mean age was 21.49 years (SD = 1.66 years). The majority of participants were males (237, 61.6%) and in the 4th year (144, 37.4%).

Descriptive statistics, including range, mean, SD, 95% CI, and median of PSQI score and its components are given in Table 2. Out of the total, 263 (68.3%) scored greater than 5 on the PSQI scale and were considered poor sleepers, while 122 (31.7%) scored equal to or less than 5 and were considered good sleepers. Among MBBS students the prevalence of poor sleep was 63.5% ($n = 174$) while among BDS students the prevalence was 80.2% ($n = 89$). Among PSQI 7 components, the worst performance was seen in sleep duration with the highest mean ($M = 1.60$, $SD = 0.95$), followed by sleep latency ($M = 1.44$, $SD = 1.07$).

Participants' mean hours of sleep per night during the past month was 5.87 hrs ($SD = 1.21$ hrs). Out of the total students, 282(73.3%) perceived their sleep quality as very or fairly good while 103(26.7%) perceived it as fairly or very bad. It was found that 47(12.2%) students had taken sleep medications during the past month with different frequencies. Of the total participants, 292(75.8%) had 'always' bedtime phone usage before sleep, only 41(10.6%) had a normal circadian rhythm, and 242(62.9%) had no familiarity with "Sleep hygiene" (Table 4).

Binary logistic regression was employed to assess the predictive capability of the included variables on the likelihood that the respondents had poor sleep quality. All included variables were first arranged in dichotomous form with zero indicating lack of characteristic and one for presence of characteristic. The tolerance value ($1-R^2$) for all independent variables was >0.10 , showing no violation of the multicollinearity assumption. The final model was built having 9 variables as covariates (gender [females vs. males], age [<21 years vs. ≥ 21 years], clinical phase [1st and 2nd year as pre-clinical vs. 3rd, 4th, and 5th year as clinical], discipline [MBBS vs. BDS], circadian rhythm disruption [yes vs. no], bedtime phone use [yes vs. no], "sleep hygiene"

familiarity [yes vs. no], daytime nap [yes vs. no], and residence [hostel vs. home]) for the dependent variable of sleep quality [good sleeper vs poor sleeper]. The full model containing all the predictors was statistically significant, (χ^2 ($df=9$, $N=385$) = 50.68, $p < 0.001$), indicating the adequacy of the model fit for the data. The model explained between 12.3% (Cox and Snell R^2) and 17.3% (Nagelkerke R^2) of the variance in sleep quality and had a percentage accuracy in classification (PAC) of 71% an improvement over 68% when predictors were not included in the model. Binary logistic regression showed that out of 9 included independent variables in the model, only 6 made a unique statistically significant contribution to the model ($p < 0.05$), namely; gender, age, medical phase, discipline, circadian rhythm disruption, and residence. The strongest predictor of poor sleep was disrupted circadian rhythm, recording an odds ratio of 4.15 (95%CI; 2.01-8.57, $P < 0.001$), meaning that those who had problems with their sleep-wake routine were over four times more likely to have poor sleep than those whose routine was disciplined, controlling for all the other factors in the model. In addition, females (OR = 2.29; 95%CI; 1.34-3.92, $P = 0.002$) and aged ≥ 21 years (OR = 2.54; 95%CI; 1.11-5.83, $P = 0.027$) were over two times more likely to have poor sleep as compared to males and

Table 1: Characteristics of survey participants

Variables	N (%)	
Gender	Female	148 (38.4)
	Male	237 (61.6)
Age	18-20 years	97 (25.5)
	21-23 years	256 (66.5)
	24-26 years	32 (8.3)
Year of Study	1st year	50 (13.0)
	2nd year	91 (23.6)
	3rd year	82 (21.3)
	4th year	144 (37.4)
	5th year	18 (4.7)
Discipline	MBBS	274 (71.2)
	BDS	111 (28.8)
Residence	Hostel	257 (66.8)
	Day Scholars	128 (33.2)
*Sleep medication dosage	No usage	338 (87.8)
	< 1 times/week	16 (4.2)
	1-2 times/week	15 (3.9)
	≥ 3 times/week	16 (4.2)

Footnote: * During the past month

that age < 21 years, respectively. The BDS students were almost two times more likely to have poorer sleep than MBBS students (OR = 1.97; 95%CI; 1.11-3.52, P = 0.021). Further examination of the results is given in Table 3.

The chi-square test (χ^2) was able to establish a significant correlation between sleep medication dosage (P < 0.001) and self-perceived sleep quality (P < 0.001) with poor sleep. However, year of study

(P = 0.079) failed to have a significant association with it (Table 4).

DISCUSSION

In this study, the sleep quality of medical and dental students was assessed and poor sleep was found to be prevalent in more than half of the participants (68.3%). Females, age \geq 21 years, pre-clinical phase, BDS students, disrupted circadian rhythm, and hostelites were more likely to suffer from poor

Table 2: Descriptive statistics of PSQI score and its components

Observed Characteristics of PSQI score							
	Observed range	Mean \pm SD	95% CI				
			Lower limit		Upper limit		
Total participants	1-19	7.28 \pm 3.67	6.92		7.64		
Good sleepers	1-5	3.32 \pm 1.30	3.09		3.57		
Poor sleepers	6-19	9.11 \pm 2.87	8.77		9.48		
Observed Characteristics of PSQI seven components							
PSQI components	Observed range	Mean \pm SD	SCORE				Median
			0 (%)	1 (%)	2 (%)	3 (%)	
C 1: Subjective sleep quality	0-3	1.10 \pm 0.83	90 (23.4)	192 (49.9)	77 (20.0)	26 (6.8)	1
C 2: Sleep latency	0-3	1.44 \pm 1.07	92 (23.9)	112 (29.1)	102 (26.5)	79 (20.5)	1
C 3: Sleep duration	0-3	1.60 \pm 0.95	52 (13.5)	124 (32.2)	134 (34.8)	75 (19.5)	2
C 4: Sleep efficiency	0-3	0.54 \pm 0.87	249 (64.7)	91 (23.6)	19 (4.9)	26 (6.8)	0
C 5: Sleep disturbance	0-3	1.05 \pm 0.55	46 (11.9)	276 (71.7)	60 (15.6)	3 (0.8)	1
C 6: Use of sleep medication	0-3	0.24 \pm 0.72	338 (87.8)	16 (4.2)	15 (3.9)	16 (4.2)	0
C 7: Daytime dysfunction	0-3	1.30 \pm 0.99	98 (25.5)	123 (31.9)	113 (29.4)	51 (13.2)	1

Footnote: PSQI= Pittsburgh Sleep Quality Index; C= Component; SD= Standard Deviation; CI= Confidence Interval

Table 3: Binary logistic regression analysis of sleep quality with associated factors

	B	SE	Wald	OR	95% CI		*P value
					Lower limit	Upper limit	
Gender (ref: Females)	-0.830	0.273	9.230	0.436	0.255	0.745	0.002
Age (ref: <21 years)	0.934	0.423	4.877	2.545	1.111	05.832	0.027
Medical phase (ref: Pre-clinical)	-1.117	0.390	8.225	0.327	0.153	0.702	0.004
Discipline (ref: MBBS)	0.679	0.295	5.291	1.972	1.106	3.516	0.021
Circadian rhythm disruption (ref: No)	1.424	0.369	14.865	4.154	2.014	8.568	<0.001
Bedtime phone use (ref: No)	0.115	0.802	0.021	1.122	0.233	5.399	0.886
Daytime nap (ref: No)	-0.023	0.286	0.007	0.977	0.558	1.710	0.935
Residence (ref: Hostel)	-0.549	0.259	4.487	0.578	0.348	0.960	0.034
“Sleep Hygiene” familiarity (ref: Yes)	0.186	0.242	0.592	1.205	0.750	1.937	0.442
Summary Statistics of Model: Pseudo R ² = .173, Omnibus Test χ^2 = 50.687 (df = 9, p < .001), Hosmer and Lemeshow Test χ^2 = 7.054 (df = 8, p = .531), The number of correctly predicted good sleepers: 30 (24.6%), The number of correctly predicted poor sleepers: 243 (92.4%), N = 385							

Footnote: Ref = Reference group, SE = Standard error, OR = Odds ratio, CI = Confidence interval, P significant at < 0.05

sleep. The results of prevalence of poor sleep among medical students were consistent with former studies conducted in other cities of Pakistan i.e. 67.3% in Islamabad¹⁵, 58.1% in Lahore¹⁶, and 65.7% in Karachi⁹. There is not much variation among our findings. Although this difference gets bigger when compared with other countries i.e. 42.2% in Iran (3), 76.7% in Libya¹⁷, 87.1% in Brazil¹⁸, 68% in Yemen¹⁹, and 62.7% in India²⁰. These variations in the prevalence are possibly attributed to differences in cultural values, living conditions, overall mental health, environmental stresses, and curriculum demands.

After analyzing BDS students separately, 80% of them were found to be suffering from poor sleep. A past study of dental students by Elagra MI et al. agrees with this finding (72.5%)²¹. A higher prevalence of poor sleep quality among them in comparison with MBBS students is perhaps due to the shorter time required for their degree completion (4 years) as compared to medical students (5 years) in the country. This means they get relatively less time to cover their courses. This study found that poor sleep affected females more than males. Nadeem A et al. and El Sahly RA et al. had similar findings^{15,17} while Attal BA et al. have contradicting results where males had poorer sleep quality¹⁹. Poorer quality of sleep among females can be explained by the hor-

monal changes in the menstrual cycle throughout the month. These hormones have been shown to affect the sleep regulatory mechanism, disrupting the females' circadian rhythm²².

Pre-clinical students showed more predictability of poor sleep (Table 3) as well as worse subjective sleep quality than the clinical. Similar results were obtained by Corrêa CdC et al. in Brazil¹⁸. These findings are likely the consequence of transitioning into a more stressful environment after they get admission into medical school. Study findings showed that the average time of sleep per day was 5.87 hours which is less than the recommended time²³. But sleeping less than the advised time does not necessarily bring adverse effects as the demand varies among individuals²⁴. It was noticed that bedtime phone users had a higher percentage of poor sleepers as compared to non-users (Table 4). Nowreen N et al. have affirmed in their study that excessive use of smartphones leads to poorer sleep quality²⁰. This effect has been proven to be the result of blue light emitted from these gadgets²⁵. However, we could not establish a temporal association between poor sleep and bedtime phone usage.

Familiarity with "sleep hygiene" was not associated with improved sleep quality ($p > 0.05$) as shown by Mazar D et al. in an interventional study

Table 4: Chi-square test showing association of included variables with sleep quality

Variables	Good sleepers (%)	Poor sleepers (%)	^b P
Year of study			
1st year	13 (26.0)	37 (74.0)	0.079
2nd year	20 (22.0)	71 (78.0)	
3rd year	27 (32.9)	55 (67.1)	
4th year	54 (37.5)	90 (62.5)	
5th year	8 (44.5)	10 (55.6)	
aSleep medication dosage			
No usage	121 (35.8)	217 (64.2)	<0.001
< 1times/week	0 (0.0)	16 (100.0)	
1-2 times/week	0 (0.0)	15 (100.0)	
≥ 3 times/week	1 (6.2)	15 (93.8)	
Self-perceived sleep quality			
Very good	70 (77.8)	20 (22.2)	<0.001
Fairly good	52 (27.1)	140 (72.9)	
Fairly bad	0 (0.0)	77 (100.0)	
Very bad	0 (0.0)	26 (100.0)	

Footnote: PSQI= Pittsburgh Sleep Quality Index; Good sleeper= PSQI score ≤ 5; Poor sleeper= PSQI score > 5; MBBS= Bachelor of Medicine and Bachelor of Surgery; BDS= Bachelor of Dental Surgery. a During the past month. bP significant at < 0.05

who proved that education about good sleep practices only improved knowledge and not the quality of sleep²⁶. This demonstrates that it takes more than mere awareness to improve one's sleep.

The importance of sleep for medical students cannot be doubted. Its deprivation not only just affects their academic performance¹⁰ but can lead to many health problems ranging from short-term such as emotional distress, mood disorders, and reduced quality of life, to long-term complications such as metabolic disorders, cardiovascular problems, and cancer²⁷.

One of the limitations of our study was that the convenience sampling technique was used making our data biased. This could make our results unable to reflect the whole population of medical and dental students. Another limitation was that participants were asked to answer the questions in the context of the past month. Hence there was a chance of recall bias. We did not ask about any alternative word participants might have heard instead of "sleep hygiene" which again could affect the responses to that particular question. Factors like overall mental health, food and nutrition, meditation/ prayers, daily exercise, substance use, exam seasonality and others which could potentially affect sleep of the students were not studied and would need further research in the future.

CONCLUSION

This study reveals that more than half of medical students were suffering from poor sleep which requires immediate attention. Their average sleep duration was lower than the recommended time suggesting sleep deprivation. Interventional studies are needed that focus on the improvement of sleep quality. Medical students should be targeted with programs with the goal of their sleep improvement and should have access to counselors if they need help.

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