

# Association between poor sleep hygiene practices, sleep deprivation, and their effects on medical students of Karachi: A cross-sectional study

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## ABSTRACT

**Objectives:** This study was conducted to investigate the poor sleep hygiene practices of medical students, causing sleep deprivation, and any negative effects on physical and cognitive health of the adult population in Karachi.

**Participant:** The participant for this study were the medical students enrolled in six medical colleges in Karachi during 2021-2022.

**Methods:** The data was collected from 200 medical students using questionnaire based survey. Data was analysed using SPSS version 20. t-test and Chi-square ( $\chi^2$ ) test was used for the best data analysis. P-value of <0.05 was considered statistically significant in case of comparative analysis.

**Results:** The majority students did not follow sleep hygiene protocols. Concerning the psychological and cognitive effects of poor sleep hygiene practices, more than 76% participants reported feeling sleep deprived, and experienced physical symptoms.

**Conclusion:** Our findings support the use of sleep-hygiene awareness as a prevention strategy to improve university students' sleep practices, preventing sleep deprivation.

**Keywords:** sleep hygiene, sleep deprivation, mental health, psychological health, physical health

## INTRODUCTION

The link between poor sleep hygiene practices, sleep deprivation with physical and mental health is an important area of study among medical students, as medical students are noted for poor sleep habits and short sleep durations. This is commonly seen due to lack of sleep hygiene practices, and sleep deprivation in medical students. Poor sleep quality, indicated by subjective sleep ratings, sleep duration, sleep difficulties, and daytime functioning, can lead to significantly greater psychosocial distresses in the lives of medical students [1]. Research has shown that sleep deprivation is directly related to poor cognitive function, grouchy mood, decreased memory, anxiety, low energy and decreased alertness [2]. Insufficient sleep also leads to a general slowing of response speed and increased variability in performance, attention, alertness and vigilance, however, there is much less agreement about the effects of sleep deprivation on many higher-level cognitive capacities, including perception, memory and executive functions [3]. With these findings so relevant, it is important that the medical students training to be doctors ensure that they avoid such lapses. Studies have suggested that good sleep hygiene depends on proper sleep practices, which, in turn, relate to overall sleep quality [4].

Good sleep hygiene practices include sleeping on a fixed time, avoiding caffeine and nicotine before bedtime, sleeping in a clean and comfortable clothing, no naps, a warm bath, a sleep diary, a regular and consistent day and night routine [5]. Poor sleepers have reported sleeping in excessively noisy bedrooms, uncomfortable night-time temperature, and activities that were exciting, emotional, or demanded high concentration near bedtime [6].

Sleep deprivation is sleeplessness, a condition of not having adequate duration. There have been numerous studies on the detrimental effects of sleep deprivation. It is important to differentiate between the terms insomnia and sleep deprivation. Although both chronic sleep deficiency and insomnia share decreased quantity and/or quality of sleep as well as impaired function, their difference lies on the ability to fall asleep. Sleep deprived individuals are able to fall asleep rapidly when allowed but those suffering from insomnia have difficulty falling asleep [7]. Chronic sleep deprivation has many debilitating consequences.

A chronic sleep-restricted state adversely affects the brain and cognitive function [8]. Neuroimaging evidence has found that the prefrontal cortex as a brain region that may be particularly affected by sleep loss, but confusingly, executive function tasks that mainly measure prefrontal functioning have

yielded inconsistent findings within the context of sleep deprivation. Whereas reasoning, decision making, and planning tasks are relatively unaffected by sleep loss, more creative, divergent, and innovative aspects of cognition do appear to be degraded by lack of sleep [8].

The manifestations of sleep deprivation are many. On a psychological level, studies have shown that lack of sleep can cause mood disturbances, depression, fatigue, lack of empathy, bitterness, difficulty concentrating, stress, burnout and anxiety [9]. In terms of physical health, medical students experience physical fatigue, aches, soreness, especially shoulder and neck pain, exhaustion and dizziness [10]. Unfortunately, many medical students are unaware of the serious and wide-ranged repercussions of inadequate sleep.

Among university students, one of the most common causes of daytime sleepiness is sleep deprivation; students get inadequate sleep because they go to bed late and wake up early [11]. Medical students often neglect their own sleep and health amidst the overwhelming academic pressures. Students with sleep disorders probably do not achieve optimal academic performance, and up to 27% of students may be at risk for at least one sleep disorder [12]. It was unfortunate to note that, across the board, many medical students were neglectful of their sleep hygiene. Students did not prioritise good sleeping habits [13].

However, this is a rather manageable issue. Good sleep patterns and proper sleep hygiene are a promising solution to avoiding these problems. Improved sleep hygiene, which is believed to be remarkably helpful, has been the focus of most educational programs on improving sleep. It is essential to educate medical students on it, considering its deleterious effects on physical and mental health of medical students [14].

## METHODS

The questionnaire constitutes a cross-sectional study for which the population was the medical students of Karachi. Study duration was six months. The approval was obtained from the head of institutes of all medical colleges before administration questionnaires. As part of the ethical consideration, written informed consent was obtained from the participants before research. As the names of participants were kept confidential and not included therefore reducing response bias to make this study more reliable. Before the study was conducted, the synopsis and questionnaire were approved by the review committee of Jinnah Sindh Medical University. After the approval of questionnaire, a pilot study was conducted where 20 questionnaire were distributed, and data was collected and analyzed and approved by the research supervisor. Only after the questionnaire was validated, it was distributed in different medical colleges.

Data collection was carried out using a structured questionnaire, inclusion criteria was medical students of Karachi, whereas the exclusion criteria was any non-medical students and any medical students not living in Karachi. The questionnaire included details about age, gender, year of study of the students, and the university they were enrolled in. Further, the questionnaire was divided into three core parts. The first part comprised of questions to assess whether sleep hygiene practices were practiced by the participant or not. The second part had questions whether the participant has felt

physical symptom due to lack of sleep. Lastly questions were asked if sleep deprivation had effects on mood and cognition.

As for the method of data collection, this cross-sectional questionnaire based was carried out in six medical colleges in Karachi. The sample size was determined using the formula for unknown population size. Sampling technique was non-probability purposive sampling was used to collect data from 200 university students. In order to grasp a conclusive result a confidence level of 95% with an error rate of 5% was selected. The calculated sample size was 385 but were not able to collect enough responses to match this number. Data collection was over six months, from July 2021 to December 2021.

For the statistical analysis, data was analyzed using SPSS version 20. Mean (M)+standard deviation (SD) will be calculated for continuous variables like age, duration of condition, frequency and percentages were calculated for categorical variables like gender, habits and factors associated etc. t-test was used to analyze any difference between the continuous variables like age etc. Chi-square ( $\chi^2$ ) test was used to analyze any difference between the categorical variables. ANOVA test was used to analyze any difference among more than two continuous variables. p-value of <0.05 was considered statistically significant in case of comparative analysis.

## RESULTS

In this survey 200 responses were recorded from the medical students of six different medical colleges in Karachi, the mean age of respondents is 20.1 years ( $\pm 2.5$ ). Each sleep hygiene variable was co-related with the quality of sleep, as shown in **Table 1**.

According to the data obtained, there was a strong correlation between poor sleep hygiene and lack of a proper sleep routine ( $p=0.003$ ), which shows a strong correlation between the two variables. Majority of the participants reported to being sleep deprived (76%) with sleep duration less than seven hours (54%),  $p=0.003$ , and reported day-time sleepiness (60%).

Many neighborhoods of the urban city suffer noise pollution, and a strong association of poor sleep hygiene was seen with neighborhood traffic ( $p=0.006$ ). The major complaint on mood was irritability (76%), with a Pearson's Chi-squared value for sleep deprivation and its effect on irritability was 88.96 ( $p=0.0004$ ). Excessive screen time also showed major correlation with poor sleep hygiene, ( $p=0.001$ ), among the medical students.

The major cognitive complaint associated with sleep deprivation and poor sleep hygiene was forgetfulness (60%), with a Pearson's Chi-square test value  $p=0.052$ ; and shortened concentration span (64%) of the individuals, a Pearson's Chi-squared test value for sleep deprivation and its effect on concentration ability was 59.09 ( $p=0.0001$ ). A strong correlation was seen between sleeplessness and poor analytical skills, Pearson's Chi-square test value 56.03,  $p=0.0003$ .

As for the association of physical health symptoms associated with sleep deprivation owing to poor sleep hygiene, the main co-relation was with headache (66.7%), followed by backache (32.5%) (**Table 2**).

Interestingly, there was a strong correlation between less sleep duration on the night before exam and better grade point average (GPA) (58%), Pearson's Chi-squared test value

**Table 1.** Correlation between sleep hygiene's variables & participants' qualitative measure of sleep quality

Sleep hygiene variable		1	2	3	4	5	p-value
Insufficient sleep duration	Yes	3	7	25	19	5	0.003
	No	3	5	14	8	2	
Sleep routine	Yes	5	17	45	19	4	0.001
	No	3	5	14	8	2	
Neighborhood traffic	Yes	1	6	8	12	0	0.006
	No	0	8	3	1	0	
Toddler/elderly caregiving	Yes	4	10	15	6	2	0.912
	No	3	6	11	7	2	
Family member works night shift	Yes	1	6	12	11	3	4.910
	No	13	44	68	35	7	
Parental supervision	Yes	5	18	3	17	5	2.751
	No	4	15	6	14	3	
Screen-time restriction	Yes	4	1	26	16	2	0.001
	No	1	16	11	3	4	
Late dinner	Yes	6	32	33	8	7	0.000
	No	8	18	47	38	3	
Family commitments	Yes	2	16	17	7	2	0.568
	No	5	14	18	12	3	

**Table 2.** Effects of sleep deprivation on mental & physical health

Effect on health	F (%)
<b>Mood and cognition</b>	
Depressed	112 (56)
Irritable	150 (75)
Forgetful	120 (60)
Distracted	124 (62)
Decreased concentration span	128 (64)
Decreased ability to deal with a challenging situation	76 (38)
<b>Physical health</b>	
Headache	110 (55)
Backache	54 (27)
Shoulder pain	44 (22)
Sore eyes	48 (24)
Fallen ill	98 (49)
Palpitation/tachycardia	50 (25)

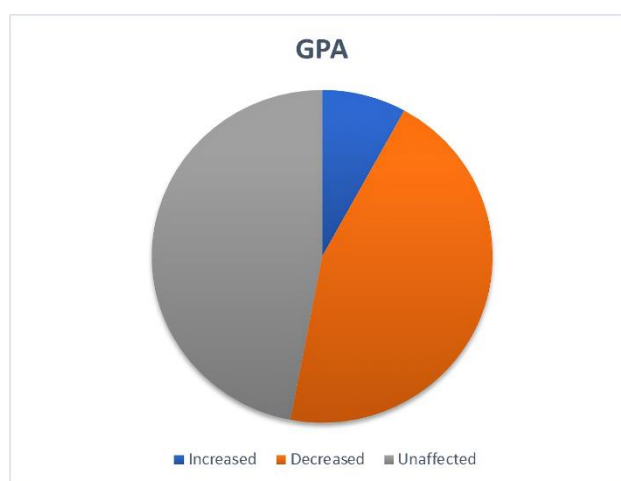
Note. F: Frequency

between sleep deprivation and its effect on GPA was 16.18 ( $p=0.0003$ ) (Figure 1).

## DISCUSSION

Our findings suggest that students had little awareness about sleep hygiene practices, not taking their sleep schedules and cycles seriously. Another study suggested that even if medical students did have an idea of the proper sleep hygiene practices, they did not employ those activities in real practice [4]. Lack of proper sleeping routines on a consistent sleeping and waking up time are the significant factors, which, if altered, can affect the sleep quality of the medical students. Some practical steps are supervision by parents, if the students are living in dormitories, friends can have a similar routine and encourage each other, having an alarm clock, eliminating screen time before bed, etc.

Our results suggest that in addition to poor sleep quality, unregulated screen time contributes to psychological problems, like anxiety, depression, and psychopathological symptoms, as was found in other surveys in China [15, 16]. More time spent in front of the screen not only takes away the precious sleeping hours, but also a toll on mental health of medical students. Poor quality of sleep and poor mental health

**Figure 1.** Effects of lack of sleep on GPA (Source: Authors' own elaboration)

are found to be strongly associated with each other. The topmost is feelings of depression and hopelessness, as seen in our study, and in other clinical trials where Chinese students, and teenagers were asked about the repercussions of sleep deprivation [1, 15]. In today's world, where mental health is such a huge topic of concern, this simple fix of better quality and appropriate quantity of sleep can immensely contribute to mentally healthy adolescents. Also, the physical health is also impacted. Our study suggested that many students experienced headaches and backaches when sleep deficient. Recently many researchers reported drastic effects on physical health related to overuse of communication devices [17, 18]. More specifically prolonged use of smartphones could directly affect and disturb the duration of sleep, causing a downward trend in quality and amount of sleep [18, 19].

A recently conducted survey by National Sleep Foundation found that Americans use light emitting devices within one hour of their bedtime have terrible outcomes related to sleep quality [20]. Light emitting devices actually delay the chosen bedtime and disrupt circadian cycle and alertness. These devices, by suppressing melatonin secretion, delay circadian clock, which again disrupt sleep-wake cycle, producing morning sleepiness [18, 21].

A study on medical students in Brazil and the sleep deprivation shows that 41.2% of the medical students exhibited daytime sleepiness [22]. A higher trend was noticed in our research study, where 60% of the medical students in Karachi reported to daytime sleepiness. These studies in Brazil also corroborated the correlation between sleepiness and depression or anxiety [22, 23]. Another study conducted in December 2016 in Vietnam for first year medical students, perceived stress and its association with the sleep quality. The sample size chosen was 150 students, 121 volunteered and the response rate remained 80.67%. Results showed that lack of recreational activity (30.6%) and frequency of examination (24.8%) were the main stressors due to which the sleep was negatively impacted. There was also limited parental guidance and support from the teachers' aspect, as also seen in another study. This aspect was also actively investigated in our study, where medical students in Karachi were left feeling irritable and anxious, left to navigate things on their own, and the first year medical students usually take the brunt of it [24, 25].

Reducing neighborhood noise levels is a particularly challenging issue for the study participants, especially in this metropolitan city. It was observed that it adversely affects sleep hygiene. However, it is a difficult issue to resolve. This can be done by wearing earplugs, closing windows or moving to a quieter neighborhood. It was also noted in another research study, where college dormitories were found to be very noisy and had a major negative impact on the sleep quality of the college students [4]. Our research showed that toddler activity does not impact sleep hygiene in adults. Toddlers in the house are usually taken care of by the elders or by nannies. Toddler activity does not adversely impact the sleep quality ( $p=0.912$ ).

In our study it was also found that late mealtimes were a strong factor in compromising the quality of sleep. Another study conducted in 2011 has indicated that late dinners negatively affect sleep quality. The study concluded that a high caloric meal within one hour of bedtime is associated with increase in sleep latency. In contrast, the study also found that high caloric meals four hours prior to bedtime were associated with decreased sleep latency [26, 27]. The study concluded that inadequate sleep patterns can have an effect on the metabolic system, which may lead to a variety of hormonal imbalances, leading to obesity, dyslipidemia, diabetes and insulin resistance [27].

Our research study concluded that majority of the students felt staying awake on an exam night improved their GPA. On the contrary, studies have indicated that sleep deprivation has detrimental effects on the academic performance and health [28, 29]. A study showed that students who scored excellent in college had longer sleeping hours. Another study in University of Washington showed that students with sufficient sleep have higher GPA than sleep deprived students [27, 29]. It was also explored the idea that sleep plays an essential role in learning and memory [30].

Some variables, which could be further investigated are how power outages affecting the metropolis affect sleep quality, since loadshedding is prevalent in many areas of Karachi. Smoking, diet, and daily exercise should also be included. It is only through such endeavors that researchers can develop interventions to treat and prevent sleep difficulties in students and others who are at high risk for sleep difficulties.

In terms of caffeine intake, a minor 28% of our study participants agreed that caffeine helped them feel energized

and alert on occasions when they felt sleep deprived. Caffeine intake and alcohol consumption have been known to interfere with sleep cycles [4].

This is supported by [31], which showed that college students were unaware of the impact of their sleep deprivation on their memory, retention and ability to complete cognitive tasks. Students were also unaware of the factors that deterred memory and retention [31]. So to sum up, sleep deprivation, at large, adversely impacted the academic capabilities and cognition, however, the students were either unaware of that, or thought late night assignment were beneficial to their academic performance.

## CONCLUSION

Our findings support the use of sleep-hygiene awareness as an intervention and prevention strategy to improve university students' sleep practices. Medical students need to be educated to build satisfactory sleep habits that will aid in their future practices as medical doctors. Since there is evidence for lack of implementation, methods of accountability need to be put in place. Because of the nature of the university lifestyle, sleep-hygiene instructions should include practical suggestions for changing habits. For example, reducing environmental noise might include talking with resident advisors, changing dormitory quiet hours, and encouraging students to use earplugs that are adapted for sleeping. It is vital to spread awareness about negatives caused by an imbalanced sleep routine, so that residents of metropolitan city, especially medical professionals, would be able to act against it.

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**Ethical statement:** Authors stated that the study was approved by Jinnah Sindh Medical University Ethical Review Board after taking into consideration; reference number for the approved study is JSMU/IRB/2021/505.

**Declaration of interest:** No conflict of interest is declared by authors.

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