

# Sleep patterns and predictors of disturbed sleep among medical students at Imam Mohammad Ibn Saud Islamic University in Riyadh, Saudi Arabia, in 2022

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Received: November 2022 Accepted: December 2022; Published: December 15, 2022.

Citation: Yasir Ibrahim Al-Senaidi et al. Sleep patterns and predictors of disturbed sleep among medical students at Imam Mohammad Ibn Saud Islamic University in Riyadh, Saudi Arabia, in 2022. World Family Medicine. December 2022 - January 2023; 21(1): 58-66 DOI: 10.5742/MEWFM.2023.95251500

## Abstract

**Background:** Sleep is a natural need and a biological necessity for human beings (5) and is significant for the maintenance of favorable physical, mental, and emotional wellbeing. Sleep deprivation may have serious health consequences, and it is becoming more common in both developing and developed societies ranging from 22% to 65% of the general population. University students reported to have two times more difficulty in sleep in comparison to the general population. Aim: Determine the sleep patterns and predictors of disturbed sleep among medical students at Imam Mohammad Ibn Saud Islamic University in Riyadh, Saudi Arabia.

**Methods:** A cross-sectional study was conducted at Imam Mohammad Ibn Saud Islamic University. A total of 273 medical students were invited to respond to the questionnaire about the association between sleep disturbance and academic performance, by use of demographic questions and the Pittsburgh Sleep Quality Index.

**Results:** In this study, 279 responses were collected in response to our questionnaire. Females represented 77.4% of total sample and 56.6% of the participants were aged between 20-22 years. 63.8% of the students had poor sleep quality. Females had a higher risk of poor sleep than men by 1.54 times where 66.2% of female had poor sleep compared with 55.6% of male students (P=0.123). We noticed

that younger participants were found to have a higher prevalence of poor quality sleep where 73.7% of 18-19 year olds had poor quality of sleep compared with 56.3% of those who were older than 25 years (RR:2.17, 95 % CI: 0.52:9.01). Moreover, we found that poor quality of sleep was slightly higher in those who did not take naps during the day (68.7% compared with 59.5%) with a higher risk of 1.5 times more however, this is not significant (P=0.109). Consuming coffee or caffeinated drinks did not affect the quality of sleep significantly (P=0.689) however, we found that the prevalence of poor quality of sleep increases with an increase in coffee consumption.

**Conclusion:** We found that almost two third of the medical students at Imam Mohammad Ibn Saud Islamic University in Saudi Arabia experienced poor quality sleep. Female, younger students, with low incomes, higher GPA, who consumed caffeinated drinks and did not take naps during the day were associated with a high prevalence of poor sleep.

**Key words:** sleep patterns and predictors, disturbed sleep, medical students, Saudi Arabia

## Background

Sleep is a natural need and a biological necessity for human beings [1], it is connected to the nocturnal period of the 24-hour time scale because of the intricate interaction or collaboration of two systems : a circadian timing system and a sleep homeostatic. The former advances alertness during the daytime and sleep around evening time. Conversely, the sleep homeostatic system is reliant upon the sleep wake history of the individual, with a drive for sleep (or sleep pressure) that develops during wakefulness [2]. Sleep is significant for the maintenance of healthy physical, mental, and emotional wellbeing. Furthermore sleep is critical for memory, learning, decision making and analyzing, and because of that sleep is considered important for the optimal activity of key mental capacities related to academic performance in advanced education [1].

Sleep deprivation may have serious health consequences, such as increased disease morbidity and mortality. It was posited that sleep deprivation may be associated with defects in the immune function and may be implicated in the pathogenesis of psychological problems and metabolic problems [3], and it is becoming more common in both developing and developed societies. The prevalence of sleep disorders in the general population has been calculated to range from 22% to 65% [4].

Many variables are responsible for any change in sleeping habits, including developmental changes that happen at puberty, which cause an adjustment in the circadian timing system [2]. The magnitude of the issue can be evaluated based on examinations that illustrate both lack of sleep and poor sleep quality are predominant in the college student population [1].

Based on a study which has been conducted in the United States [1], university students were reported to have two times more difficulty sleeping in comparison to the general population.

In a university environment, typically, students strive to achieve excellent grades in their particular courses. College students' sleep is frequently irregular in terms of duration and time [5].

Medical students are an example of a high stressed group who must undergo long and demanding academic years before coming physicians. Their focus on their studies means they may not consider sleep as a priority when faced with their academic demands. They may sleep less in order to have additional hours to study and to achieve high test scores [6]. As it is acknowledged that sufficient and quality sleep minimizes concentration difficulties [5] a lack of this and a prevalence of stress among medical students all around the world is an issue. It is characterized as the body's own mechanism of defense against pressure or unpleasant situations [6].

Many factors can result medical students being extremely stressed and include: extensive curricula and various academic requirements [6]. The extensive use of stimulants such as caffeine [7], physical, mental, and

environmental factors such as age, gender, job, lifestyle, emotional tension, and noise all influence sleep patterns and sleep problems [5]. Studies have discovered that students who lack regular sleep have unfortunate impacts on their assessments and were more depressed than their colleagues [6].

With this in mind, screening for sleep quality among medical students is critical to identify and manage a problem which may have an impact on the quality of patient care offered by future physicians [3].

In this study we aim to determine the sleep patterns and predictors of disturbed sleep among medical students at Imam Mohammad Ibn Saud Islamic University in Riyadh, Saudi Arabia.

## Methodology

### Study design and setting:

This cross-sectional study was conducted over 4 months at Imam Mohammad Ibn Saud Islamic University in Saudi Arabia.

### Study subjects and size:

Participants in this study were undergraduate college students from different specialties and educational levels. A sample of 273 participants, with a 95% confidence level and a 5% margin error. All participants had to meet the following criteria: Medical student at Imam University, Adults  $\geq 18$  years old, Saudi, female, and male. Those who did not match the criteria were excluded.

### Sampling technique, data collection method, the instrument used:

This study was conducted through an electronic self-administered questionnaire distributed randomly to determine the association between sleep disturbance and academic performance among medical students of Al-imam Mohammad bin Saud Islamic University. The authors used a scale adapted from multiple previous studies for the questionnaire, and a pilot study checked the validity and reliability of this questionnaire. The self-administered questionnaire contained three sections: a demographic section, a section about academic performance, and the Pittsburgh Sleep Quality Index.

### Statistical analysis plan:

The quantitative data was analyzed using the Statistical Package for Social Sciences version 23 (SPSS 23.0). Frequencies and percentages were used to present qualitative data. Statistical significance was defined as  $p < 0.05$ . The data did not need to be cleaned because all of the questions in the Google form were multiple choice and had to be answered in order to submit so there was no error in the database.

### Ethical consideration:

The study was approved by the Imam Mohammad Ibn Saud Islamic University's Institutional Review Board (IRB), and it was carried out according to the IRB's standards. The study goals were communicated to all participants, and their consent was obtained. All replies from this study are kept strictly secret, with full access granted only to the study's authors, and all participants' information is kept in strict confidence.

## Results

In this study, 279 responses were collected in response to our questionnaire. Females represented 77.4% of total sample while 56.6% of the participants reported ages between 20-22 years and 30.8% were between 23-25 years old. 96.8% of participants were single and 46.6% of them had a monthly family income of more than 20,000 SR. 25.1% of the students were in their third year of studies, 23.7 % were in their fourth year and 21.9 % in their first year. Furthermore, 47.3 % of the participants reported GPA of 3.5-4.5 while 41.2 % reported having GPA higher than 4.5 (Table 1)

**Table 1: Demographic factors of the participants (N=279)**

		Count	Column N %
Gender	Male	63	22.6%
	Female	216	77.4%
Age	18-19	19	6.8%
	20-22	158	56.6%
	23-25	86	30.8%
	> 25	16	5.7%
Marital status	Single	270	96.8%
	Married	9	3.2%
Monthly income	< 10,000 SR	72	25.8%
	10,000-20,000	77	27.6%
	> 20,000 SR	130	46.6%
Year	First year	61	21.9%
	Second year	51	18.3%
	Third year	70	25.1%
	Fourth year	66	23.7%
	Fifth year	31	11.1%
GPA	<2.5	5	1.8%
	2.5-3.49	27	9.7%
	3.5-4.5	132	47.3%
	>4.5	115	41.2%

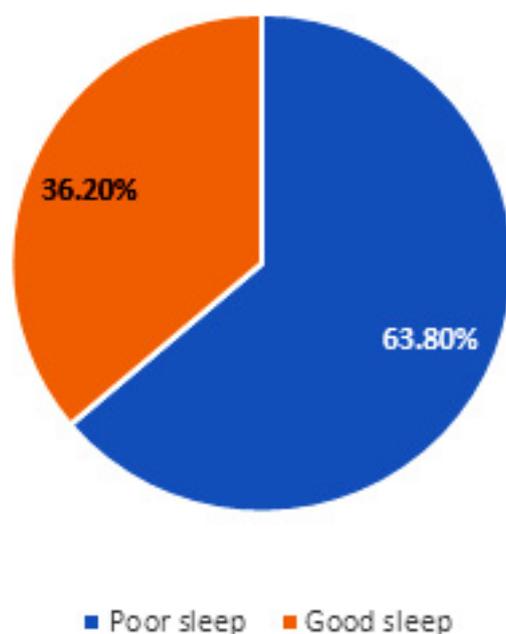
We found that 40.5% of the students reported spending 4-6 hours studying daily, 25.1% reported spending 2-4 hours daily and 23.3% reported spending more than 6 hours daily. 53.0% of the participants reported taking naps during the day. Among the participants, 14.3% reported not consuming caffeinated drinks while 36.6% reported having one cup a day. 78.1% of the participants recorded that they did not take regular exercise (Table 2).

Table 2: Daily lifestyle habits among students

		Count	Column N %
How many hours do you spend studying?	< 2 h	31	11.1%
	2-4	70	25.1%
	4-6	113	40.5%
	> 6	65	23.3%
Do you take naps during the day?	Yes	148	53.0%
	No	131	47.0%
Do you consume caffeinated drinks?	I do not drink coffee or caffeine	40	14.3%
	One cup a day	102	36.6%
	2-3 cups a day	100	35.8%
	More than 3 cups a day	37	13.3%
Do you exercise regularly?	Yes	61	21.9%
	No	218	78.1%

Using the developed questionnaire, we found that 63.8% of the students had poor sleep quality (Figure 1). In the questionnaire, only 14.7% of them evaluate their sleep as excellent and all participants reported sleeping more than 6 hours sleep daily. Moreover, 9.7% of participants reported taking medications to help them sleep. 66.7% of them reported that their activity had been affected by poor sleep and 40.5% reported suffering from sleep disorders such as bad dreams.

Figure 1: Distribution of the participants according to their sleep quality



In Table 3, we found that the gender of students had no significant effect on his/her sleep quality ( $P=0.123$ ) however, we noticed that females had a higher risk of poor sleep than men by 1.54 times (66.2 % of females compared to 55.6% of males). We also found the age of participants had no effect on their sleep quality ( $P=0.328$ ) however, we noticed that younger participants were found to have higher prevalence of poor quality of sleep where 73.7% of those 18-19 year olds had poor quality of sleep compared with 56.3% of those who were older than 25 years (RR:2.17, 95 % CI: 0.52:9.01). Moreover, we found that there is no significant difference considering quality sleep of students based on their marital status ( $P=0.856$ ), family monthly income ( $P=0.120$ ) nor their educational level ( $P=0.521$ ). However, we noticed that those with an income lower than 10,000 SR had a significantly higher level of poor quality of sleep than those with income of more than 20,000 SR by 1.92 times (RR:1.92, 95% CI:1.02:3.60,  $P=0.045$ ). Considering students' GPA, we found that sleep quality improved for those with a higher GPA (42.6% of those with GPA > 4.5 had good quality compared with 20.0% in those with GPA lower than 2.5) however, this is not significant (Table 3).

**Table 3: The relation between sleep quality and demographic factors of the participants**

	Sleep assessment							
	Poor sleep		Good sleep		P-value	OR	Low 95 % CI	High 95 % CI
	Count	Row N %	Count	Row N %				
Male	35	55.6%	28	44.4%	0.123	Control		
Female	143	66.2%	73	33.8%		1.54	0.88	2.77
18-19	14	73.7%	5	26.3%	0.328	2.17	0.52	9.01
20-22	95	60.1%	63	39.9%		1.17	0.42	3.31
23-25	60	69.8%	26	30.2%		1.79	0.60	5.33
> 25	9	56.3%	7	43.8%		Control		
Single	172	63.7%	98	36.3%	0.856	Control		
Married	6	66.7%	3	33.3%		1.13	0.27	4.65
< 10,000 SR	53	73.6%	19	26.4%	0.120	1.92	1.02	3.60
10,000-20,000	48	62.3%	29	37.7%		1.13	0.63	2.03
> 20,000 SR	77	59.2%	53	40.8%		Control		
First year	34	55.7%	27	44.3%	0.521	Control		
Second year	34	66.7%	17	33.3%		1.58	0.72	3.41
Third year	47	67.1%	23	32.9%		1.61	0.79	3.30
Fourth year	45	68.2%	21	31.8%		1.71	0.82	3.51
Fifth year	18	58.1%	13	41.9%		1.1	0.45	2.63
<2.5	4	80.0%	1	20.0%	0.283	Control		
2.5-3.49	18	66.7%	9	33.3%		0.5	0.04	5.15
3.5-4.5	90	68.2%	42	31.8%		0.5	0.05	4.94
>4.5	66	57.4%	49	42.6%		0.33	0.03	3.1

There is no significant correlation between quality of sleep and duration of studying ( $P=0.885$ ) however, we found that those who study for more than 6 hours and those with less than 2 hours reported a higher prevalence of poor quality sleep. Moreover, we found that the incidence of poor quality sleep was slightly higher in those who did not take naps during the day (68.7% compared with 59.5%) with a higher risk of 1.5 times however, this is not significant ( $P=0.109$ ). Consuming coffee or caffeinated drinks did not affect the quality of sleep significantly ( $P=0.689$ ) however, we found that the prevalence of poor quality sleep increases with an increase in coffee consumption. Moreover, 64.7% of those who reported not exercising regularly showed poor quality of sleep compared with 60.7% of those who exercised with no significant difference ( $P=0.563$ ) (Table 4).

**Table 4: The relation between daily habits and sleep quality**

		Sleep assessment							
		Poor sleep		Good sleep		P-value	OR	Low 95 % CI	High 95 % CI
		Count	N %	Count	N %				
How many hours do you spend studying?	< 2 h	20	64.5%	11	35.5%	0.885	Control		
	2-4	43	61.4%	27	38.6%		0.87	0.36	2.11
	4-6	71	62.8%	42	37.2%		0.92	0.41	2.12
	> 6	44	67.7%	21	32.3%		1.15	0.46	2.82
Do you take naps during the day?	Yes	88	59.5%	60	40.5%	0.109	Control		
	No	90	68.7%	41	31.3%		1.5	0.91	2.45
Do you consume caffeinated drinks?	I do not drink coffee or caffeine	23	57.5%	17	42.5%	0.689	Control		
	One cup a day	64	62.7%	38	37.3%		1.24	0.59	2.62
	2-3 cups a day	65	65.0%	35	35.0%		1.4	0.64	2.90
	More than 3 cups a day	26	70.3%	11	29.7%		1.7	0.68	4.48
Do you exercise regularly?	Yes	37	60.7%	24	39.3%	0.563	Control		
	No	141	64.7%	77	35.3%		1.2	0.66	2.16

## Discussion

This study aimed to assess the prevalence of poor quality of sleep among medical students at the Imam Mohammad Ibn Saud Islamic University in Saudi Arabia. The results of this study provided evidence of a high and alarming prevalence of poor sleep quality (63.8%). Many previous studies showed a different prevalence of poor sleep among medical and non-medical students. Our results was in agreement with some of the results of previous study including a study conducted by Siddiqui A et al., showed a prevalence of poor quality of sleep among almost three-quarters of medical students at King Khalid University, Saudi Arabia in the study group [1]. Moreover, other studies confirmed our results including the study of Lund H et al., who reported a prevalence of poor sleep of over 60% [8], and the study of Yassin A et al., who found that at least two thirds of the medical students in Jordan may have poor sleep [9]. However, our results are lower than reported in some previous studies including the study of Ibrahim NK et al., conducted among medical students at King Abdulaziz university, Saudi Arabia, where the authors reported a prevalence of 70.4 % [3]. Another study conducted by Almojali A et al, of medical students in King Saud bin Abdulaziz University, Riyadh region, Saudi Arabia, reported a prevalence of poor sleep of 76 % [6]. In addition, the study by Goweda R et al. showed that the prevalence of poor sleep among medical students at Umm Al-Qura University, Saudi Arabia was found to be higher than two thirds of the sample (73.8 %) [10]. Our results were higher than other studies including the study of Cheng S et al., of university students showing that 54.7% of the students had poor sleep [11], the study by Salama A which was conducted among medical students at Menoufia University, Egypt, which reported a prevalence of poor sleep of 58.5% [12]. These are in addition to other studies that were conducted in countries including Hong Kong (57.5%) [13], Lithuania (59.4%) [14], China (19%) [15] and Brazil (28.2%) [16] using a PSQI questionnaire. HLs discrepancy between studies in the prevalence of sleep quality may be due to the difference in sample sizes, race, target population and when the study was conducted as all these factors could affect the results of the study. Nowadays, there is a marked increase in the use of social media and online education during the 'night' hours because of the COVID-19 pandemic which may increase the risk of poor quality sleep among the participants as found in our study. Moreover, some previous studies had compared the prevalence of poor quality of sleep between medical and non-medical students showing that medical students had a higher level of poor sleep quality compared with other students [14,17]. This difference between medical and non-medical students could be due to a heavier academic load and their different lifestyles [17]. According to a previous study, medical students are one of the subgroups of the general population with a higher risk of poor sleep because of heavy clinical duties, long duration of study, challenging workplaces and different lifestyles [18]. These higher rates of poor sleep among medical students which were reported in studies conducted in different countries highlights the need to address with the stresses that face

medical students. It is possible these stresses could be improved through counselling and regular education to help medical students moderate their behaviours and lifestyles.

In our study, we found that females had a higher risk of poor sleep than men by 1.54 times however, this difference is not significant. This is similar to the results of the previous study by Almojali et al [6]. Many previous studies showed that the prevalence of poor sleep was significantly higher among female students than males [19–23]. The cause of this difference between the two genders unclear. However, it could be related to a higher prevalence of psychological problems such as stress and depression which are reported among females in higher education levels as these can be related to sleep disturbance [24]. However, a previous study conducted in India showed that males had a higher prevalence of poor sleep quality compared to females. This could be due to the high prevalence of addiction among males in this study which could increase the daytime sleepiness and poor quality of sleep at night [25].

In our study we found that younger participants had a higher prevalence of poor quality of sleep than older participants however, this is not significant. This result is in agreement with previous studies including the study of Brick et al from California University, USA [26], the results of a recent study in Egypt [23] and the study of Ibrahim NK et al. [3]. All these studies showed that there is negative association between age and poor quality sleep. This difference could be attributed to the high number of lectures and other study requirements during the early years of colleges. Young participants may not have adequately adapted to this increased work load compared to that in their secondary schools. Additionally, the anxiety and the pressure to pass the first years of medical school may play a significant role impacting the quality of sleep among those students [27].

Considering students' academic performance, we found that sleep quality improved in those with higher GPA however, this is not significant. This result is in disagreement with the results of previous study including the study of Bahammam et al., in Riyadh, Saudi Arabia [28] and the study of Ibrahim NK [3] which showed that better achievers (GPA > 4.5) had poorer sleep quality when compared with others.

The consumption of coffee or caffeinated drinks did not affect the quality of sleep significantly ( $P=0.689$ ) however, we found that the prevalence of poor quality of sleep increased with an increase in coffee consumption. This result agrees with the results of another study conducted by Sanchez et al. [29] among students from a Peruvian College (Peru). Moreover, in our study, those who take naps during the days had slightly better quality of sleep with significant difference which is similar to the results of Ibrahim NK [3]. In our study exercise was not a significant factor affecting the sleep quality which is similar to results of previous studies [5,8].

This study had some limitations including the dependence on self-reported questionnaires which may lead to some personal bias. Moreover, the questionnaire was distributed online which may have caused a bias towards those who preferred using social media as this was associated with a high prevalence of poor sleep patterns. Finally, this study required respondents to recall events of the previous week, which may have led to some recall bias.

In conclusion, we found that almost two thirds of the medical students at Imam Mohammad Ibn Saud Islamic University in Saudi Arabia had poor quality of sleep. Female, younger students, with low incomes, higher GPA, who consumed caffeinated drinks and did not take naps during the day were associated with a high prevalence of poor sleep.

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