Original Article

Sleep quality and mental health among medical students in Imphal, Manipur: A cross-sectional study

Jalina Laishram, Sandra Fernandez, Pangambam A. Devi, Mani R. Bhowmick, Roshnee Heigrujam, Hanjabam S. Devi

Department of Community Medicine, Regional Institute of Medical Sciences, Imphal, Manipur, India

Abstract

Background: Sleep and mental health are deeply interlinked, with poor sleep quality, a common issue among medical students, having a profound impact on their mental well-being. **Methods:** A cross-sectional study was conducted among medical students in a tertiary care hospital in Imphal, Manipur. Data were collected using a self-administered questionnaire consisting of the Pittsburgh Sleep Quality Index (PSQI) and Depression Anxiety Stress Scale (DASS-21). Descriptive statistics, Chi-square test, and Pearson correlation test were applied, and $P < 0.05$ was considered statistically significant. **Results:** A total of 425 respondents took part in the study, including 268 undergraduate and 157 postgraduate students. Most participants, 236 (55.5%) had poor sleep quality. Among the participants, 168 (39.5%) had depression, 167 (39.3%) had anxiety, and 95 (22.4%) had stress. Poor sleep quality was significantly associated with academic year among undergraduate students ($P = 0.005$), increased total screentime per day ($P = 0.024$), and increased screentime before sleep ($P = 0.007$). Depression, anxiety, and stress were significantly associated with younger age ($P = 0.001$), the undergraduate course being pursued ($P = 0.001$, 0.003, and 0.001), and increased screen time before sleep ($P = 0.021$, 0.046, and 0.039). Depression, anxiety and stress scores had a significant positive correlation with the global PSQI score. **Conclusion:** More than half of the participants experienced poor sleep quality, with four out of ten experiencing depression or anxiety, and two out of ten experiencing stress. Hence, medical institutes must implement sleep hygiene education and screen time reduction initiatives to enhance students' sleep quality and overall well-being.

Keywords: DASS-21, medical students, mental health, PSQI, sleep quality

Introduction

Sleep is a physiological function that is vital to life. The quality is closely related to both physical and mental health. Mental health is a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. A person's lifetime risk of stress, anxiety, depression, and mental disorders may be increased if they report poor sleep quality.[1,2] The quality of sleep can be defined by both quantitative and qualitative components of sleep. The quantitative component includes the duration of sleep, whereas the qualitative component is a subjective measure of depth and feeling of restfulness upon awakening.[3] Four items are generally assessed to measure sleep quality: sleep latency, sleep waking, wakefulness, and sleep efficiency.

Sleep latency

This measures how long it takes you to fall asleep. Drifting off within thirty minutes or less after you go to bed suggests that the quality of your sleep is good.

Sleep waking

This measures how often you wake up during the night. Frequent wakefulness at night can disrupt your sleep cycle and reduce your

Address for correspondence: Dr Jalina Laishram, Department of Community Medicine, Regional Institute of Medical Sciences, Imphal - 795 004, Manipur, India.
E-mail: jalinalaishram@yahoo.in

Received: 05-07-2024 **Revised:** 24-08-2024
Accepted: 29-08-2024 **Published:** 13-01-2025

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_1160_24

How to cite this article: Laishram J, Fernandez S, Devi PA, Bhowmick MR, Heigrujam R, Devi HS. Sleep quality and mental health among medical students in Imphal, Manipur: A cross-sectional study. J Family Med Prim Care 2025;14:276-82.

sleep quality. Waking up once or not at all suggests that your sleep quality is good.

Wakefulness

This measurement refers to how many minutes you spend awake during the night after you first go to sleep. People with good sleep quality have twenty minutes or less of wakefulness during the night.

Sleep efficiency

The amount of time you spend sleeping while in bed is known as sleep efficiency. This measurement should ideally be 85% or more for optimal health benefits.[4]

Adequate sleep of high quality and optimum duration facilitates memory processing and learning. It helps to maintain concentration, executive cognitive functions, sensorimotor integration, and memory processing.[5] Sleep and mental health are, therefore, global public health challenges in their own right, with each having substantive impacts on both individuals and society. However, poor sleep quality and mental health difficulties are also intrinsically linked. It was previously assumed that mental health difficulties led to poor sleep; however, the reverse may also be true, such that poor sleep contributes to the onset, recurrence, and maintenance of mental health difficulties.

Medical students are a group that has a high risk for poor sleep quality because of long study periods, academic overload, frequent exams, and demanding clinical duties. They also have to accept the change in their lifestyle, such as staying away from their family. The above-mentioned factors put them at a greater risk of poor sleep quality and, in turn, affect their mental health.[6]

Screening for poor sleep quality and mental health among medical students facilitates early detection of potential mental health issues, enabling timely intervention. It also underscores the importance of preventive healthcare, where physicians can encourage better sleep hygiene to mitigate mental health problems in the community. Furthermore, it will ensure that our future primary care providers maintain their overall well-being. Therefore, this study assessed sleep quality and mental health among medical students in Imphal, Manipur, and determined the association between background characteristics and sleep quality and mental health.

Materials and Methods

A cross-sectional study was conducted from February to March 2024 among medical students, which included those pursuing MBBS and MD/MS courses in a tertiary care hospital in Imphal, Manipur. The annual intake of this institute was 125 MBBS students and 150 MD/MS students. There were 506 undergraduate MBBS students and 449 postgraduate students (MD/MS) during the study period. Those consuming any medications for psychiatric illness and those who cannot be contacted after two attempts were excluded.

Sample size and sampling

Taking a prevalence of 58% of poor sleep quality (from a study conducted by Lohitashwa R *et al.*[7]) and an absolute allowable error of 5%, the calculated sample size was 374 with a 95% confidence level and 80% power. Taking a non-response rate of 10%, the final sample size was 411. Convenience sampling was used to select the participants.

Study tools

A pre-tested structured questionnaire was used consisting of three sections: background characteristics, assessment of sleep quality by Pittsburgh Sleep Quality Index (PSQI),[3] and mental health by Depression Anxiety Stress Scale 21 (DASS-21).[8] PSQI and DASS-21 were used without any modifications. The questionnaire was pre-tested among forty participants from the study population, after which no revisions were made, and these participants were excluded from the final analysis.

PSQI is a self-rated questionnaire with an internal reliability of 0.83 that helps assess sleep quality for the past month.[3] It has 19 self-rated questions and five other questions to be answered by the partner (bed or room). However, the scale's last five questions (rated by a bed partner or roommate) do not contribute to the PSQI scoring, so these were not included in the global score. The 19 questions assess various factors related to sleep quality. The questions are again grouped into seven component scores and all are reflected equally on a 0 – 3 scale. These components are sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction. Questions 1–4 were based on estimations for the past, and they included: bedtime, number of minutes to fall asleep, getting up time, and hours of sleep per night. Questions 5 to 10 were based on a score ranging from 0 to 3 points (0 - Not during the past month, 1 - Less than once a week, 2 - Once or twice a week, 3 - Three or more times a week). The seven component scores were added to yield a global PSQI score ranging from 0 to 21. A global score of more than or equal to 5 indicates poor sleep quality in the person for the last 1 month.

DASS-21 is a self-reporting inventory with an internal reliability of 0.88 for depression, 0.82 for anxiety, and 0.90 for stress.[9] It consists of 21 items to assess the individual's emotional state over one week. It has three subscales of anxiety, depression, and stress, with each subscale having seven items. The cut-off scores for the subscales are below 10 for depression, below 8 for anxiety, and below 15 for stress. The severity of the subscales is further qualified as being mild (depression: 10–13, anxiety: 8–9, stress: 15–18) and moderate (depression: 14–20, anxiety: 10–14, stress: 19–25), severe (depression: 21–27, anxiety: 15–19, stress: 26–33) and extreme (depression: ≥28, anxiety: ≥20, stress: ≥34).

Data collection

Data were collected using a self-administered questionnaire after briefing the purpose of the study. For undergraduate students,

questionnaires were distributed in their classes, whereas for postgraduate students, questionnaires were distributed in their respective departments/wards. Filled questionnaires were taken back after twenty minutes.

Statistical analysis

After checking for completeness and consistency, data were analyzed using IBM SPSS 26 for Windows (IBM, Armonk, New York, USA). Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to summarize data. Univariate analysis was carried out using the Chi-square test. Correlation between sleep quality and mental health was conducted using the Pearson correlation test. $P < 0.05$ was considered to be statistically significant.

Ethical issues

Ethical approval was obtained from the Research Ethics Board, RIMS, Imphal (A/REB/Prop (SP) 213/189/05/2024). Informed verbal consent and assent were obtained from the study participants, and the participation was completely voluntary. A unique code number was assigned, and no names were taken to maintain confidentiality.

Results

A total of 500 questionnaires were distributed proportionate to population size. We got responses from 425 participants, which included 268 undergraduate and 157 postgraduate students. The response rate was 85%. All the non-responders were postgraduate students belonging to clinical departments. The participants' ages ranged from 17 to 44 years, with a mean age of 24.63 ± 5.52 years. Of the participants, 217 (51.1%) were female. Among undergraduate students, 116 (43.3%) were phase 1 students and among postgraduates, 66 (41.7%), were 1st year students. The majority, 407 (95.8%) participants, used gadgets before going to sleep, and 190 (44.7%) spent more than five and a half hours each day using screens. Overall, 76 (18.8%) participants had screen time exceeding 60 minutes before sleep [Table 1].

Most of the participants, 236 [55.5% (50.6%–60.2%)], experienced poor sleep quality [Figure 1]. Among the participants, 168 [39.5% (34.8%–44.5%)] had depression, 167 [39.3% (34.4%–44.2%)] had anxiety, and 95 [22.4% (18.4%–26.6%)] had stress [Figure 2].

Sleep quality was significantly associated with the academic year of undergraduate students ($P = 0.016$), increased total screentime per day ($P = 0.024$), and increased screentime before sleep ($P = 0.007$) [Table 2]. There was a significant association between the academic year of undergraduate students ($P = 0.001$) and the use of gadgets before sleep ($P = 0.043$) with depression. Depression, anxiety, and stress were significantly associated with age ($P = 0.001$, 0.001, 0.001), the undergraduate course being pursued ($P = 0.001$, 0.003, 0.001), and screentime before sleep ($P = 0.021$, 0.046, 0.039) [Table 3].

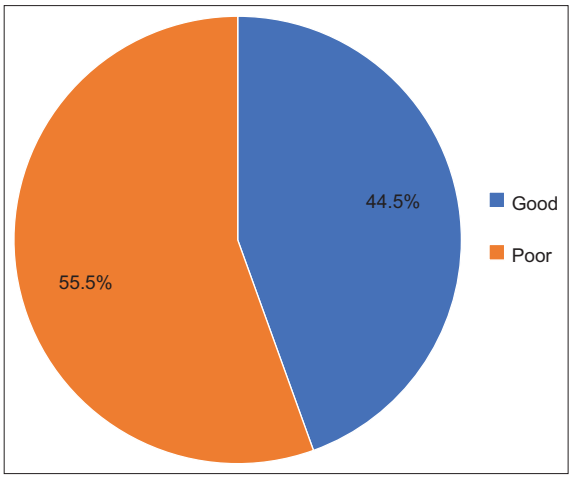

Figure 1: Distribution of participants by sleep quality (N = 425)

Table 1: Background characteristics (*n*=425)

Background characteristics	*n* (%)
Age (in completed years)	
17-20	113 (26.6)
21-22	102 (24.0)
23-28	110 (25.9)
>28	100 (23.5)
Gender	
Male	208 (48.9)
Female	217 (51.1)
Course pursued	
Undergraduate	268 (63.1)
Postgraduate	157 (36.9)
Academic year of undergraduates (*n*=268)	
Phase 1	116 (43.3)
Phase 2	78 (29.1)
Phase 3 part I	46 (17.2)
Phase 3 part II	28 (10.4)
Academic year of postgraduates (*n*=157)	
1st year	66 (41.7)
2nd year	57 (36.1)
3rd year	35 (22.2)
Screentime (hours/day)	
≥5.30	235 (55.3)
>5.30	190 (44.7)
Use of gadgets* before sleep	
Yes	407 (95.8)
No	18 (4.2)
Screentime before sleep in minutes (*n*=407)	
≤30	198 (48.6)
31-40	12 (2.9)
41-60	121 (29.7)
>60	76 (18.8)

*Mobile phone, tablet, laptop, desktop, television

As the age of the participants increased, the level of depression significantly decreased (Chi-square for trend: $P = 0.001$). On post-hoc analysis, depression was significantly more in the 17-20 years of age group ($P = 0.001$) and significantly less in more than 28 years ($P = 0.001$). Also, as participants' age increased, the likelihood of experiencing no stress significantly

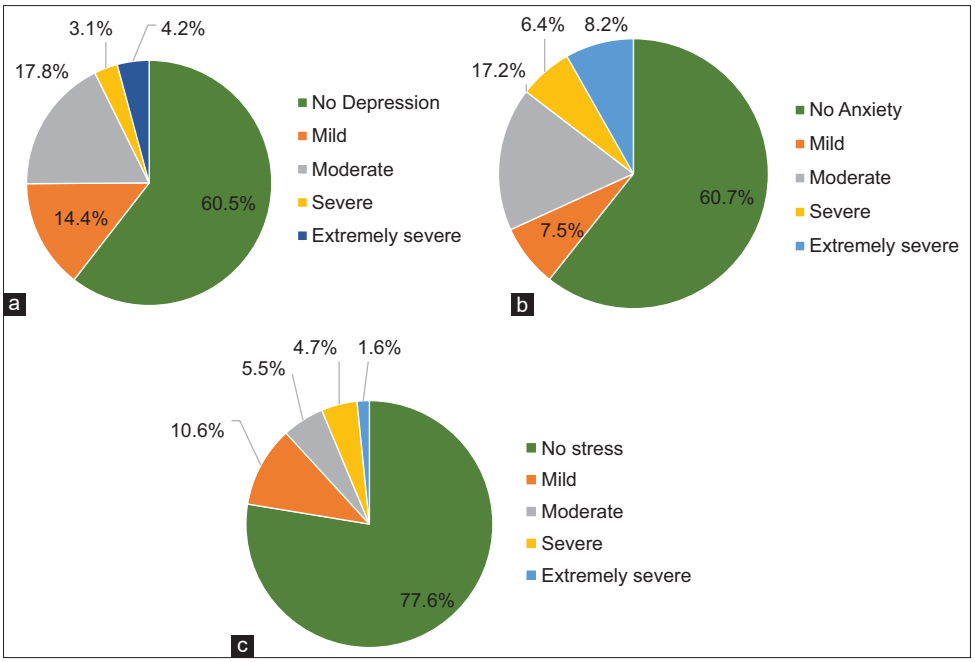

Figure 2: (a-c) Distribution of participants by level of depression, anxiety and stress (N = 425)

Table 2: Association between background characteristics and sleep quality (*n*=425)

Variable	SLEEP QUALITY		*P*
	Good, *n* (%)	Poor, *n* (%)	
Age category (in completed years)			
17-20	45 (39.8)	68 (60.2)	0.706
21-22	47 (46.1)	55 (53.9)	
23-28	50 (45.5)	60 (54.5)	
>28	47 (47.0)	53 (53.0)	
Gender			
Male	93 (44.7)	115 (55.3)	0.922
Female	96 (44.2)	121 (55.8)	
Course pursued			
Undergraduate	119 (44.4)	149 (55.6)	0.971
Postgraduate	70 (44.6)	87 (55.4)	
Academic year of undergraduates (*n*=268)			
Phase 1	39 (33.6)	77 (66.4)	0.016
Phase 2	42 (53.8)	36 (46.2)	
Phase 3 part I	22 (47.8)	24 (52.2)	
Phase 3 part II	16 (57.1)	12 (42.9)	
Academic year of postgraduates (*n*=157)			
1st year	27 (40.9)	39 (59.1)	0.685
2nd year	27 (47.4)	30 (52.6)	
3rd year	17 (48.6)	18 (51.4)	
Screentime (hours/day)			
≤5.30	116 (49.4)	119 (50.6)	0.024
>5.30	73 (38.4)	117 (61.6)	
Use of gadgets* before sleep			
Yes	180 (44.1)	228 (55.9)	0.473
No	9 (52.9)	8 (47.1)	
Screentime before sleep in minutes (*n*=407)			
≤30	102 (51.5)	96 (48.5)	0.007 (0.001†)
31-40	6 (50.0)	6 (50.0)	
41-60	50 (41.3)	71 (58.7)	
>60	22 (28.9)	54 (71.1)	

*Mobile phone, tablet, laptop, desktop, television. †Chi square for trend

Table 3: Association between background characteristics and depression, anxiety and stress (*n*=425)

Variable	DEPRESSION		*P*	ANXIETY		*P*	STRESS		*P*
	Present, *n* (%)	Absent, *n* (%)		Present, *n* (%)	Absent, *n* (%)		Present, *n* (%)	Absent, *n* (%)	
Age category (in completed years)									
17-20	66 (58.4)	47 (41.6)	0.001 (0.001†)	59 (52.2)	54 (47.8)	0.001	42 (37.2)	71 (62.8)	0.001 (0.001†)
21-22	43 (42.2)	59 (57.8)		39 (38.2)	63 (61.8)		21 (20.6)	81 (79.4)	
23-28	35 (35.5)	71 (64.5)		45 (40.9)	65 (59.1)		23 (20.9)	87 (79.1)	
>28	20 (20.0)	80 (80.0)		24 (24.0)	76 (76.0)		9 (9.0)	91 (91.0)	
Gender									
Male	80 (38.5)	128 (61.5)	0.659	79 (38.0)	129 (62.0)	0.587	44 (21.2)	164 (78.8)	0.561
Female	88 (40.6)	129 (59.4)		88 (40.6)	129 (59.4)		51 (23.5)	166 (76.5)	
Course pursued									
Undergraduate	129 (48.1)	139 (51.9)	0.001	120 (44.8)	148 (55.2)	0.003	75 (28.0)	193 (72.0)	0.001
Postgraduate	39 (24.8)	118 (75.2)		47 (29.9)	110 (70.1)		20 (12.7)	137 (87.3)	
Academic year of undergraduates (*n*=268)									
Phase 1	72 (62.1)	44 (37.9)	0.001	60 (51.7)	56 (48.3)	0.165	41 (35.3)	75 (64.7)	0.085
Phase 2	30 (38.5)	48 (61.5)		34 (43.6)	44 (56.4)		19 (24.4)	59 (75.6)	
Phase 3 part I	16 (34.8)	30 (65.2)		16 (34.8)	30 (65.2)		11 (23.9)	35 (76.1)	
Phase 3 part II	11 (39.3)	17 (60.7)		10 (35.7)	18 (64.3)		4 (14.3)	24 (85.7)	
Academic year of postgraduates (*n*=157)									
1st year	18 (27.3)	48 (72.7)	0.849	18 (27.3)	48 (72.7)	0.092	10 (15.2)	56 (84.8)	0.369
2nd year	13 (22.8)	44 (77.2)		23 (40.4)	34 (59.6)		8 (14.0)	49 (86.0)	
3rd year	9 (25.7)	26 (74.3)		7 (20.0)	28 (80.0)		2 (5.7)	33 (94.3)	
Screentime (hours/day)									
≤5.30	86 (36.6)	149 (63.4)	0.169	83 (35.3)	152 (64.7)	0.062	48 (20.4)	187 (79.6)	0.289
>5.30	82 (43.2)	108 (56.8)		84 (44.2)	106 (55.8)		47 (24.7)	143 (75.3)	
Use of gadgets* before sleep									
Yes	165 (40.5)	242 (59.5)	0.043	160 (39.3)	247 (60.7)	0.971	92 (22.6)	315 (77.4)	0.554
No	3 (16.7)	15 (83.3)		7 (38.9)	11 (61.1)		3 (16.7)	15 (83.3)	
Screentime before sleep in minutes (*n*=407)									
≤30	66 (33.3)	132 (66.7)	0.021 (0.001†)	64 (32.3)	134 (67.7)	0.046	33 (16.7)	165 (83.3)	0.039
31-40	5 (41.7)	7 (58.3)		6 (50.0)	6 (50.0)		4 (33.3)	8 (66.7)	
41-60	54 (44.6)	67 (55.4)		55 (45.5)	66 (54.5)		32 (26.4)	89 (73.6)	
>60	40 (52.6)	36 (47.4)		35 (46.1)	41 (53.9)		23 (30.3)	53 (69.7)	

*Mobile phone, tablet, laptop, desktop, television †Chi square for trend

increased (Chi-square for trend: $P = 0.001$). On *post hoc* analysis, no stress was significantly less in 17-20 years of age group ($P = 0.001$) and significantly more in more than 28 years ($P = 0.001$) [Table 3].

As the screen time before sleep increased, the likelihood of having good sleep quality significantly decreased (Chi-square for trend: $P = 0.001$) [Table 3]. On post-hoc analysis, good sleep quality was significantly more among those with a screentime of ≤30 min before sleep ($P = 0.003$) and significantly less among those with a screentime of >60 min before sleep ($P = 0.002$).

As the screen time before sleep increased, the likelihood of depression significantly increased (Chi-square for trend: $P = 0.001$). On post-hoc analysis, depression was significantly less among those with a screen time of ≤30 min before sleep ($P = 0.004$) and significantly more among those with a screen time of >60 min before sleep ($P = 0.011$) [Table 3].

Depression ($r = 0.389$, $P = 0.001$), anxiety ($r = 0.372$, $P = 0.001$) and stress ($r = 0.392$, $P = 0.001$) scores had a significant positive correlation with global PSQI score [Table 4].

Discussion

Medical students, who are future primary care providers are susceptible to high levels of stress, burnout, and sleep disturbances. By understanding and intervening in this complex dynamic, we can improve mental health outcomes and enhance their quality of life, which in turn can provide quality healthcare to the community.

This study revealed that 55.5% of the participants had poor sleep quality, which is comparable (58%) to the findings of a study conducted by Lohitashwa R *et al.*[7] in Karnataka. This similarity might stem from shared cultural norms and academic expectations among the study populations. But, in a study conducted by Abdussalam *et al.*,[10] in another part of India (Lucknow), the prevalence of poor sleep quality was lower (64%). This difference may be because their study focused solely on first-year medical students, who are more vulnerable to sleep disturbances due to the challenges of their initial year in medical institute. Moreover, the prevalence was also lower than in studies conducted outside India: (63.2%) by Al-Khani AM

Table 4: Correlation between Global PSQI score and DASS-21 (*n*=425)

Variables	Global PSQI	
DASS 21	Rho*	*P*
Depression score	0.389	0.001
Anxiety score	0.372	0.001
Stress score	0.392	0.001

*Pearson correlation co-efficient

et al.,[11] (76.4%) by Safhi MA *et al.*,[12] and (76%) by Almojali AI *et al.*[13] This suggests that regional differences in lifestyle patterns, societal attitude towards sleep hygiene and varying academic pressures might influence sleep quality.

Depression, anxiety, and stress rates in the study population were 39.5%, 39.3%, and 22.4%, respectively. Depression rates were comparable to a study conducted by Kumar SD *et al.*[14] in Karnataka (37.3%) using the DASS-21 questionnaire. Whereas the proportion of depression, anxiety, and stress in this study is comparatively lower than those reported by studies conducted outside India (Al-Khani AM *et al.*[11] and Dogan I and Dogan[15]). Reason for this disparity could be because of differences in academic pressures, coping styles, and access to mental health support among medical students in India compared to those in other countries. Also, differences in cultural attitudes towards mental health may influence the reporting and prevalence of these conditions.

The study found significant associations between increased screen time and poor sleep quality ($P = 0.024$ for total screen time, $P = 0.007$ for screen time before sleep), which is similar to findings reported by Gradisar *et al.*[16] (2013), which highlights the negative impact of excessive screen use, especially close to bedtime, on sleep outcomes. Also, the association between screen time before sleep and mental health issues such as depression ($P = 0.021$), anxiety ($P = 0.046$) and stress ($P = 0.039$) observed in our study is consistent with the findings of Eleftheriou A *et al.*[17] and Munezawa *et al.*,[18] found similar associations in their studies. This suggests that reducing screen time before bed could be an important intervention to improve both sleep quality and mental health among medical students.

We found that the academic year (first professional year) significantly affected sleep quality ($P = 0.016$) and depression levels ($P = 0.001$) among undergraduates, which may be due to difficulty in coping with the new environment like staying away from home, escalation in academic volume, adjusting with peers, etc.

Our study showed that younger age is significantly associated with higher levels of depression ($P = 0.001$), anxiety ($P = 0.001$), and stress ($P = 0.001$). This may be because of the adjustment challenges and academic pressures faced by younger students in demanding medical curricula.

The significant association between higher levels of depression, anxiety, and stress among undergraduate students compared to postgraduate students ($P = 0.001$, 0.003, and 0.001) may be attributed to several factors. Undergraduate students face challenges such as transitioning to higher education, academic pressure, acclimatizing to university life, and uncertainty about future careers. In contrast, postgraduate students have often overcome initial challenges, possess clearer career goals, and may experience lower levels of psychological distress. These factors collectively contribute to observed differences in mental health outcomes between the two groups.

The significant positive correlations found between depression ($r = 0.389$, $P = 0.001$), anxiety ($r = 0.372$, $P = 0.001$), and stress ($r = 0.392$, $P = 0.001$) scores with the global PSQI score among medical students in our study are consistent with studies conducted by Veldi *et al.*[19] and Abdulghani *et al.*[20] Such correlations underscore the bidirectional relationship between mental health and sleep quality, highlighting the importance of addressing both aspects in interventions to promote overall well-being.

The strength of this study lies in the use of validated questionnaires, while its limitations include the use of convenience sampling, the potential for social desirability bias, and the subjective assessment of screen time, which may have introduced information bias, and also lack of temporality due to cross-sectional study design.

Conclusion

More than half of the medical students experienced poor sleep quality, with four out of ten experiencing depression or anxiety and two out of ten experiencing stress. Sleep quality and mental health were interrelated. The study also found that as age increased, depression levels significantly decreased, and the likelihood of experiencing no stress significantly increased. Additionally, increased screen time before sleep was significantly associated with poorer sleep quality and higher depression levels. Therefore, sleep hygiene educational programs should be considered in the undergraduate medical curricula, and counseling centers in the institute should be established to promote good sleep hygiene and strengthen students' coping with stressors.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Pilcher JJ, Ott ES. The relationships between sleep and measures of health and wellbeing in college students: A repeated measures approach. Behav Med 1998;23:170-8.
2. Mental health: Strengthening our response-World Health Organization. Geneva: WHO; c2022. Mental health:

Strengthening our response; [about 3screens]. Available from: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response. [Last accessed on 2022 Jul 23].

3. Buysse DJ, Reynolds CF, Timothy HM, Susan RB, David JK. The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. Psych Res 1988;18:498.
4. National Sleep Foundation. Washington DC, c2024. News and articles: What is sleep quality. Available from: https://www.thensf.org/what-is-sleep-quality. [Last accessed on 2024 Jan 28].
5. Maheshwari G, Shaukat F. Impact of poor sleep quality on the academic performance of medical students. Cureus 2019;11:2-5.
6. Bergmann C, Muth T, Loerbroks A. Medical students' perceptions of stress due to academic studies and its interrelationships with other domains of life: A qualitative study. Med Educ Online 2019;24:1-10. doi: 10.1080/10872981.2019.1603526.
7. Lohitashwa R, Kadli N, Kisan R, Sindhuja A, Deshpande D. Effect of stress on sleep quality in young adult medical students: A cross sectional study. Int J Res Med Sci 2015;3:3519-23.
8. Lovibond SH, Lovibond PF, Psychology Foundation of Australia. Manual for the Depression Anxiety Stress Scales. 2nd ed. Sydney: Psychology Foundation of Australia; 1995. p. 42.
9. Henry JD, Crawford JR. The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. Br J Clin Psychol 2005;44:227-39.
10. Abdussalam, Salam MT, Gupta S, Trivedi M, Farooqi M. Poor quality of sleep and it's relationship with depression in first year medical students. J Adv Life Sci Technol 2013;12:17-21.
11. Al-Khani AM, Sarhandi MI, Zaghloul MS, Ewid M, Saquib N. A cross-sectional survey on sleep quality, mental health, and academic performance among medical students in Saudi Arabia. BMC Res Notes 2019;12:665.
12. Safhil.MA, Alafif.RA, Almoudi NM, Alamoudi MM, Alghamdi WA, Albishri SF, *et al.* The association of stress with sleep quality among medical students of Kind Abdulaziz University. J Family Med Prim Care 2020;9:1662-7.
13. Almojali AI, Akmalki SA, Alothman AS, Masuadi EM, Alaqeel MK. The prevalence and association of stress with sleep quality among medical students. Epidemiol Glob Health 2017;7:169-74.
14. Kumar S, Samal A, Dwivedi S. Sleep quality, daytime sleepiness and mental health in undergraduate medical students: A cross-sectional study. J Clin Diagn Res 2023;17:1-5. doi: 10.7860/JCDR/2023/60633.17524.
15. Dogan I, Dogan N. The prevalence of depression, anxiety, stress and its association with sleep quality among medical students. Ankara Med J 2019;550-8.
16. Gradisar M, Wolfson AR, Harvey AG, Hale L, Rosenberg R, Czeisler CA. The sleep and technology use of Americans: Findings from the national sleep foundation's 2011 sleep in America poll. J Clin Sleep Med 2013;9:1291-9.
17. Eleftheriou A, Rokou A, Arvaniti A, Nena E, Steiropoulos P. Sleep quality and mental health of medical students in Greece during the COVID-19 pandemic. Front Public Health 2021;9:1-8. doi: 10.3389/fpubh. 2021.775374.
18. Munezawa T, Kaneita Y, Osaki Y, Kanda H, Minowa M, Suzuki K, *et al.* The association between use of mobile phones after lights out and sleep disturbances among Japanese adolescents: A nationwide cross-sectional survey. Sleep 2011;34:1013-20.
19. Veldi M, Aluoja A, Vasar V. Sleep quality and more common sleep-related problems in medical students. Sleep Med 2005;6:269-75.
20. Abdulghani HM, Alrowais NA, Bin-Saad NS, Al-Subaie NM, Haji AM, Alhaqwi AI. Sleep disorder among medical students: Relationship to their academic performance. Med Teach 2012;34:37-41.