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Original article

The interplay between insomnia, sleep aid use, and perceived stress: A cross-sectional study among medical students in Dammam, Saudi Arabia

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Abstract. *Background and Aim:* Sleep is essential for maintaining both physical and psychological health and for supporting cognitive processes. Insomnia is highly prevalent among medical students worldwide, primarily due to academic demands and lifestyle factors. This study assesses the prevalence and predictors of insomnia among medical students in Saudi Arabia and explores its association with perceived stress and sleep-aid use. *Methods:* A cross-sectional online survey was conducted among medical students in Dammam, Saudi Arabia. The questionnaire included sociodemographic data, the Insomnia Severity Index (ISI), the Perceived Stress Scale (PSS), and sleep-aid use. Data were analyzed using SPSS Statistics version 27, with a p-value < 0.05 considered statistically significant. Categorical variables were summarized as frequencies and percentages, and associations were examined using Pearson's Chi-square, the Fisher–Freeman–Halton exact test, and Multiple linear regression analysis. *Results:* Of the 407 students who completed the survey, 53.6% were female. According to ISI scores, 26.0% had subthreshold insomnia, 18.7% had moderate insomnia, and 0.7% had severe insomnia. Stress levels were elevated, with 49.9% reporting moderate stress and 13.5% reporting high stress. Nearly 48.2% reported using sleep aids at some point. Significant associations were identified between insomnia and perceived stress, academic failure, lower monthly income, and sleep-aid use. *Conclusion:* Insomnia among medical students is associated with stress, demographic factors, and academic pressure. The high prevalence of insomnia and frequent sleep-aid use underscores the necessity for institutional support, sleep education, and enhanced mental health resources. (www.actabiomedica.it)

Key words: insomnia, medical students, mental health, sleep aids, stress

Introduction

Insomnia is the most common sleep disorder, characterized by difficulty initiating or maintaining sleep, early morning awakenings, and impaired daytime functioning (1). Worldwide studies among university students report that approximately 30% experience sleep difficulties (2,3). A higher prevalence rate (43.3%) was reported among students across Saudi Arabia (4). According to the American Academy of Sleep Medicine, two main treatment modalities are recommended for insomnia: Cognitive Behavioral Therapy for Insomnia (CBT-I) and pharmacotherapy. CBT-I is considered the first-line treatment for chronic insomnia in adults (2). However, evidence suggests that many university students tend to self-prescribe sleep aids as an initial step in managing their sleep problems (2,5). In Saudi Arabia, a study found that nearly 52% of college students used melatonin to address sleep difficulties (6). Stress has been strongly linked to sleep difficulties, with chronic sleep deprivation and circadian disruption considered both

as causes and consequences of declining mental health among university students (7). Stress is a psychological and physiological response to increased demands on life. Within medical education, moderate stress may motivate students to perform better; however, excessive or persistent stress often leads to negative outcomes, as not all students can cope effectively with it. Globally, several studies have documented high levels of stress among medical students. Research from the United States and Canada has shown significantly higher stress rates in this group compared with the general population and age-matched peers (8). Similarly, studies from India, Nigeria, Malaysia, and Brazil have reported high stress prevalence rates of 51%, 61%, 46.9%, and 47.1%, respectively (9-12). Medical students are exposed to multiple stressors, including rigorous academic requirements, time management challenges, continuous evaluations, and a competitive environment. These pressures are further intensified by high family expectations and perfectionistic tendencies, particularly as most students are at an age when vulnerability to psychiatric disorders is heightened. Prioritizing the mental health of medical students is essential, given their role as future healthcare professionals (13). Accordingly, this study aims to assess the prevalence of insomnia among medical students and to examine the relationship between sleep-aid use and perceived stress levels.

Participants and methods

This cross-sectional study targeted all Saudi medical students enrolled at Imam Abdulrahman bin Faisal University, Dammam, Saudi Arabia. The minimum required sample size was calculated using Epi Info version 7.2 and was estimated to be 340 participants. The calculation was based on a previously reported prevalence of insomnia among medical students of 38.6%, assuming a 95% confidence level, a 5% margin of error, and a 20% non-response rate (4). Data were collected using an online self-administered questionnaire developed through QuestionPro. The purpose of the study was explained on the first page of the survey. Participation was voluntary and anonymous. The questionnaire consisted of three sections: Section 1: Collected data on sociodemographic characteristics and sleep aid use. Section 2: Utilized the validated scale of Insomnia Severity Index (ISI) to assess insomnia symptoms with a Cronbach's alpha value of 0.85 (14). The ISI comprises seven items, each rated on a five-point Likert scale (0–4), yielding a total score ranging from 0 to 28. Scores are interpreted as follows: 0–7 (no clinically significant insomnia), 8–14 (subthreshold insomnia), 15–21 (moderate insomnia), and 22–28 (severe insomnia). Section 3: Included the validated Perceived Stress Scale (PSS-10), with Cronbach's alpha of 0.82 to evaluate the level of perceived stress (15). This scale consists of ten items, each scored on a five-point Likert scale (0–4), with total scores ranging from 0 to 40. Higher scores indicate greater perceived stress and are categorized as low stress (0–13), moderate stress (14–26), and high stress (27–40). The analysis was conducted using SPSS Statistics version 27, with a p-value < 0.05 considered statistically significant. Descriptive statistics were used to summarize participants' sociodemographic, academic, and behavioral characteristics. Categorical variables were presented as frequencies and percentages. Inferential analyses were performed to examine associations between participant characteristics, perceived stress scores, and insomnia severity. Associations between categorical variables were assessed using the Pearson Chi-square test, and the Fisher–Freeman–Halton exact test. To identify independent predictors of ISI and PSS scores, multiple linear regression analyses were conducted, including variables that were significant in bivariate analyses or supported by prior literature. Results were expressed as unstandardized regression coefficients (B) with 95% confidence intervals (CI) and corresponding p-values.

Results

Distribution of Sociodemographic, academic Characteristics, and pattern of sleep aid use (N = 407)

A total of 407 participants completed the survey, of whom 53.6% were female and 46.4% were male. Participant ages ranged from 18 to 25 years, with a mean of 21.2 ± 1.8 years. The majority were single (97.3%). Participants were distributed across various

academic levels, with the largest proportions in the second (20.9%) and fifth (20.1%) years. Only 10.6% reported a history of course failure. The most common reported Grade Point Averages (GPA) were A (29.7%), B+ (23.6%), and A+ (16.0%). Lower GPA categories included B (13.8%), C+ (6.6%), C (5.2%), D+ (4.2%), and D (1.0%). Nearly half (44.2%) reported a family income between 10,000 and 20,000 SAR, while 40.3% reported income above 20,000 SAR, and 15.5% reported income below 10,000 SAR (Table 1). Only 10.3% of participants reported a diagnosed psychiatric disorder, while the majority (89.7%) did not. Smoking was reported by 12.5%, and only 1.2% reported alcohol or substance use. Almost half (48.2%) had used sleep aids at least once, though only 30.0% were current users. Melatonin was the most frequently used sleep aid (33.9%), followed by antihistamines (18.4%) and herbal products (12.5%). Regarding the frequency of sleep aid use in the past month, the majority of participants (63.4%) did not use sleep aids, 19.4% used them rarely, and 17.1% used them more frequently. Advice on sleep-aid use was mainly obtained from friends or relatives (23.6%), followed by self-prescription (17.4%), with only 7.4% from a doctor. Only 12.3% sought professional help for sleep problems (Table1).

Insomnia Severity Index (ISI) Components among Study Participants

Approximately 34.6% of participants reported no difficulty falling asleep, 31.0% mild difficulty, and 26.3% moderate difficulty. Severe or very severe problems initiating sleep were reported by 8.1%. Mild difficulty in maintaining sleep was reported by 22.6%, while 18.4% and 5.1% reported moderate and severe difficulties, respectively. Regarding early awakenings, 31.0% reported mild, 14.7% moderate, and 8.1% severe or very severe. A total of 35.7% of participants reported dissatisfaction or strong dissatisfaction with their sleep. Sleep problems disrupted daily activities for 38.3% of participants, and 31.2% indicated that their sleep issues were noticeable to others. Additionally, 17.9% expressed significant concern about their sleep. Overall, a substantial proportion of participants experienced mild to moderate insomnia symptoms, particularly related to sleep initiation and maintenance (Table 2). The mean ISI score was 7.80 ± 6.24, with a median of 6.00 and an interquartile range (IQR) of 2.00–13.00, indicating that most students scored within the lower range. Based on ISI categories, 54.5% of participants reported no insomnia, 26.0% had subthreshold insomnia, 18.7% had moderate insomnia, and 0.7% had severe insomnia.

Distribution of Responses to the Perceived Stress Scale (PSS-10) Items among Study Participants

Findings from the Perceived Stress Scale (PSS-10) showed 38.8% sometimes felt upset by unexpected events, and 24.1% felt this fairly often or very often. Similarly, 31.4% sometimes felt unable to control important things in their lives, and 16.7% felt this fairly often. Nearly half (49.9%) sometimes felt nervous and stressed, while 37.4% felt nervous and stressed often or very often. Additionally, 13.8% reported never or almost never feeling confident in handling personal problems. Almost one-third (27.5%) sometimes felt that difficulties piled up so high (Table 3).

The (PSS-10) revealed a mean score of 17.86 ± 6.90, with a median of 16.00 and an IQR of 12.00–24.00, reflecting overall moderate stress among participants. Thus, 36.6% of medical students reported low stress, 49.9% moderate stress, and 13.5% high stress. There was a statistically significant association between perceived stress and insomnia severity. The Pearson correlation analysis revealed a strong positive correlation between stress and insomnia ($r = 0.797$, $p < 0.001$). Students with higher perceived stress were significantly more likely to experience greater insomnia severity (Figure 1).

Association between Insomnia Severity Index (ISI) Categories and Characteristics of Study Participants

The analysis of the association between Insomnia Severity Index (ISI) categories and sociodemographic characteristics among study participants revealed several statistically significant associations, such as age, marital status, academic year, history of academic failure, GPA, and monthly income. Additionally, a significant association was found between insomnia and being diagnosed with a psychiatric disorder, smoking

Table 1. Characteristics of Study Participants (N = 407).

Variable	Category	N (%)
Gender	Male	189 (46.4%)
	Female	218 (53.6%)
Age (years) Mean ± SD	21.2 ± 1.8	(Range: 18–25)
Marital status	Single	396 (97.3%)
	Married	9 (2.2%)
	Divorced	2 (0.5%)
Current year of study	2nd	85 (20.9%)
	3rd	79 (19.4%)
	4th	60 (14.7%)
	5th	82 (20.1%)
	6th	60 (14.7%)
	Internship	41 (10.1%)
Ever failed a course	Yes	43 (10.6%)
	No	364 (89.4%)
Last known GPA	A+	65 (16.0%)
	A	121(29.7%)
	B+	96 (23.6%)
	B	56 (13.8%)
	C+	27 (6.6%)
	C	21 (5.2%)
	D+	17 (4.2%)
	D	4 (1.0%)
Monthly income in Saudi Riyal (SAR)	<10,000	63 (15.5%)
	10,000–20,000	180 (44.2%)
	>20,000	164 (40.3%)
Diagnosed psychiatric disorder	Yes	42 (10.3%)
	No	365 (89.7%)
Smoker	Yes	51 (12.5%)
	No	356 (87.5%)
Use alcohol/ substances	Yes	5 (1.2%)
	No	402 (98.8%)
Ever used sleep aids	Yes	196 (48.2%)
	No	211 (51.8%)
Currently using sleep aids	Yes	122 (30.0%)
	No	285 (70.0%)
Type of sleep aid used	Melatonin	138 (33.9%)
	Antihistamines	75 (18.4%)
	Herbal medications	51 (12.5%)
	Sedating antidepressants	18 (4.4%)
	Benzodiazepines	6 (1.5%)
	Analgesics	14 (3.4%)
	Muscle relaxants	24 (5.9%)
	Vitamins/minerals	52 (12.8%)
	Other	3 (0.7%)
Frequency of sleep aid use (past month)	Never	258 (63.4%)
	Rarely (1–3 /month)	79 (19.4%)
	Sometimes (1–2 /week)	38 (9.3%)
	Often (3–4 /week)	20 (4.9%)
	Always / almost every night	12 (2.9%)
Source of information on sleep aids	Friends/relatives	96 (23.6%)
	Doctor prescription	30 (7.4%)
	Self-prescription	71(17.4%)
Sought professional advice for sleep problems	Yes	50 (12.3%)
	No	357 (87.7%)

Table 2. Insomnia Severity Index (ISI) Components among Study Participants.

		N	%
1. Difficulty falling asleep	None	141	34.6%
	Mild	126	31.0%
	Moderate	107	26.3%
	Severe	29	7.1%
	Very Sever	4	1.0%
2. Difficulty staying asleep	None	219	53.8%
	Mild	92	22.6%
	Moderate	75	18.4%
	Severe	20	4.9%
	Very Sever	1	0.2%
3. Problems waking up too early	None	188	46.2%
	Mild	126	31.0%
	Moderate	60	14.7%
	Severe	29	7.1%
	Very Sever	4	1.0%
4. Satisfaction with current sleep pattern	Very Satisfied	32	7.9%
	Satisfied	139	34.2%
	Neutral	91	22.4%
	Dissatisfied	115	28.3%
	Very Dissatisfied	30	7.4%
5. Extent sleep problems interfere with daily functioning	Not at all	156	38.3%
	A Little	95	23.3%
	Somewhat	96	23.6%
	Much	46	11.3%
	Very Much	14	3.4%
6. Sleep problems noticeable to others	Not at all	207	50.9%
	A Little	73	17.9%
	Somewhat	97	23.8%
	Much	23	5.7%
	Very Much	7	1.7%
7. Level of worry/distress about sleep problems	Not at all	190	46.7%
	A Little	78	19.2%
	Somewhat	66	16.2%
	Much	57	14.0%
	Very Much	16	3.9%

or alcohol use, and using sleep aids. Gender differences were not statistically significant ($p = 0.147$), though males tended to have slightly higher rates of moderate insomnia than females. Age showed a strong and highly significant association with insomnia severity ($p < 0.001$) as younger participants (ages 18–20) predominantly experienced little to no insomnia, whereas older participants (ages 23–25) demonstrated

Table 3. Distribution of Responses to the Perceived Stress Scale (PSS) Items among Study Participants.

	Never		Almost Never		Sometimes		Fairly Often		Very Often	
	N	%	N	%	N	%	N	%	N	%
1. Upset by unexpected events	40	9.8%	111	27.3%	158	38.8%	80	19.7%	18	4.4%
2. Unable to control important things	58	14.3%	139	34.2%	128	31.4%	68	16.7%	14	3.4%
3. Felt nervous and stressed	11	2.7%	41	10.1%	203	49.9%	120	29.5%	32	7.9%
4. Confident handling personal problems	10	2.5%	46	11.3%	132	32.4%	187	45.9%	32	7.9%
5. Things going your way	22	5.4%	74	18.2%	152	37.3%	144	35.4%	15	3.7%
6. Could not cope with tasks	26	6.4%	164	40.3%	120	29.5%	80	19.7%	17	4.2%
7. Controlled irritations	6	1.5%	34	8.4%	148	36.4%	201	49.4%	18	4.4%
8. Felt on top of things	24	5.9%	93	22.9%	140	34.4%	137	33.7%	13	3.2%
9. Angered by uncontrollable events	24	5.9%	137	33.7%	141	34.6%	86	21.1%	19	4.7%
10. Felt difficulties piling up	58	14.3%	146	35.9%	112	27.5%	61	15.0%	30	7.4%

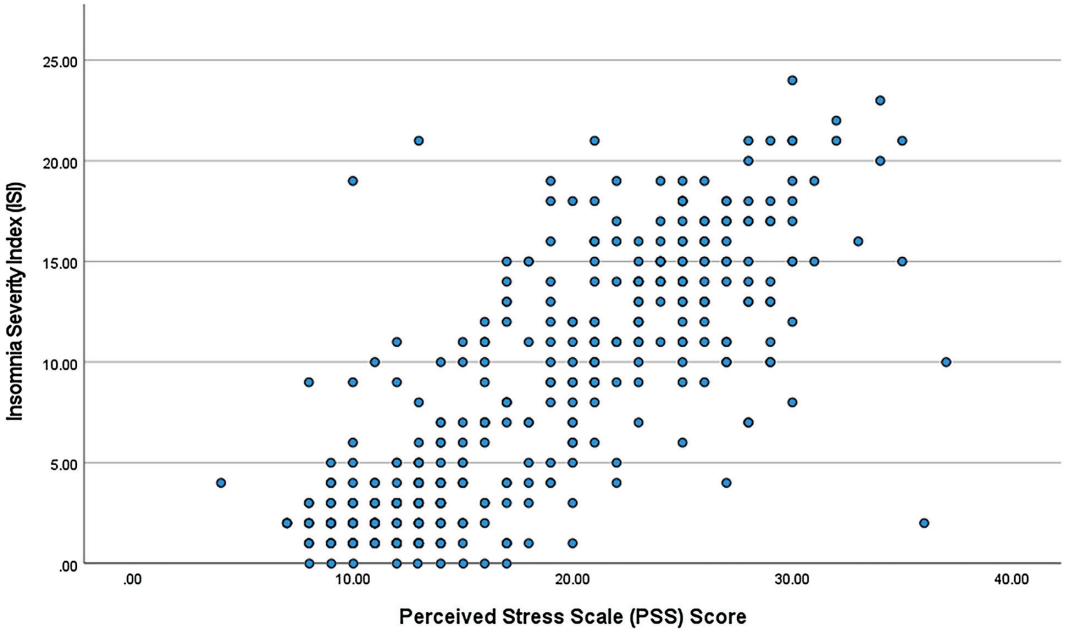

Figure 1. Scatter plot showing the correlation between Insomnia Severity Index (ISI) scores and Perceived Stress Scale (PSS) scores among study participants. ISI = Insomnia Severity Index; PSS = Perceived Stress Scale. ($r = 0.797$, $p < 0.001$).

markedly higher rates of moderate to severe insomnia. Married and divorced participants showed higher levels of insomnia compared to single individuals ($p = 0.013$). Insomnia severity increases progressively through academic years. Interns reported the highest prevalence of moderate insomnia (46.3%), while second and third-year students exhibited the lowest rates ($p < 0.001$). In addition, 58.1% of students who had a history of academic failure experienced moderate insomnia, compared to only 14.0% among those who had not ($p < 0.001$). Similarly, GPA showed a strong inverse relationship with insomnia severity ($p < 0.001$). Students with higher GPAs (A+ or A) had the lowest insomnia rates, whereas those with lower GPAs (C or below) experienced substantially higher rates of moderate to severe insomnia, reaching up to 70.6% among students with a D+ average. Monthly family income also demonstrated a significant correlation ($p < 0.001$). Participants with lower incomes below 10,000 SAR reported considerably higher insomnia severity, while those with higher incomes (above 20,000 SAR) showed fewer symptoms (Table 4).

Multiple Linear Regression Analysis of Factors Associated with Insomnia Severity Index (ISI) Scores among Study Participants

The multiple linear regression analysis identified several significant predictors of Insomnia Severity Index (ISI) scores among study participants. The Perceived Stress Scale (PSS) score emerged as the strongest predictor, demonstrating a significant positive association with insomnia severity ($B = 0.569$, $p < 0.001$, 95% CI = 0.510 to 0.628), indicating that higher stress levels were strongly linked to increased insomnia symptoms. Significant association was found between higher ISI scores and academic failure ($B = 1.513$, $p = 0.019$, 95% CI = 0.246 to 2.780). Students with higher monthly incomes reported fewer insomnia symptoms. Specifically, those earning 10,000–20,000 SAR ($B = -1.414$, $p = 0.009$, 95% CI = -2.471 to -0.358) and over 20,000 SAR ($B = -1.981$, $p < 0.001$, 95% CI = -3.066 to -0.896) had significantly lower ISI scores compared to those earning less than 10,000 SAR. Furthermore, participants who used alcohol or substances had markedly higher ISI scores ($B = 4.299$, $p = 0.011$, 95% CI = 1.006 to 7.592). Moreover, the use of sleep aids was strongly associated with greater insomnia severity—both for those who had ever used them ($B = 1.962$, $p < 0.001$, 95% CI = 1.140 to 2.785) and for current users ($B = 1.646$, $p < 0.001$, 95% CI = 0.790 to 2.501) (Table 5).

Discussion

Sleep is a fundamental human need for maintaining both physical and mental health. It plays an essential role in improving cognitive functions critical to learning and academic success. Lack of sleep or disturbed sleep can negatively impact concentration, emotional regulation, and overall performance (16). In this study, the overall prevalence of insomnia among medical students was 45.4%, with 18.7% reporting moderate insomnia and 0.7% experiencing severe insomnia. Additionally, more than half (53.3%) of participants reported feeling worried about their current sleep patterns. The prevalence observed here is slightly higher than that reported in previous studies in Saudi Arabia. For example, a 2021 study in Riyadh reported a total prevalence of 34.9% (17), and a systematic review conducted in 2024 estimated that nearly 38.6% of medical students across Saudi Arabia suffer from insomnia (4). These variations may reflect regional factors affecting sleep patterns. Specifically, a study conducted during the COVID-19 pandemic found that students in the Eastern region experienced more severe insomnia than peers in other regions; however, the timing of the study may have influenced this difference (18). Nonetheless, large-scale, multicenter studies are needed to better understand regional differences and identify modifiable risk factors. Almost one-third (30%) of the study participants are currently using a sleep aid, and 48.2% report ever using one. Consistently, a study conducted in Riyadh and Jeddah reported that almost 27% of university students are misusing sleep pills (19). Similar findings were reported among college students in the United States and Jordan: 25% and 22.4% have consumed a sleep aid (5,20). Additionally, 46.1% of adults in Saudi Arabia have reported use of sleep aids (21).

Table 4. Association between Insomnia Severity Index (ISI) Categories and Characteristics of Study Participants.

Variable	Category	Absence of Insomnia (N, %)	Subthreshold Insomnia (N, %)	Moderate Insomnia (N, %)	Severe Insomnia (N, %)	P VALUE$^{F/C}$
Gender	Male	93 (49.2%)	53 (28.0%)	42 (22.2%)	1 (0.5%)	0.147
	Female	129 (59.2%)	53 (24.3%)	34 (15.6%)	2 (0.9%)	
Age (years)	18	3 (60.0%)	2 (40.0%)	0 (0.0%)	0 (0.0%)	<0.001*
	19	76 (79.2%)	10 (10.4%)	10 (10.4%)	0 (0.0%)	
	20	55 (74.3%)	12 (16.2%)	6 (8.1%)	1 (1.4%)	
	21	22 (59.5%)	14 (37.8%)	1 (2.7%)	0 (0.0%)	
	22	33 (41.8%)	27 (34.2%)	19 (24.1%)	0 (0.0%)	
	23	25 (37.9%)	25 (37.9%)	15 (22.7%)	1 (1.5%)	
	24	7 (20.0%)	13 (37.1%)	15 (42.9%)	0 (0.0%)	
	25	1 (6.7%)	3 (20.0%)	10 (66.7%)	1 (6.7%)	
Marital Status	Single	219 (55.3%)	103 (26.0%)	72 (18.2%)	2 (0.5%)	0.013*
	Married	3 (33.3%)	3 (33.3%)	2 (22.2%)	1 (11.1%)	
	Divorced	0 (0.0%)	0 (0.0%)	2 (100.0%)	0 (0.0%)	
Current Year of Study	2nd year	58 (68.2%)	15 (17.6%)	11 (12.9%)	1 (1.2%)	<0.001*
	3rd year	64 (81.0%)	10 (12.7%)	5 (6.3%)	0 (0.0%)	
	4th year	33 (55.0%)	16 (26.7%)	11 (18.3%)	0 (0.0%)	
	5th year	35 (42.7%)	30 (36.6%)	16 (19.5%)	1 (1.2%)	
	6th year	25 (41.7%)	20 (33.3%)	14 (23.3%)	1 (1.7%)	
	Internship	7 (17.1%)	15 (36.6%)	19 (46.3%)	0 (0.0%)	
Ever Failed a Course	Yes	5 (11.6%)	13 (30.2%)	25 (58.1%)	0 (0.0%)	<0.001*
	No	217 (59.6%)	93 (25.5%)	51 (14.0%)	3 (0.8%)	
Last known GPA	A+	47 (72.3%)	8 (12.3%)	9 (13.8%)	1 (1.5%)	<0.001*
	A	87 (71.9%)	23 (19%)	11(9.1%)	0 (0.0%)	
	B+	60 (62.5%)	26 (27.1%)	10 (10.4%)	0 (0.0%)	
	B	14 (25.0%)	27 (48.2)	14 (25.0%)	1 (1.8%)	
	C+	7 (25.9%)	11 (40.7%)	8 (29.6%)	1 (3.7%)	
	C	6 (28.6%)	5 (23.8%)	10 (47.6%)	0 (0.0%)	
	D+	0 (0.0%)	5 (29.4%)	12 (70.6%)	0 (0.0%)	
	D	1 (25.0%)	1 (25%)	2 (50.0%)	0 (0.0%)	
Monthly Income (SAR)	<10,000	15 (23.8%)	22 (34.9%)	25 (39.7%)	1 (1.6%)	<0.001*
	10,000–20,000	106 (58.9%)	48 (26.7%)	24 (13.3%)	2 (1.1%)	

Variable	Category	Absence of Insomnia (N, %)	Subthreshold Insomnia (N, %)	Moderate Insomnia (N, %)	Severe Insomnia (N, %)	P VALUE[F/C]
	>20,000	101 (61.6%)	36 (22.0%)	27 (16.5%)	0 (0.0%)	
Diagnosed Psychiatric Disorder	Yes	10 (23.8%)	11 (26.2%)	20 (47.6%)	1 (2.4%)	<0.001*
	No	212 (58.1%)	95 (26.0%)	56 (15.3%)	2 (0.5%)	
Smoker	Yes	11 (21.6%)	16 (31.4%)	24 (47.1%)	0 (0.0%)	<0.001*
	No	211 (59.3%)	90 (25.3%)	52 (14.6%)	3 (0.8%)	
Alcohol or substance use	Yes	0 (0.0%)	0(0.0%)	5 (100.0%)	0 (0.0%)	<0.001*
	No	222 (55.2%)	106 (26.4%)	71 (17.7%)	3 (0.7%)	
Ever Used Sleep Aid	Yes	63 (32.1%)	65 (33.2%)	67 (34.2%)	1 (0.5%)	<0.001*
	No	159 (75.4%)	41 (19.4%)	9 (4.3%)	2 (0.9%)	

*F: Fisher–Freeman–Halton exact test; C: Pearson Chi-square test; *p < 0.05 = significant.

The most reported misused sleep aids among the Saudi population were Panadol night (antihistamine combined with analgesic), followed by Melatonin, which is expected due to their availability as over-the-counter (OTC) medications (19,21). Furthermore, an alarming finding is that most study participants have used sleep aids based on advice from friends or relatives and personal information without consulting a healthcare professional, which raises safety concerns, as these supplements can have adverse effects, particularly with prolonged use (22,23). This study examined the association between insomnia and participants' characteristics. Interestingly, no significant association was found between gender and insomnia, a finding consistent with previous studies conducted in Jeddah and Qassim (24,25). On the other hand, in regression analysis, several factors demonstrated significant associations with insomnia. For example, a significant association was observed between insomnia and academic failure. This finding aligns with previous studies conducted in Saudi Arabia, which reported a positive correlation between poor sleep quality and insomnia with reduced academic performance among medical students. (26,27). This finding highlights the crucial role of sleep in supporting learning, memory consolidation, and cognitive performance; thus, sleep deprivation impairs students' learning ability and overall academic achievement (28). Moreover, a significant association was found between substance and alcohol use and insomnia. This could be explained by the temporary hypnotic effect of alcohol, which helps induce sleep among people suffering from insomnia (29). Additionally, this study found that lower family income is significantly associated with insomnia. In this regard, several studies reported a strong link between low income and sleep disturbances across different ages and populations, underscoring the impact of financial strain on sleep patterns (30). Insomnia was significantly associated with the use of sleep aids, as reported in previous studies. People suffering from insomnia usually struggle with regulating their sleep–wake cycles, making them more likely to consume medications to initiate sleep (29,31). This study found a significant association between stress and insomnia among medical students, indicating that elevated stress has a negative impact on sleep. This is consistent with the findings of studies conducted among medical students in Saudi Arabia, Pakistan, and Egypt (26,32,33). Furthermore, a study conducted in the US reported that tension

Table 5. Multiple Linear Regression Analysis of Factors Associated with Insomnia Severity Index (ISI) Scores among Study Participants.

Model		Unstandardized Coefficients		Standardized Coefficients	t	95.0% C.I for B		P value
		B	Std. Error	Beta		Lower	Upper	
Perceived Stress Scale (PSS) Score		0.569	0.030	0.630	18.970	0.510	0.628	<0.001*
Gender	Male	0.127	0.360	0.010	0.353	-0.581	0.835	0.724
	Female	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Current Year of Study	2nd year	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	3rd Year	-0.693	0.545	-0.044	-1.272	-1.763	0.378	0.204
	4th Year	-0.890	0.615	-0.051	-1.448	-2.099	0.319	0.148
	5th Year	-0.901	0.570	-0.058	-1.579	-2.022	0.221	0.115
	6th Year	-0.022	0.634	-0.001	-0.035	-1.268	1.224	0.972
	Internship	0.319	0.754	0.015	0.423	-1.163	1.801	0.672
Ever Failed a Course	Yes	1.513	0.645	0.075	2.347	0.246	2.780	0.019*
	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Monthly Income SAR	< 10000	Ref	Ref	Ref	Ref	Ref	Ref	Ref
	10000-20000	-1.414	0.537	-0.113	-2.632	-2.471	-0.358	0.009*
	>20000	-1.981	0.552	-0.156	-3.591	-3.066	-0.896	<0.001*
Diagnosed Psychiatric Disorder	Yes	0.198	0.622	0.010	0.318	-1.025	1.421	0.751
	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Smoker	Yes	-0.116	0.609	-0.006	-0.190	-1.313	1.081	0.849
	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Use Alcohol/ Substances	Yes	4.299	1.675	0.076	2.566	1.006	7.592	0.011*
	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Ever Used Sleep Aids	Yes	1.962	0.418	0.157	4.691	1.140	2.785	<0.001*
	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Currently Using Sleep Aids	Yes	1.646	0.435	0.121	3.781	0.790	2.501	<0.001*
	No	Ref	Ref	Ref	Ref	Ref	Ref	Ref

a. Dependent Variable: Insomnia Severity Index (ISI); *p < 0.05 = significant.

and stress explained about 24% of sleep disturbances among college students (34). In this regard, various studies highlighted the physiological connection between sleep and stress through their shared regulation by the hypothalamic–pituitary–adrenal (HPA) axis, which explains the strong relationship between them (35). Additionally, the demanding academic environment often leads medical students to sacrifice sleep for studying, which eventually adds more stress, as reflected in the study participants, who reported moderate to high stress levels. Therefore, implementing structured stress-management programs and promoting healthier study–sleep habits, such as time-management training and scheduled breaks, could help reduce stress and improve overall well-being.

Conclusion

This study demonstrates a substantial prevalence of insomnia among medical students. Insomnia was significantly associated with multiple factors, including stress levels, sleep-aid use, and several

sociodemographic and academic factors. The association between insomnia and stress emphasizes the close interplay between psychological burden and sleep disturbances in this population. Additionally, the widespread use of sleep aids without consulting healthcare professionals underscores the need for targeted educational and clinical interventions.

Strengths and limitations

This study examined insomnia and its associated factors, which are crucial to students' well-being. It employed validated tools (ISI and PSS) within a relatively large sample to ensure a reliable assessment of insomnia and stress among medical students. Furthermore, the study has several limitations. First, its cross-sectional design prevents establishing causality because associations cannot determine the temporal sequence. Additionally, since the study was conducted in a single region of Saudi Arabia, the findings may not be fully generalizable to all medical students. Furthermore, reliance on self-reported data introduces the potential for recall or reporting bias.

Author's Contribution: The author was responsible for the study's conception and design, data collection, statistical analysis, interpretation of findings, and manuscript writing and revision. The author approved the final version of the manuscript.

Data Availability: All data supporting the findings of this study are available from the author upon reasonable request and approval of the ethical committee.

Conflict of Interest: The author declares that she has no commercial associations (e.g., consultancies, stock ownership, equity interests, patent/licensing arrangements, etc.) that might pose a conflict of interest in connection with the submitted article.

Ethics Approval: This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) at Imam Abdulrahman Bin Faisal University, Saudi Arabia (IRB-2025-01-0732).

Consent for Participation: All participants provided informed consent prior to participating in the study, after explanation of its anonymous nature; thus, no personally identifiable data will be collected.

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