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ORIGINAL RESEARCH

Determinants of Poor Sleep Quality Among Health Profession Students in Iraq: The Role of Physical Activity, Perceived Stress, and Smartphone Use

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ABSTRACT

Background: Poor sleep quality is a prevalent public health concern among health professions students and has been associated with adverse academic, psychological, and health outcomes. Identifying modifiable determinants of poor sleep quality is essential for developing targeted interventions in this population.

Objectives: This study aimed to determine the prevalence of poor sleep quality and examine the roles of physical activity, perceived stress, and smartphone use as determinants of poor sleep quality among undergraduate health professions students in the Kurdistan Region of Iraq.

Methodology: In this cross-sectional study, 871 undergraduate students from five health professions disciplines at two public universities in Sulaymaniyah, Iraq, participated. Sleep quality was evaluated using the Pittsburgh Sleep Quality Index (PSQI). Additional covariates included perceived stress (Perceived Stress Scale-10; PSS-10), physical activity (International Physical Activity Questionnaire–Short Form; IPAQ-SF), and problematic smartphone use (Smartphone Addiction Scale–Short Version; SAS-SV). Data were analyzed using multivariable binary logistic regression to estimate Adjusted Odds Ratios (AOR).

Results: Poor sleep quality was identified in 60.7% of participants (mean PSQI: 7.04 ± 3.45). After multivariable adjustment, nine predictors were independently associated with increased odds of poor sleep quality: moderate perceived stress (AOR = 6.895), high perceived stress (AOR = 6.549), obesity (AOR = 6.773), paid employment (AOR = 4.591), dormitory residency (AOR = 4.188), chronic illness (AOR = 3.855), overweight status (AOR = 3.584), pre-sleep caffeine intake (AOR = 1.677), and problematic smartphone use (AOR = 1.649). High (AOR = 0.208) and moderate (AOR = 0.439) physical activity levels and pre-sleep dairy consumption (AOR = 0.409) were independently associated with reduced odds of poor sleep quality.

Conclusion: The high prevalence of poor sleep quality among health professions students underscores the need for multi-level, evidence-based interventions targeting modifiable lifestyle and environmental factors at the university level.

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INTRODUCTION

Sleep is a fundamental biological requirement essential for memory consolidation, neuroendocrine regulation, and maintenance of immune function (Baranwal et al., 2023). According to the American Academy of Sleep Medicine guidelines, optimal sleep duration is at least 7 hours per day; shorter durations are associated with impaired cognitive performance, affective regulation, and decision-making capacity (Khan et al., 2023). Insufficient sleep may also contribute to patient safety risks and reduced clinical readiness among healthcare professionals (Okano et al., 2019).

Health professions students—including those studying medicine, dentistry, pharmacy, nursing, and allied health—are particularly vulnerable. The competitive academic environment, characterized by rigorous assessments and clinical practice requirements, poses unique challenges to sleep health in this population compared with students in other disciplines (Khaksarian et al., 2020). Sleep-disturbed students demonstrate impaired working memory, reduced concentration, and inadequate clinical decision-making (Khan et al., 2023).

Globally, a systematic review of 109 studies involving over 59,000 students reported a pooled prevalence of poor sleep of 55.6% (Binjabr et al., 2023). In the Middle East and North Africa (MENA) region, a meta-analysis aggregating data from 150 studies and over 52,000 health professions students across 16 countries found a pooled prevalence of poor sleep of 59.1% and a mean nocturnal sleep duration of 6.1 hours (Chaabane et al., 2025). Country-level studies report poor sleep prevalence of 88.1% in Saudi Arabia, 71.2% in Egypt, and 70.5% in the United Arab Emirates (Khaled et al., 2025; Talaia et al., 2025; Alhusami et al., 2024).

Multiple interacting factors contribute to poor sleep quality among health professions students, including high academic workload, clinical stress, irregular sleep schedules, physical inactivity, prolonged smartphone use, caffeine intake, smoking, unhealthy diet, obesity, mental distress, chronic illness, and inadequate living arrangements (Chaabane et al., 2025; Alhusami et al., 2024; Hassan et al., 2025). These disturbances can impair memory consolidation, cognitive functioning, and psychological well-being, with downstream effects on academic performance (Alhusami et al., 2024; Hassan et al., 2025).

In Iraq, poor sleep quality associated with psychological distress has been documented in Fallujah (Al Ani et al., 2024). In Mosul and Erbil, shift work and excessive caffeine intake were identified as contributing factors (Abdullah et al., 2025; Ahmed et al., 2024). In Baghdad, sociodemographic characteristics were associated with inefficient sleep and increased daytime sleepiness (Saeed et al., 2024). However, the existing Iraqi literature tends to focus on single institutions or disciplines, limiting a comprehensive understanding of sleep quality across the health professions student population.

The present study aims to address this gap by investigating poor sleep quality among health professions students across two large public universities in Sulaymaniyah, Iraq. Specifically, the study seeks to: (i) estimate the prevalence of poor sleep quality; (ii) examine bivariate associations between sleep quality and sociodemographic, health-related, and lifestyle variables; and (iii) identify independent predictors of poor sleep quality.

AIMS OF THE STUDY

This study aimed to determine the prevalence of poor sleep quality and examine the roles of physical activity, perceived stress, and smartphone use as determinants of poor sleep quality among undergraduate health professions students in the Kurdistan Region of Iraq.

METHODOLOGY

Research Design

A cross-sectional study design was employed to estimate the prevalence and identify predictors of poor sleep quality among health professions students. The study was conducted at the University of Sulaimani and Sulaimani Polytechnic University in Sulaymaniyah, Kurdistan Region, Iraq, which together enroll approximately 6,300 undergraduate students across faculties of medicine, dentistry, pharmacy, nursing, and health sciences.

Participants and Selection Process

The target population comprised undergraduate students enrolled in five health professions faculties (College of Medicine, Pharmacy, Dentistry, Nursing, and Health Sciences) during the 2024/2025 academic year. First-year students were excluded because institutional email accounts had not yet been activated at the time of data collection. The estimated eligible population was approximately 5,000 students.

Participants were recruited through voluntary response sampling via institutional email and student communication channels (WhatsApp, Telegram). Two reminder communications were sent at two-week intervals; no monetary or academic incentives were offered. The minimum required sample size was calculated using the formula $n = Z^2 \cdot p \cdot (1 - p)/e^2$, assuming a poor sleep prevalence of approximately 62%, a 95% confidence level ($Z = 1.96$), and a 5% margin of error, yielding a minimum of 338 participants. In total, 871 completed responses were received over two months, representing a response rate of 17.4% (871/5,000). All respondents provided electronic informed consent prior to survey access. It is acknowledged that this sampling approach may introduce non-response bias, potentially inflating prevalence estimates.

Ethical Considerations

Ethical approval was granted by the Institutional Review Board of the University of Sulaimani (Approval No. 824/6, June 2024). All procedures conformed to the Declaration of Helsinki (World Medical Association, 2013). Participation was voluntary, and electronic informed consent was obtained prior to survey access. All data were collected anonymously.

Materials and Measures

Data were collected from 1 October to 30 November 2024 using a composite self-report questionnaire available in English and Kurdish. The Kurdish version was developed through forward-backward translation by two independent bilingual translators, with discrepancies resolved through expert panel discussion. The questionnaire required approximately 15–18 minutes to complete.

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), a 19-item instrument generating seven component scores and a global score (0–21). A global score greater than 5 classified poor sleep quality (Mollayeva et al., 2016), a threshold with established reliability in Kurdish populations (Cronbach's $\alpha = 0.70–0.83$; Seidi et al., 2019). Although the primary analysis used the dichotomized PSQI threshold, the seven PSQI component scores—sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction—were also examined descriptively.

Perceived stress was measured using the Perceived Stress Scale-10 (PSS-10; Cohen & Williamson, 1988), with scores classified as low (0–13), moderate (14–26), or high (27–40), validated in Kurdish populations (Shakor et al., 2023). Physical activity was measured using the IPAQ-SF (Craig et al., 2003), following official data-cleaning and truncation procedures, and categorized as low (< 600 MET-min/week), moderate (600–2,999), or high (≥ 3,000 MET-min/week). Problematic smartphone use was assessed using the SAS-SV (Kwon et al., 2013), a 10-item scale with gender-specific cut-off scores (≥ 31 for males; ≥ 33 for females).

Operational definitions: caffeine intake = any caffeinated beverage consumed within one hour of bedtime; dairy consumption = any dairy product consumed within one hour of bedtime; employment = any paid work during the academic term; chronic illness = any physician-diagnosed condition requiring ongoing management.

A pilot study was conducted with 55 students prior to the main data collection, with satisfactory internal consistency across all instruments (PSQI: Cronbach's $\alpha = 0.83$; PSS-10: $\alpha = 0.87$; SAS-SV: $\alpha = 0.83$).

Data Analysis

All analyses were performed using IBM SPSS Statistics, version 26.0, with statistical significance set at $\alpha = 0.05$. Continuous variables are reported as means ± standard deviations; categorical variables as frequencies and percentages. Bivariate associations were examined using Pearson's chi-square or Fisher's exact test, with Cramér's V as effect size. Multivariable binary logistic regression with forced entry was conducted to identify independent predictors of poor sleep quality (PSQI > 5). Variables with bivariate $p < 0.25$ were eligible for inclusion (Hosmer et al., 2013). Multicollinearity was assessed using the Variance Inflation Factor (VIF) and tolerance statistics. Given the cross-sectional design, all findings are interpreted as associations rather than causal effects.

RESULTS

Participants' characteristics

The sample comprised 871 students with a mean age of 21.13 ± 2.09 years; 75.1% were aged 20–25 years. Females constituted 54.0% of the sample. Medicine was the most represented discipline (28.1%), followed by Nursing (22.8%). Dormitory residency was reported by 48.9% of participants. A minority (6.4%) were employed (Table 1). Mean BMI was 25.13 ± 3.35 kg/m²; 34.4% were overweight and 15.0% obese. Chronic illness was reported by 8.2% of participants (Table 2). Problematic smartphone use was identified in 69.0% of students; 34.7% reported low physical activity levels (Table 3).

Prevalence of Poor Sleep Quality and PSQI Component Analysis

Poor sleep quality (PSQI > 5) was identified in 60.7% of participants, with a mean global PSQI score of 7.04 ± 3.45. Mean PSS-10 score was 18.18 ± 7.43; 23.8% reported high perceived stress. Sleep duration had the highest mean component score (1.49 ± 1.05), followed by subjective sleep quality (1.45 ± 1.01). Nearly half the sample (43.8%) reported sleeping fewer than six hours per night. Only 16.4% reported no difficulty initiating sleep, while 53.2% described mild sleep latency difficulty. Habitual sleep efficiency was relatively preserved (mean: 0.53 ± 0.75), with 61.3% reporting efficiency above 85%. Sleep medication use was uncommon (mean: 0.10 ± 0.34); 91.8% had not used sleep medication in the past month. Daytime dysfunction was moderate (mean: 1.21 ± 1.04), with 29.5% reporting at least 'somewhat of a problem'. Component data are presented in Table 4.

Bivariate Associations with Sleep Quality

Among sociodemographic variables, dormitory residency was significantly associated with poor sleep quality ($p < 0.001$, Cramér's V = 0.279), with 74.6% of dormitory students classified as poor sleepers versus 47.4% of family-residing students. Employment was also significant ($p = 0.001$, Cramér's V = 0.115), with 82.1% of working students classified as poor sleepers. Age, gender, academic discipline, and financial status were not significantly associated ($p > 0.05$). See Table 5.

Perceived stress demonstrated the strongest bivariate association ($p < 0.001$, Cramér's V = 0.479). Poor sleep prevalence rose from 30.9% in low-stress students to 82.1% in those with high perceived stress. BMI was also significantly associated ($p < 0.001$, Cramér's V = 0.289) with poor sleep prevalence, ranging from 47.3% at normal BMI to 84.0% among obese students. Chronic illness was associated with a small-to-moderate effect ($p < 0.001$, Cramér's V = 0.162). See Table 6.

Physical activity demonstrated the strongest lifestyle-related association ($p < 0.001$, Cramér's V = 0.315), with poor sleep prevalence decreasing progressively from 80.8% (low) to 41.8% (high activity). Pre-sleep dairy consumption was inversely associated with poor sleep (43.7% vs. 64.8%; $p < 0.001$, Cramér's V = 0.170). Pre-sleep caffeine intake, smoking, and problematic smartphone use were each significantly associated with poor sleep quality. Alcohol intake was not significant ($p = 0.869$). See Table 7.

Multicollinearity and Logistic Regression: Independent Predictors of Poor Sleep Quality

Multicollinearity among independent variables was assessed using the Variance Inflation Factor (VIF) and tolerance statistics prior to binary logistic regression analysis. All VIF values were below 5.0, and all tolerance values exceeded 0.20, indicating no evidence of problematic multicollinearity among the predictors.

The overall model was statistically significant (Omnibus $\chi^2(14) = 421.996$, $p < 0.001$), with satisfactory fit (Hosmer–Lemeshow: $\chi^2 = 8.336$, df = 8, $p = 0.401$). The model explained 38.4–52.0% of variance (Cox & Snell $R^2 = 0.384$; Nagelkerke $R^2 = 0.520$) and correctly classified 79.3% of cases (sensitivity = 84.7%; specificity = 71.1%). All VIF values were below 5 and tolerance above 0.20, confirming acceptable multicollinearity. See Table 8.

Nine variables were independently associated with increased odds of poor sleep quality: moderate perceived stress (AOR = 6.895, 95% CI: 4.543–10.465, $p < 0.001$), high perceived stress (AOR = 6.549, 95% CI: 3.748–11.441, $p < 0.001$), obesity (AOR = 6.773, 95% CI: 3.517–13.045, $p < 0.001$), paid employment (AOR = 4.591, $p = 0.001$), dormitory residency (AOR = 4.188, $p < 0.001$), chronic illness (AOR = 3.855, $p = 0.003$), overweight status (AOR = 3.584, $p < 0.001$), pre-sleep caffeine intake (AOR = 1.677, $p = 0.049$), and problematic smartphone use (AOR = 1.649, $p = 0.012$). High physical activity (AOR = 0.208), moderate physical activity (AOR = 0.439), and pre-sleep dairy consumption (AOR = 0.409) were independently associated with reduced odds. Underweight status ($p = 0.507$) and smoking ($p = 0.120$) did not reach statistical significance in the adjusted model. The large AOR values for perceived stress and BMI likely reflect strong bivariate associations combined with residual confounding from unmeasured variables such as anxiety and depression, and should be interpreted with caution.

DISCUSSION:

This study identified a poor sleep quality prevalence of 60.7% (mean PSQI: 7.04 ± 3.45) among health professions students in the Kurdistan Region of Iraq. This figure exceeds the global pooled estimate of 55.6% (Binjabr et al., 2023) and the MENA regional estimate of 59.1% (Chaabane et al., 2025), and is markedly higher than the 48.7% reported in a comparable German university sample (Schmickler et al., 2023). Within Iraq, the prevalence aligns closely with the 61.3% reported by Ahmed et al. (2024) among Iraqi university students, suggesting a consistent pattern of sleep dysfunction across the country's higher education sector. The observed excess burden relative to higher-income settings is likely attributable to a confluence of contextual factors, including infrastructure deficits in dormitory environments, socio-economic pressures, and limited mental health services—all of which may amplify susceptibility to sleep disturbance beyond what is observed in better-resourced settings.

Analysis of the PSQI components revealed that sleep duration was the most affected domain, with nearly half of the students (43.8%) reporting fewer than six hours of sleep per night. Subjective sleep quality was the second most affected component, indicating that a substantial proportion of participants perceived their sleep as unsatisfactory. Difficulties initiating sleep were also common, as only 16.4% reported no sleep latency problems, while more than half experienced mild difficulty falling asleep. Daytime dysfunction was evident, with almost one-third reporting that sleep-related problems caused at least some impairment in daytime activities. In contrast, habitual sleep efficiency appeared relatively preserved, with almost two-thirds of students maintaining sleep efficiency above 85%. The least affected component was sleep medication use, as the vast majority of participants (91.8%) reported not using sleep medication. These findings align with previous studies (Binjabr et al., 2023; Ahmed et al., 2024).

Perceived stress was the most strongly associated independent predictor of poor sleep quality. Both moderate and high perceived stress were associated with substantially elevated odds, with over 60% of participants reporting moderate or high stress levels. These findings are consistent with established research linking stress to disrupted sleep through hypothalamic-pituitary-adrenal (HPA) axis dysregulation and sympathetic nervous system arousal (Leistner & Menke, 2020), though these pathways were not directly measured in this study. It should be noted that anxiety and depression, which may partially mediate this relationship, were not assessed and represent important confounders for future research. Evidence-based interventions, including cognitive behavioral therapy for insomnia (CBT-I) and mindfulness-based stress reduction (MBSR), have demonstrated efficacy in improving perceived stress and sleep quality among university students (Amanvermez et al., 2023).

Obesity was associated with substantially elevated odds of poor sleep (AOR = 6.773), with a graded pattern from 47.3% poor sleep prevalence at normal BMI to 84.0% among obese students. Potential mechanisms proposed in the literature include obesity-related obstructive sleep apnea, low-grade systemic inflammation, and bidirectional hormonal pathways (Esmaeili et al., 2025; Tong et al., 2023; Al-Horani et al., 2023), though none were measured in this study. Chronic illness was associated with nearly four-fold higher odds of poor sleep (AOR = 3.855), with 87.3% of affected students classified as poor sleepers. The bidirectional relationship between chronic disease and sleep disruption is well-established (McKinley et al., 2022).

Dormitory residency was associated with markedly higher odds of poor sleep quality (AOR = 4.188), with 74.6% of dormitory residents classified as poor sleepers. Environmental factors documented in dormitory settings—including noise, artificial light, irregular peer schedules, and thermal discomfort (Meng et al., 2020)—may contribute to this finding. Randomized trial evidence supports dormitory-level interventions targeting acoustic management and lighting (Li et al., 2022). Paid employment was associated with the highest odds ratio among binary predictors (AOR = 4.591), with approximately 82% of working students classified as poor sleepers, consistent with the dual burden of academic and occupational demands (Pérez et al., 2024).

Higher physical activity levels were associated with substantially reduced odds of poor sleep, exhibiting a graded pattern (low: reference; moderate: AOR = 0.439; high: AOR = 0.208). This is consistent with a network meta-analysis of 86 randomized controlled trials supporting aerobic exercise as an effective sleep intervention (Liang et al., 2025). Despite this, only 22.3% of the current sample reported high physical activity. Problematic smartphone use was independently associated with 64.9% higher odds of poor sleep (AOR = 1.649) and was prevalent in 69.0% of students. Pre-sleep dairy consumption was associated with lower odds of poor sleep (AOR = 0.409), a finding consistent with proposed mechanisms involving tryptophan-mediated melatonin synthesis (St-Onge et al., 2023). Pre-sleep caffeine intake was an independent risk predictor (AOR = 1.677), consistent with its adenosine receptor antagonist properties (Gardiner et al., 2025). Age, gender, financial status, and academic discipline were not significantly associated with sleep quality, suggesting that universal rather than demographic-targeted interventions may be appropriate.

The findings support a multi-level intervention framework. At the individual level, evidence-based strategies addressing perceived stress, physical inactivity, problematic smartphone use, caffeine intake, and dietary practices could be integrated into student health services. At the environmental level, dormitory improvements in acoustics, lighting, and thermal comfort—measures with established trial-based efficacy (Meng et al., 2020)—are recommended. At the institutional level, flexible scheduling for employed students, academic counseling, and resilience-focused curricula may be beneficial. These recommendations are preliminary and require confirmation through longitudinal and intervention research.

CONCLUSIONS:

This study provides the first comprehensive, multi-disciplinary investigation of poor sleep quality across five health professions disciplines at two public universities in the Kurdistan Region of Iraq. Poor sleep quality was identified in 60.7% of participants, with perceived stress, obesity, dormitory residency, employment, chronic illness, and low physical activity emerging as the strongest independent predictors. Physical activity and pre-sleep dairy consumption were independently associated with reduced odds of poor sleep. These findings highlight the importance of multi-level, evidence-based interventions targeting modifiable lifestyle and environmental determinants of sleep quality in this high-risk population.

Limitations

Several limitations must be acknowledged. The cross-sectional design precludes causal inference; all associations should be interpreted accordingly. All measures were self-reported, introducing potential recall and social desirability bias. The PSQI provides validated subjective assessment but does not replace objective measurements such as actigraphy or polysomnography. The sample was limited to two public universities in the Kurdistan Region, restricting generalizability to other Iraqi regions and private institutions. The voluntary response sampling approach and response rate of 17.4% introduce non-response bias. First-year students were excluded, limiting generalizability during a critical academic transition period. Key confounders—including anxiety, depression, academic workload, medication use, and screen time duration—were not measured, and their absence may partially explain the large AOR values observed. The SAS-SV Kurdish version has not been formally psychometrically validated.

Research Contribution:

This study constitutes the first multi-institutional, multi-disciplinary baseline epidemiological study of sleep quality across all major health professions in the Kurdistan Region of Iraq. The findings contribute nationally and regionally relevant evidence on the sociodemographic, health-related, and lifestyle predictors of poor sleep quality, and offer a framework for evidence-based, multi-level interventions within health professions education. The study provides a foundation for future longitudinal and interventional research targeting sleep health in this underserved population.

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TABLES:

Table (1): Sociodemographic Characteristics of Study Participants (N = 871)

Variable	Category	n (%)	Mean ± SD
Age (years)	< 20 years	182 (20.9)	21.13 ± 2.09
	20–25 years	654 (75.1)	
	> 25 years	35 (4.0)	
Gender	Female	470 (54.0)	—
	Male	401 (46.0)	
Academic Discipline	Medicine	245 (28.1)	—
	Dentistry	138 (15.8)	
	Pharmacy	122 (14.0)	
	Nursing	199 (22.8)	
	Health Sciences	167 (19.2)	
Residency Status	Living with Family	445 (51.1)	—
	University Dormitory	426 (48.9)	
Financial Status	Insufficient	237 (27.2)	—
	Barely Sufficient	470 (54.0)	
	Sufficient	164 (18.8)	
Employment Status	Not Working	815 (93.6)	—
	Working	56 (6.4)	

SD = Standard Deviation.

Table (2): Health-Related Characteristics of Study Participants (N = 871)

Variable	Category	n (%)	Mean ± SD
BMI (kg/m²)	Underweight	49 (5.6)	25.13 ± 3.35
	Normal	391 (44.9)	
	Overweight	300 (34.4)	
	Obese	131 (15.0)	
Chronic Health Condition	No	800 (91.8)	—
	Yes	71 (8.2)	
Perceived Stress (PSS-10)	Low	330 (37.9)	18.18 ± 7.43
	Moderate	334 (38.3)	
	High	207 (23.8)	

PSS-10 = Perceived Stress Scale-10; SD = Standard Deviation.

Table (3): Lifestyle Characteristics of Study Participants (N = 871)

Variable	Category	n (%)	Mean ± SD
Pre-sleep Caffeine Intake	No	679 (78.0)	—
	Yes	192 (22.0)	
Pre-sleep Dairy Consumption	No	704 (80.8)	—
	Yes	167 (19.2)	
Smoking	No	761 (87.4)	—
	Yes	110 (12.6)	
Alcohol Intake	No	829 (95.2)	—
	Yes	42 (4.8)	
Problematic Smartphone Use (SAS-SV)	Non-problematic	270 (31.0)	38.37 ± 14.95
	Problematic	601 (69.0)	
Physical Activity (IPAQ-SF)	Low (< 600 MET-min/wk)	302 (34.7)	1,603 ± 1,144 MET-min/wk
	Moderate	375 (43.1)	
	High (≥ 3,000 MET-min/wk)	194 (22.3)	

SAS-SV = Smartphone Addiction Scale–Short Version; IPAQ-SF = International Physical Activity Questionnaire–Short Form; MET = Metabolic Equivalent of Task; SD = Standard Deviation.

Table (4): Distribution of PSQI Component Scores Among Study Participants (N = 871)

PSQI Component	Category	n (%)	Mean ± SD
1. Subjective Sleep Quality	Very Good	175 (20.1)	1.45 ± 1.01
	Fairly Good	290 (33.3)	
	Fairly Bad	249 (28.6)	
	Very Bad	157 (18.0)	
2. Sleep Latency	No Difficulty	143 (16.4)	1.30 ± 0.93
	Mild Difficulty	463 (53.2)	
	Moderate Difficulty	124 (14.2)	
	Severe Difficulty	141 (16.2)	
3. Sleep Duration	≥ 7 hours	162 (18.6)	1.49 ± 1.05
	6–7 hours	327 (37.5)	
	5–6 hours	177 (20.3)	
	< 5 hours	205 (23.5)	
4. Habitual Sleep Efficiency	≥ 85%	534 (61.3)	0.53 ± 0.75
	75–84%	224 (25.7)	
	65–74%	100 (11.5)	
	< 65%	13 (1.5)	
5. Sleep Disturbances	None in Past Month	108 (12.4)	1.09 ± 0.59
	< Once a Week	591 (67.9)	
	1–2 Times a Week	161 (18.5)	
	≥ 3 Times a Week	11 (1.3)	
6. Sleep Medication Use	None in Past Month	800 (91.8)	0.10 ± 0.34
	< Once a Week	59 (6.8)	
	1–2 Times a Week	12 (1.4)	
7. Daytime Dysfunction	No Problem	232 (26.6)	1.21 ± 1.04
	Very Slight Problem	382 (43.9)	
	Somewhat a Problem	96 (11.0)	

	Very Big Problem	161 (18.5)	
Global Sleep Quality (PSQI)	Good (PSQI ≤ 5)	342 (39.3)	7.04 ± 3.45
	Poor (PSQI > 5)	529 (60.7)	

PSQI = Pittsburgh Sleep Quality Index. Each component is scored 0–3 (higher scores indicate worse sleep). SD = Standard Deviation.

Table (5): Association Between Sociodemographic Characteristics and Global Sleep Quality (N = 871)

Variable	Category	Poor Sleep n (%)	Good Sleep n (%)	χ² (df)	p-value	Cramér's V
Age Group	< 20 years	108 (59.3)	74 (40.7)	0.430 (2)	0.807	0.022
	20–25 years	401 (61.3)	253 (38.7)			
	> 25 years	20 (57.1)	15 (42.9)			
Gender	Female	277 (58.9)	193 (41.1)	1.385 (1)	0.239	0.040
	Male	252 (62.8)	149 (37.2)			
Academic Discipline	Medicine	157 (64.1)	88 (35.9)	4.805 (4)	0.308	0.074
	Dentistry	86 (62.3)	52 (37.7)			
	Pharmacy	64 (52.5)	58 (47.5)			
	Nursing	121 (60.8)	78 (39.2)			
	Health Sciences	101 (60.5)	66 (39.5)			
Residency	Family	211 (47.4)	234 (52.6)	67.682 (1)	< 0.001	0.279
	Dormitory	318 (74.6)	108 (25.4)			
Financial Status	Insufficient	149 (62.9)	88 (37.1)	2.458 (2)	0.293	0.053
	Barely Sufficient	289 (61.5)	181 (38.5)			
	Sufficient	91 (55.5)	73 (44.5)			
Employment	Not Working	483 (59.3)	332 (40.7)	11.502 (1)	0.001	0.115
	Working	46 (82.1)	10 (17.9)			

χ² = Pearson chi-square; df = degrees of freedom; Cramér's V = effect size.

Table (6): Association Between Health-Related Characteristics and Global Sleep Quality (N = 871)

Variable	Category	Poor Sleep n (%)	Good Sleep n (%)	χ² (df)	p-value	Cramér's V
BMI Category	Underweight	24 (49.0)	25 (51.0)	72.823 (3)	< 0.001	0.289
	Normal	185 (47.3)	206 (52.7)			
	Overweight	210 (70.0)	90 (30.0)			
	Obese	110 (84.0)	21 (16.0)			
Chronic Illness	No	467 (58.4)	333 (41.6)	22.917 (1)	< 0.001	0.162
	Yes	62 (87.3)	9 (12.7)			
Perceived Stress	Low	102 (30.9)	228 (69.1)	199.623 (2)	< 0.001	0.479
	Moderate	257 (76.9)	77 (23.1)			
	High	170 (82.1)	37 (17.9)			

χ² = Pearson chi-square; df = degrees of freedom; Cramér's V = effect size.

Table (7): Association Between Lifestyle Characteristics and Global Sleep Quality (N = 871)

Variable	Category	Poor Sleep n (%)	Good Sleep n (%)	χ^2 (df)	p-value	Cramér's V
Pre-sleep Caffeine	No	397 (58.5)	282 (41.5)	6.635 (1)	0.010	0.087
	Yes	132 (68.8)	60 (31.3)			
Pre-sleep Dairy	No	456 (64.8)	248 (35.2)	25.104 (1)	< 0.001	0.170
	Yes	73 (43.7)	94 (56.3)			
Smoking	No	440 (57.8)	321 (42.2)	21.487 (1)	< 0.001	0.157
	Yes	89 (80.9)	21 (19.1)			
Alcohol Intake	No	504 (60.8)	325 (39.2)	0.027 (1)	0.869	0.006
	Yes	25 (59.5)	17 (40.5)			
Smartphone Use	Non-problematic	144 (53.3)	126 (46.7)	8.989 (1)	0.003	0.102
	Problematic	385 (64.1)	216 (35.9)			
Physical Activity	Low	244 (80.8)	58 (19.2)	86.581 (2)	< 0.001	0.315
	Moderate	204 (54.4)	171 (45.6)			
	High	81 (41.8)	113 (58.2)			

χ^2 = Pearson chi-square; df = degrees of freedom; Cramér's V = effect size.

Table (8): Binary Logistic Regression: Independent Predictors of Poor Global Sleep Quality (N = 871)

Variable / Category	B	SE	Wald	AOR	95% CI Lower	95% CI Upper	p-value
Dormitory (Ref. = Family)	1.432	0.195	54.070	4.188	2.859	6.134	< 0.001
Overweight (Ref. = Normal BMI)	1.277	0.215	35.393	3.584	2.354	5.458	< 0.001
Obese (Ref. = Normal BMI)	1.913	0.334	32.724	6.773	3.517	13.045	< 0.001
Underweight (Ref. = Normal BMI)	0.252	0.380	0.439	1.287	0.611	2.711	0.507
Pre-sleep Caffeine (Ref. = No)	0.517	0.263	3.872	1.677	1.002	2.808	0.049
Pre-sleep Dairy (Ref. = No)	−0.893	0.259	11.865	0.409	0.246	0.680	0.001
Smoking (Ref. = No)	0.489	0.315	2.414	1.631	0.880	3.023	0.120
Smartphone Use (Ref. = No)	0.500	0.198	6.369	1.649	1.118	2.432	0.012
Chronic Illness (Ref. = No)	1.349	0.457	8.703	3.855	1.573	9.450	0.003
Employment (Ref. = Not Working)	1.524	0.454	11.291	4.591	1.887	11.167	0.001
Moderate Stress (Ref. = Low Stress)	1.931	0.213	82.272	6.895	4.543	10.465	< 0.001
High Stress (Ref. = Low Stress)	1.879	0.285	43.579	6.549	3.748	11.441	< 0.001
Moderate Activity (Ref. = Low Activity)	−0.823	0.260	10.027	0.439	0.264	0.731	0.002
High Activity (Ref. = Low Activity)	−1.570	0.273	33.013	0.208	0.122	0.355	< 0.001

AOR = Adjusted Odds Ratio; B = unstandardized logistic regression coefficient; SE = Standard Error; CI = Confidence Interval; Ref. = Reference category. Dependent variable: 0 = good sleep quality (PSQI ≤ 5), 1 = poor sleep quality (PSQI > 5). AOR > 1.0 = increased odds of poor sleep; AOR < 1.0 = protective association. Model fit: Omnibus $\chi^2(14) = 421.996$, $p < 0.001$; Nagelkerke $R^2 = 0.520$; Cox & Snell $R^2 = 0.384$; classification accuracy = 79.3%; VIF < 5 for all predictors.