Section: Community Medicine

Original Research Article

SLEEP DISTURBANCE, PHYSICAL ACTIVITY, ANXIETY AND DEPRESSIVE SYMPTOMS AMONG UNDERGRADUATE MEDICAL STUDENTS IN ANDHRA PRADESH, INDIA: AN ANALYTICAL CROSS-SECTIONAL STUDY

Bharghavi Sikhakolli[1], Harika Siddabathula[2], Ramalakshmi Makineedi[3], Sai Kiran Santosh Pissey[3], Naidana Parthasarathy[4], Uthakalla Vijayakumar[5]

[1]Undergraduate Medical Student, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, India
[2]Assistant Professor, Department of Community Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, India
[3]Assistant Professor, Department of Community Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, India
[4]Professor and Head, Department of Community Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, India
[5]Professor, Department of Community Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, India

Received *: 29/07/2026*
Received in revised form *: 25/08/2026*
Accepted *: 29/08/2026*

Corresponding Author:
Dr. Harika Siddabathula,
Assistant Professor, Department of Community Medicine, Alluri Sitarama Raju Academy of Medical Sciences, Eluru, Andhra Pradesh, India.
Email: harika_grace@yahoo.com

DOI: 10.70034/ijmedph.2026.3.270

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (3); 1699-1704

ABSTRACT

Background: Sleep disturbance and low physical activity are modifiable correlates of psychological distress among medical students. Evidence evaluating these domains together remains limited.

Materials and Methods: This analytical cross-sectional study included 220 MBBS students aged 18–25 years at a private medical college in Eluru, Andhra Pradesh. Anxiety and depressive symptoms were measured using the Hospital Anxiety and Depression Scale. Physical activity and sleep disturbance were evaluated using prespecified operational indices derived from items adapted from the IPAQ-Short Form and Pittsburgh Sleep Quality Index. Associations were examined using chi-square tests, crude prevalence ratios (PRs), Cramér's V and Spearman correlations.

Results: Higher sleep disturbance (operational score ≥5) was present in 103 students (46.8%), while 123 (55.9%) and 100 (45.5%) screened positive for anxiety and depression. Anxiety was more prevalent among students with higher versus lower sleep disturbance (73.8% vs 40.2%; PR 1.84, 95% CI 1.43–2.36; $p<0.001$; $V=0.329$). The association with depression was weaker and not statistically significant (52.4% vs 39.3%; PR 1.33, 95% CI 1.00–1.78; $p=0.070$). Sleep-disturbance scores correlated with anxiety ($\rho=0.426$) and depression ($\rho=0.284$), and anxiety too correlated with depression ($\rho=0.554$; all $p<0.001$). Physical-activity categories were not associated with either outcome.

Conclusion: Sleep disturbance showed a more consistent relationship with psychological symptoms than the operational physical-activity measure. The findings support sleep-health education and mental-health services; causal inference remains limited by the cross-sectional design and nonstandard indices.

Keywords: Anxiety; Cross-sectional studies; Depression; India; Medical students; Physical activity; Sleep disturbance.

INTRODUCTION

Medical training coincides with late adolescence and early adulthood, a period of substantial academic, social and developmental change. Medical students additionally face dense curricula, frequent examinations, clinical responsibilities and repeated exposure to illness and death. Systematic reviews have documented a considerable burden of depression, anxiety, psychological distress and suicidal ideation in this population.[1–3] These symptoms may impair concentration, motivation, academic performance and empathy, yet stigma and

concerns about confidentiality can delay help-seeking.[1–3]

Sleep is central to learning, memory consolidation, emotional regulation and physical recovery. Irregular schedules, examination-related sleep loss and late-night screen exposure are common in medical training. Across university and medical-student populations, poorer sleep has been consistently associated with anxiety, depressive symptoms and stress.[4–8] Recent studies in medical students have likewise reported frequent co-occurrence of disturbed sleep and psychological symptoms.[5,6]

Physical activity may support mental well-being through neurobiological, behavioural and social pathways. The World Health Organization recommends at least 150–300 minutes of moderate-intensity aerobic activity, 75–150 minutes of vigorous activity, or an equivalent combination each week for adults.[9] Nevertheless, prolonged study hours and sedentary routines may constrain opportunities for regular activity among medical students.

Indian evidence remains heterogeneous, and data from Andhra Pradesh evaluating physical activity, sleep disturbance, anxiety and depressive symptoms within the same undergraduate medical-student sample are limited. Examining these domains together may help institutions identify practical, modifiable targets for student-wellness programmes. Accordingly, this study aimed to examine the relationship of physical activity and sleep disturbance with anxiety and depressive symptoms among undergraduate medical students.

Objectives

- To assess physical activity, sleep quality, anxiety and depression among undergraduate medical students.
- To determine whether physical activity level and sleep quality are associated with screen-positive anxiety and depression.
- To examine correlations among physical activity, sleep disturbance, anxiety and depression scores.
- To compare these scores across selected sociodemographic groups.

MATERIALS AND METHODS

Study design, setting and reporting: An analytical cross-sectional study was conducted at Alluri Sitarama Raju Academy of Medical Sciences, a private teaching medical college in Eluru, Andhra Pradesh, India, during one month between June and July 2026. The report was prepared with reference to the STROBE recommendations for cross-sectional studies.[16]

Participants and eligibility: The source population comprised MBBS students from first through final year. Students aged 18–25 years who were present during data collection, willing to participate and able to provide written informed consent were eligible. Students reporting a previously diagnosed psychiatric disorder, current psychiatric treatment or sleep-medication use, or a chronic illness likely to substantially affect sleep or physical activity were excluded.

Sample size and sampling: The sample size was calculated using the single-proportion formula $n=Z^2p(1-p)/d^2$. With $Z=1.96$, an anticipated prevalence of poor sleep of 83% from a previous medical-student study,[10] and an absolute precision of 5%, the minimum sample size was 217. A total of 220 students were enrolled through convenience sampling until the target was reached.

Questionnaire and data collection: Data were collected using a pilot-tested, semi-structured self-administered questionnaire covering sociodemographic characteristics, physical activity, sleep disturbance, anxiety and depressive symptoms. Participation was voluntary; no personal identifiers were collected. Completed questionnaires were checked for missing responses and logical inconsistencies before data entry.

Operational physical-activity measure: Physical activity was assessed using seven questions adapted from the International Physical Activity Questionnaire-Short Form (IPAQ-SF).[11] Standard activity-specific MET constants were considered for walking (3.3 METs), moderate activity (4.0 METs) and vigorous activity (8.0 METs). However, complete numerical duration data needed for standard IPAQ MET-minutes/week scoring were not available for all participants. Accordingly, participants were classified as having lower, moderate or higher activity using the study's prespecified operational scoring sheet. This classification is not equivalent to standard IPAQ-SF scoring and is interpreted as an investigator-defined ordinal measure. Fifteen responses were incomplete or uncertain, leaving 205 participants for physical-activity analyses.

Operational sleep-disturbance measure: Sleep was assessed using ten questions adapted from domains covered by the Pittsburgh Sleep Quality Index (PSQI).[12] Nine frequency-coded disturbance items were summed using the prespecified study scoring sheet; higher scores indicated greater sleep disturbance. Scores were grouped as lower (0–4), moderate (5–9) and higher (≥10), and a score of ≥5 defined a higher sleep-disturbance category for dichotomous analyses. Because the complete seven-component PSQI algorithm was not administered, this variable is an operational sleep-disturbance index and must not be interpreted as the validated PSQI global score.

Anxiety and depressive symptoms: Anxiety and depressive symptoms were assessed using the 14-item Hospital Anxiety and Depression Scale (HADS).[13] Each seven-item subscale ranges from 0 to 21. Scores were classified as normal (0–7), borderline (8–10) or abnormal (11–21); a score of ≥8 was considered screen-positive. These categories indicate symptom burden and do not establish a psychiatric diagnosis.

Statistical analysis: Data were analysed using IBM SPSS Statistics version 31.0. Categorical variables are presented as frequencies and percentages; continuous variables are presented as mean±standard deviation or median with interquartile range, as appropriate. Prevalence estimates are accompanied by 95% confidence intervals. Associations between ordinal physical-activity category and screen-positive outcomes were examined using Pearson's chi-square test, with Cramér's V as an effect-size measure. Two-by-two sleep-disturbance analyses used continuity-corrected chi-square tests; crude prevalence ratios and 95% confidence intervals were calculated from the corresponding contingency tables. Spearman's rank correlation assessed score-level relationships. Missing observations were handled by complete-case analysis for each comparison, without imputation. Tests were two-sided, and $p<0.05$ was considered statistically significant. Because analyses were exploratory, no multiplicity adjustment was applied, and results were interpreted using effect sizes and confidence intervals rather than p-values alone.

Ethical considerations: The Institutional Ethics Committee of Alluri Sitarama Raju Academy of Medical Sciences approved the study (ASRAMS BHR EC Approval No. 046/2026; approval date: 24-06-2026). Written informed consent was obtained from all participants. Confidentiality, anonymity and the right to withdraw without academic consequences were maintained throughout the study.

RESULTS

A total of 220 undergraduate medical students were included. The mean age was 20.63±1.15 years. Most participants were female (76.4%), lived in hostels (75.9%) and were in the third year of MBBS (82.7%) [Table 1].

Table 1: Sociodemographic characteristics of participants (N=220)

Characteristic	Category	n	%
Age (years)	Mean ± SD	20.63 ± 1.15	—
Sex	Female	168	76.4
	Male	52	23.6
Residence	Hostel	167	75.9
	Home	39	17.7
	Paying-guest accommodation	14	6.4
Academic year	First year	11	5.0
	Second year	17	7.7
	Third year	182	82.7
	Final year	10	4.5

Among 205 students with classifiable physical-activity data, 87 had lower activity, 88 moderate activity and 30 higher activity. Fifteen responses were missing or uncertain. The median operational physical-activity score was 6.0 (IQR 4.0–9.0). Higher sleep disturbance (score ≥5) was present in 103 students (46.8%; 95% CI 40.3–53.4%), and the median sleep-disturbance score was 4.0 (IQR 1.0–8.2). Screen-positive anxiety and depression were present in 123 (55.9%; 95% CI 49.3–62.3%) and 100 students (45.5%; 95% CI 39.0–52.1%), respectively [Table 2].

Table 2: Distribution of operational activity, sleep disturbance, anxiety and depressive symptoms

Measure	Category	n	%
Operational physical activity	Lower	87	39.5
	Moderate	88	40.0
	Higher	30	13.6
	Missing/uncertain	15	6.8
Operational sleep disturbance	Lower (0–4)	117	53.2
	Moderate (5–9)	63	28.6
	Higher (≥10)	40	18.2
Anxiety	Normal (0–7)	97	44.1
	Borderline (8–10)	64	29.1
	Abnormal (11–21)	59	26.8
	Screen-positive (HADS-A ≥8)	123	55.9
Depression	Normal (0–7)	120	54.5
	Borderline (8–10)	72	32.7
	Abnormal (11–21)	28	12.7
	Screen-positive (HADS-D ≥8)	100	45.5

Screen-positive anxiety was similarly distributed across lower, moderate and higher physical-activity categories (54.0%, 56.8% and 50.0%, respectively; $\chi^2=0.44$, df=2, p=0.802; Cramér's V=0.046). Screen-positive depression was present in 48.3%, 44.3% and 36.7% of these categories, respectively, with no statistically significant difference ($\chi^2=1.23$, df=2, p=0.539; Cramér's V=0.078) [Table 3].

Table 3: Operational physical-activity category and screen-positive anxiety and depression (N=205)

Activity category	Anxiety absent n (%)	Anxiety present n (%)	Depression absent n (%)	Depression present n (%)
Lower	40 (46.0)	47 (54.0)	45 (51.7)	42 (48.3)
Moderate	38 (43.2)	50 (56.8)	49 (55.7)	39 (44.3)
Higher	15 (50.0)	15 (50.0)	19 (63.3)	11 (36.7)

Note: Global association: anxiety χ^2=0.44, df=2, p=0.802, Cramér's V=0.046; depression χ^2=1.23, df=2, p=0.539, Cramér's V=0.078.

Screen-positive anxiety was substantially more frequent among students in the higher sleep-disturbance category than among those in the lower category (73.8% vs 40.2%; crude PR=1.84, 95% CI 1.43–2.36; continuity-corrected χ^2=23.76, p<0.001; Cramér's V=0.329). Depression was also more frequent in the higher category (52.4% vs 39.3%), although the association was weaker and did not reach statistical significance (crude PR=1.33, 95% CI 1.00–1.78; continuity-corrected χ^2=3.29, p=0.070; Cramér's V=0.122) [Table 4].

Table 4: Higher sleep disturbance and screen-positive anxiety and depression (N=220)

Sleep-disturbance category	Anxiety present n/N (%)	Crude PR (95% CI)	Depression present n/N (%)	Crude PR (95% CI)
Lower (<5)	47/117 (40.2)	Reference	46/117 (39.3)	Reference
Higher (≥5)	76/103 (73.8)	1.84 (1.43–2.36)	54/103 (52.4)	1.33 (1.00–1.78)

Note: PR, prevalence ratio. Anxiety: continuity-corrected χ^2=23.76, p<0.001, Cramér's V=0.329. Depression: continuity-corrected χ^2=3.29, p=0.070, Cramér's V=0.122. Confidence intervals are unadjusted.

Physical-activity, sleep-disturbance and anxiety scores did not differ significantly by sex. None of the four study scores differed significantly by age group, residence or academic stage. Female students had a higher median depression score than male students [7.0 (IQR 4.0–9.0) versus 5.0 (IQR 3.0–8.0), p=0.035] [Table 5].

Table 5: Comparison of study scores according to sociodemographic characteristics

Characteristic	Category	N	Physical activity median (IQR)	p	Sleep median (IQR)	p	Anxiety median (IQR)	p	Depression median (IQR)	p
Gender	Female	156	6.0 (3.0–9.0)	0.157	4.0 (1.0–9.0)	0.361	8.0 (5.0–11.0)	0.078	7.0 (4.0–9.0)	0.035
	Male	48	6.5 (4.8–9.0)		3.0 (1.0–6.0)		7.0 (5.0–9.0)		5.0 (3.0–8.0)	
Age group	≤20 years	103	7.0 (4.0–9.0)	0.520	5.0 (2.0–9.0)	0.074	8.5 (5.0–11.0)	0.562	7.0 (4.0–10.0)	0.211
	>20 years	102	6.0 (4.0–9.0)		3.0 (1.0–7.2)		8.0 (5.0–10.0)		7.0 (3.0–9.0)	
Residence	Hosteller/PG	168	6.0 (4.0–9.0)	0.350	4.0 (1.0–8.0)	0.824	8.0 (5.0–11.0)	0.603	7.0 (4.0–9.0)	0.721
	Home	37	7.0 (4.0–9.0)		5.0 (0.5–8.5)		8.0 (5.5–10.0)		8.0 (4.5–9.0)	
Academic stage	Preclinical (1st–2nd)	25	7.0 (3.0–9.0)	0.659	5.0 (2.0–6.5)	0.402	8.0 (5.0–11.2)	0.853	7.5 (4.8–9.2)	0.334
	Clinical	180	6.0 (4.0–9.0)		4.0 (1.0–9.0)		8.0 (5.0–11.0)		7.0 (4.0–9.0)	

Note: Values are median (IQR). Mann–Whitney U tests were used. Available-case denominators varied slightly because physical-activity data were incomplete.

At score level, sleep disturbance had a moderate positive correlation with anxiety (ρ=0.426, p<0.001) and a weak positive correlation with depression (ρ=0.284, p<0.001). Anxiety and depression scores were strongly correlated (ρ=0.554, p<0.001). The operational physical-activity score was not significantly correlated with sleep disturbance, anxiety or depression [Table 6].

Table 6: Spearman correlations among study scores

Variable 1	Variable 2	N	Spearman's ρ	p-value
Operational physical-activity score	Sleep-disturbance score	205	0.044	0.531
Operational physical-activity score	HADS-Anxiety score	205	0.117	0.095
Operational physical-activity score	HADS-Depression score	205	−0.017	0.803
Sleep-disturbance score	HADS-Anxiety score	220	0.426	<0.001
Sleep-disturbance score	HADS-Depression score	220	0.284	<0.001
HADS-Anxiety score	HADS-Depression score	220	0.554	<0.001

DISCUSSION

In this single-centre study, more than half of participants screened positive for anxiety, nearly half screened positive for depressive symptoms and 46.8% were classified in the higher sleep-disturbance category. Sleep disturbance showed the clearest relationship with mental health: students in the higher category had approximately 1.8 times the prevalence of screen-positive anxiety compared with those in the lower category, with a moderate effect size. The categorical association with depression was weaker and did not reach statistical significance, although the continuous sleep-disturbance score correlated positively with both anxiety and depression. The operational physical-activity measure was not associated with either outcome.

Female students had a higher median depression score than male students, whereas the other sex-based comparisons and all comparisons by age group, residence and academic stage were not statistically significant. Because this was an isolated unadjusted finding, the male subgroup was relatively small and the analyses were exploratory, it should be interpreted cautiously.

The observed proportions of screen-positive anxiety and depression are broadly consistent with the substantial symptom burden reported in Indian medical students. A 2024 systematic review and meta-analysis estimated pooled prevalences of approximately 54% for anxiety and 48% for depression among Indian undergraduate medical students.[3] Comparisons require caution because studies differ in sampling, academic context, instruments and thresholds. In the present study, borderline HADS scores were included as screen-positive; the results therefore represent symptoms warranting further assessment rather than confirmed psychiatric disorders.

The association between greater sleep disturbance and anxiety is consistent with earlier medical-student research.[5–8,15] Sleep loss may impair emotional regulation, increase irritability and reduce coping capacity, whereas worry and rumination may delay sleep onset and fragment sleep. The relationship is likely bidirectional. The difference between the nonsignificant dichotomous sleep–depression comparison and the significant score-level correlation is also plausible: categorising a continuous construct discards information and may reduce statistical power, while the full score can detect a gradual relationship across the distribution.

Physical activity was not significantly related to anxiety or depressive symptoms in this sample. This finding should not be interpreted as evidence that physical activity lacks mental-health benefit. Prospective evidence supports an inverse association between physical activity and incident depression.[14] The null finding may instead reflect exposure misclassification from the operational activity score, incomplete duration data, limited power within the higher-activity category, or residual confounding. Studies using complete IPAQ-SF scoring or objective accelerometry would provide more reliable estimates.

The findings have practical implications but do not justify causal claims. Medical colleges could incorporate sleep-health education, support during examination periods, confidential psychological screening and clearly signposted counselling and referral pathways. Screening should be voluntary, confidential and linked to clinical assessment rather than used as a diagnostic label. Protected opportunities for physical activity remain reasonable as part of broader student-wellness programmes despite the null association observed here.

The study's strengths include simultaneous evaluation of sleep, physical activity, anxiety and depressive symptoms; reporting of effect sizes and confidence intervals; and both categorical and score-level analyses. Important limitations are the cross-sectional design, single-centre convenience sample, marked imbalance by sex and academic year, self-reported exposures and outcomes, exclusion of students with known psychiatric illness or treatment, lack of adjustment for potential confounders and use of nonstandard operational indices rather than complete IPAQ-SF and PSQI scoring. These limitations restrict causal interpretation, precision and generalisability and may have attenuated or distorted associations.

CONCLUSION

Anxiety, depressive symptoms, and poor sleep were common among the medical students studied. Poor sleep was strongly associated with screen-positive anxiety, and greater sleep disturbance showed a graded relationship with both anxiety and depression. Physical activity was not significantly associated with either mental-health outcome. These findings support the development of comprehensive student-wellness systems in medical colleges, including sleep-hygiene education, confidential periodic screening, accessible counselling, peer and faculty support, crisis intervention, and clear referral pathways. Institutional services should be linked with India's National Mental Health Programme, particularly the District Mental Health Programme and Tele-MANAS, to ensure timely counselling, specialist assessment, referral, and continuity of care. Coordinated institutional and national support may improve early identification, reduce barriers to help-seeking, and enhance students' psychological well-being and academic functioning. Further multicentre longitudinal studies using validated tools, objective sleep and activity measures, and adjusted analyses are needed to clarify causality and independent effects over time.

REFERENCES

1. Rotenstein LS, Ramos MA, Torre M, Segal JB, Peluso MJ, Guille C, et al. Prevalence of depression, depressive

symptoms, and suicidal ideation among medical students: a systematic review and meta-analysis. JAMA. 2016;316(21):2214–2236. doi:10.1001/jama.2016.17324.
2. Quek TTC, Tam WWS, Tran BX, Zhang M, Zhang Z, Ho CSH, et al. The global prevalence of anxiety among medical students: a meta-analysis. Int J Environ Res Public Health. 2019;16(15):2735. doi:10.3390/ijerph16152735.
3. Kaur H, Gupta V, Garg A, Sangeeta, Padhi BK. Prevalence of depression, anxiety, stress and suicide ideation among undergraduate medical students in India: a systematic review and meta-analysis. Natl J Community Med. 2024;15(10):868–883. doi:10.55489/njcm.151020244529.
4. Gardani M, Bradford DRR, Russell K, Allan S, Beattie L, Ellis JG, et al. A systematic review and meta-analysis of poor sleep, insomnia symptoms and stress in undergraduate students. Sleep Med Rev. 2022;61:101565. doi:10.1016/j.smrv.2021.101565.
5. Vidović S, Rakić N, Kraštek S, Pešikan A, Degmečić D, Zibar L, et al. Sleep quality and mental health among medical students: a cross-sectional study. J Clin Med. 2025;14(7):2274. doi:10.3390/jcm14072274.
6. Verma P, Jani H, Bhanderi P, Patel B, Parlewar R. Association between sleep quality and mental health among medical students: a college-based study in Himachal Pradesh, India. J Pharm Bioallied Sci. 2025;17(Suppl 1):S363–S365. doi:10.4103/jpbs.jpbs_310_25.
7. Huang W, Wen X, Li Y, Luo C. Association of perceived stress and sleep quality among medical students: the mediating role of anxiety and depression symptoms during COVID-19. Front Psychiatry. 2024;15:1272486. doi:10.3389/fpsyt.2024.1272486.
8. Tran DS, Nguyen DT, Nguyen TH, Tran CT, Duong-Quy S, Nguyen TH. Stress and sleep quality in medical students: a cross-sectional study from Vietnam. Front Psychiatry. 2023;14:1297605. doi:10.3389/fpsyt.2023.1297605.
9. Bull FC, Al-Ansari SS, Biddle S, Borodulin K, Buman MP, Cardon G, et al. World Health Organization 2020 guidelines on physical activity and sedentary behaviour. Br J Sports Med. 2020;54(24):1451–1462. doi:10.1136/bjsports-2020-102955.
10. Olarte-Durand M, Roque-Aycachi JB, Rojas-Humpire R, Canaza-Apaza JF, Laureano S, Rojas-Humpire A, et al. Mood and sleep quality in Peruvian medical students during the COVID-19 pandemic. Rev Colomb Psiquiatr (Engl Ed). 2024;53(1):47–54. doi:10.1016/j.rcpeng.2021.11.005.
11. Craig CL, Marshall AL, Sjöström M, Bauman AE, Booth ML, Ainsworth BE, et al. International Physical Activity Questionnaire: 12-country reliability and validity. Med Sci Sports Exerc. 2003;35(8):1381–1395. doi:10.1249/01.MSS.0000078924.61453.FB.
12. Buysse DJ, Reynolds CF III, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. Psychiatry Res. 1989;28(2):193–213. doi:10.1016/0165-1781(89)90047-4.
13. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiatr Scand. 1983;67(6):361–370. doi:10.1111/j.1600-0447.1983.tb09716.x.
14. Schuch FB, Vancampfort D, Firth J, Rosenbaum S, Ward PB, Silva ES, et al. Physical activity and incident depression: a meta-analysis of prospective cohort studies. Am J Psychiatry. 2018;175(7):631–648. doi:10.1176/appi.ajp.2018.17111194.
15. Valladares-Garrido MJ, Morocho-Alburqueque N, Zila-Velasque JP, et al. Sleep quality and associated factors in Latin American medical students: a cross-sectional and multicenter study. BMC Public Health. 2025;25:755. doi:10.1186/s12889-025-21569-y.
16. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP; STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Lancet. 2007;370(9596):1453–1457. doi:10.1016/S0140-6736(07)61602-X.