ORIGINAL RESEARCH

Assessment of perceived stress and sleep quality and their relation with body mass index among medical students: A cross-sectional study

Dr. Suman[1], Dr. Dhananjay Kumar[2], Dr. Jyoti Priya[3], Dr. Rita Kumari[4]

[1]Tutor, Department of Physiology, Nalanda Medical College and hospital, Patna, Bihar, India.
[2]Assistant professor, Department of Neurosurgery, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.
[3]Associate professor, Department of Physiology, Nalanda Medical College and hospital, Patna, Bihar, India.
[4]Professor, Head of Department, Department of Physiology, Nalanda Medical College and hospital, Patna, Bihar, India.

Corresponding Author: Dr. Dhananjay Kumar
Assistant professor, Department of Neurosurgery, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.
Email: drdhananjay16@gmail.com

ABSTRACT
Background: Any uncomfortable emotional experience accompanied by predictable biochemical, physiological, and behavioral changes is the definition of stress. The present study was conducted to assess perceived stress and sleep quality among medical students.
Materials & Methods: 240 medical students of both genders were selected. A self-administered questionnaire was distributed to assess sleep quality using the Pittsburgh Sleep Quality Index (PSQI) and stress level using the Perceived Stress Scale (PSS). Weight, height and BMI was calculated.
Results: Out of 240 students, 110 were males and 130 females. PSQI score <5 was seen in 145, 5-7 in 62 and >7 in 33 students. PSS score 0-13 (low stress) was seen in 72, 14-26 (moderate stress) in 138 and 27-56 (high stress) in 30. The difference was significant (P< 0.05). There was no significant correlation between PSQI distribution and BMI (P> 0.05).
Conclusion: Most of the individuals slept well and experienced modest levels of stress. Nonetheless, a strong relationship between stress level and sleep quality was found. It's interesting to note that there was no relationship between body fat or BMI and sleep quality.
Keywords: Height, Pittsburgh Sleep Quality Index, Perceived Stress Scale

INTRODUCTION

Any uncomfortable emotional experience accompanied by predictable biochemical, physiological, and behavioural changes is the definition of stress. It happens when there is a perceived or actual threat to homeostasis, which can be caused by a number of stressors, including social, financial, academic, and personal issues.[1] High levels of stress (distress) can have detrimental effects on medical students' well-being, such as depression, sleep disturbances, dietary changes, social and environmental adjustments, mood swings, and general mental health issues, even though some stress is thought to be good for learning (favourable stress).[2]

Sleep difficulties are among the most prevalent of them. Stress frequently makes it difficult to get to sleep or stay asleep.[3] Eating habits may alter, resulting in overeating, under eating, or an increase or decrease in appetite. Additionally, stress can exacerbate environmental and social maladjustments, making it harder to sustain relationships and adjust to novel circumstances.[4,5] Understanding

the complex effects of stress on people is crucial, especially for medical students who deal with specific difficulties in both their personal and academic life. In recent decades, there has been increased interest in evaluating sleep quality. Sleep patterns are now considered an important factor in determining young adults' susceptibility to stress. Medical students often experience a reduction in sleep, which can lead to sleep and stress disorders.[6]

AIM AND OBJECTIVES: The present study was conducted to assess perceived stress and sleep quality among medical students.

MATERIALS & METHODS

Study Design: The present study was a prospective, observational and cross-sectional study.

Study Place: The current study was conducted at the Department of Physiology, Nalanda Medical College and Hospital, Patna, Bihar, India.

Study Period: The study was carried out from 10 January 2023 to 8 December 2024.

Study Population

The study was carried out on 240 medical students of both genders who were selected using a stratified random sampling technique, with 80 students from each batch of Nalanda Medical College and Hospital, Patna, Bihar, were included in the study. All gave their written consent to participate in the study after being briefed on the study's purpose and methodology.

Ethical Consideration

The study was approved by the research and ethical committee of the NMCH, Patna.

Inclusion Criteria

- All medical undergraduate students give written informed consent and aged between 18 and 26 years.
- The current study comprised students without a history of chronic illness or sleep disorders, who were communicated effectively, understood the study requirements.
- Available for follow-up.

Exclusion Criteria

- Pregnant females, smokers, or alcoholics, individuals with a history of psychiatric or neurological disorders, individuals with any chronic illness and those not willing were excluded from the study.

Data such as name, age, gender etc. was recorded. A self-administered questionnaire was distributed to assess sleep quality using the Pittsburgh Sleep Quality Index (PSQI) and stress level using the Perceived Stress Scale (PSS). The PSQI was used to assess sleep durations and patterns [9]. Overall, 19 self-rated questions, this self-administered and validated questionnaire yields seven "component" scores, with 0 indicating no difficulty and 3 indicating severe difficulty. Together, the seven component scores were calculated to create a single "global" score, which ranged from 0 to 21 points, with 0 indicating no sleep issues across all of the areas. Subjective sleep quality, sleep latency, length, habitual sleep efficiency, sleep disruptions, usage of sleeping drugs, and daytime dysfunction were the seven PSQI components that were used for examining various aspects of sleep patterns and durations. The PSQI was graded and scored in accordance with its pre-established scoring guidelines. One global score is produced by adding the scores of these seven components. For those with primary insomnia, it has good validity and high test-retest reliability [10].

The PSS-14 was used for assessing the level of stress. The questions cover topics like "coping" and "controlling stress," as well as assessing emotions like "upset" and "stressed." Participants were asked to rate their stress levels on a four-point scale for each item: 0 for never, 1 for almost never, 2 for sometimes, 3 for fairly often, and 4 for very often.

Body Mass Index

The formula of BMI (kg/m2) is-

Body weight (kg) $\div$ [Body height (m) $\times$ Body height (m)]

The World Health Organization (WHO) classifies body mass index (BMI) as follows:

- Underweight: BMI is less than 18.5 kg/m²
- Normal weight: BMI is between 18.5 and 24.9 kg/m²
- Overweight: BMI is between 25 and 29.9 kg/m²
- Obesity class I: BMI is between 30 and 34.9 kg/m²
- Obesity class II: BMI is between 35 and 39.9 kg/m²
- Obesity class III: BMI is greater than or equal to 40 kg/m²

Statistical Analysis

SPSS statistical software, version 25.0, was used to perform the statistical analysis. Categorical

data were shown as numbers and percentages, whereas continuous variables were shown as mean ± SD. The Shapiro-Wilk test was used to determine whether the data was normal. Parametric tests were performed for statistical analysis because the results showed that the data were normally distributed.

The Chi-square test was performed to assess categorical variables, and Pearson correlation was employed to ascertain the degree of association between the variables. A p-value of less than 0.05 was considered statistically significant for all statistical tests.

RESULTS

Table I: Gender wise distribution of participants

Gender	Number of students (n=240), %
Male	110(45.83%)
Female	130(54.17%)

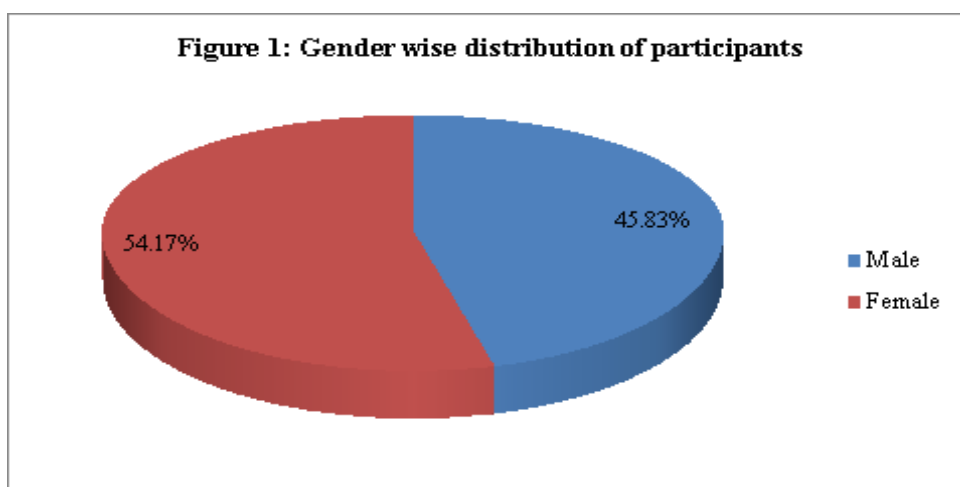Figure 1: Gender wise distribution of participants

Table I and figure 1, shows that out of 240 students, 110(45.83%) were males and 130(54.17%) females.

Table II: Assessment of gender wise grading of PSQI and PSS among the participants

Parameters	Variables	Gender			P value
		Male	**Female**	**Total**	
PSQI score	<5	64 (58.18%)	81 (62.31%)	145 (60.42%)	0.05
	5-7	37 (40.7%)	25 (19.23%)	62 (25.83%)	
	>7	9 (8.18%)	24 (18.46%)	33(13.75%)	
PSS	0-13 (Low stress)	27 (24.54%)	14(10.77%)	72 (17.08%)	0.04
	14-26 (Moderate stress)	68 (61.18%)	94(72.31%)	162(67.50%)	
	27-56 (High stress)	15(13.64%)	22(16.92%)	37(15.42%)	

PSQI= Pittsburgh Sleep Quality Index, PSS=Perceived Stress Scale, Test applied=Chi-square test, p-value <0.05 = significant

It was observed that the PSQI score fell within the range of <5 for 145 (60.42%) subjects, within the range of 5-7 for 62 (25.83%) subjects, and within the range of >7 for 33 (13.75%) subjects [Table II/Fig-2]. The difference in PSQI scores between male and female students was not statistically significant (p=0.50). *It was observed that the* PSS score was 162 (67.50%) subjects fell within the range of 14-26, 72 (17.08%) subjects fell within the range of 0-13, and 37 (1542%) subjects fell within the range of 27-56. Girls had higher perceived stress scores than boys [Table-II, Figure 2]. However, significant difference was observed when comparing the participants' stress with PSS.

Figure 2: Gender wise grading of PSQI and PSS
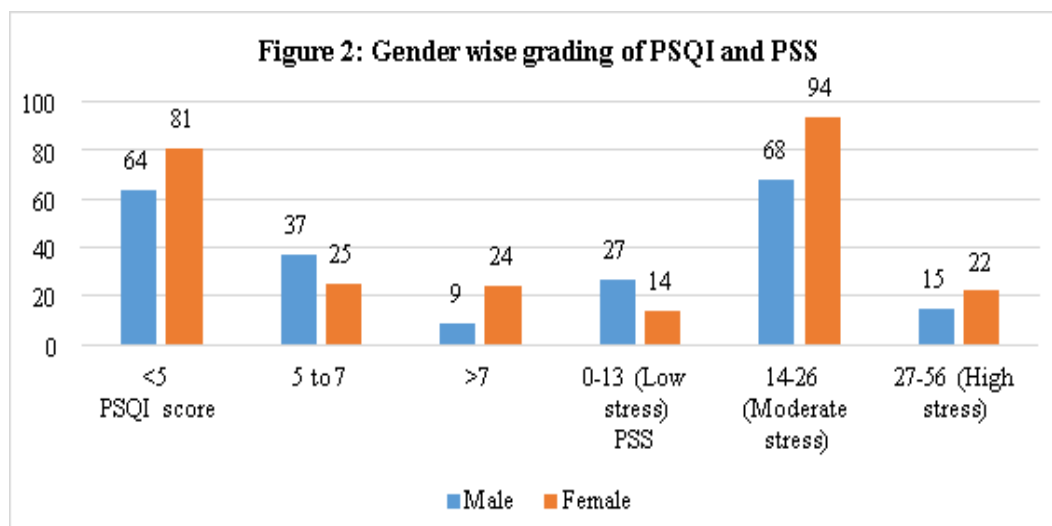
Table III: Correlation of PSQI distribution and BMI

BMI (kg/m2)	PSQI score			P value
	<5	5-7	>7	
<18.5	12	2	4	0.64
18.5-24.9	83	48	24	
<25-29.9	27	16	10	
≥30	20	4	2	
Total	132	70	38	-

Table III, shows that there was no significant correlation between PSQI distribution and BMI (P> 0.05). However, no significant difference was observed when comparing the participants' *BMI* (kg/m^2) with PSQI score.

Table-IV: Relationship between PSS and PSQI with BMI and body fat%.

Parameters (n=240)	Variables	PSQI	PSS
BMI (kg/m^2)	Pearson correlation	-0.072	-0.85
P value		0.40	0.46
Body fat %	Pearson correlation	-0.032	-0.36
P value		0.50	0.63
n=240		PSQI	
PSS	Pearson correlation	0.25	
P value		<0.001	

Test applied=Pearson correlation, p-value <0.05 (Significant)

A statistically significant correlation was observed between PSS and PSQI, with a p-value of <0.001. However, there was no statistically significant correlation between PSQI and PSS with BMI and Body Fat % [Table-IV].

DISCUSSION

Medical education is perceived as being stressful, as it is characterized by many psychological changes in students. Studies have shown that medical students experience a high level of stress during their undergraduate course.[7,8] High level of stress may have a negative effect on cognitive functioning and learning of students in the medical school. Mental health worsens after students begin medical school and remain poor throughout the training.[9,10] The present study was conducted to assess perceived stress and sleep quality among medical students.

We found that out of 240 students, 110 were males and 130 females. Amin et al.[11] assessed the perceived stress level and sleep quality in medical students and correlated the stress and sleep quality with BMI and body fat. Out of the total 200 medical students, 116 (58%) had a PSQI score of 7. The PSS score showed moderate stress (14-26) in 138 (69%) students,

low stress (0-13) in 32 (16%) students, and high statistically significant correlation was observed between PSS and PSQI (p-value=0.001). However, there was no statistically significant correlation observed between PSQI and PSS with BMI and body fat.

We found that PSQI score <5 was seen in 145, 5-7 in 62 and >7 in 33 students. PSS score 0-13 (low stress) was seen in 72, 14-26 (moderate stress) in 138 and 27-56 (high stress) in 30. Vagras PA et al.[12] explored the relationship between body mass index (BMI) and sleep patterns, including duration and disturbances. A convenience sample of 515 college students completed an online survey consisting of the Pittsburgh Sleep Quality Index (PSQI), and self-reported height and weight to calculate BMI. Univariate and multivariate logistic regression analyses were performed using components of the PSQI as predictors of overweight (BMI $\geq$ 25). One-third of the participants had BMI $\geq$ 25, and 51% were poor-quality sleepers (PSQI > 5). Controlling for age and sex, only sleep disturbances were associated with overweight (odds ratio = 1.66, 95% confidence interval [1.08, 2.57]. Sleep disturbances, rather than sleep duration, predicted overweight among young adults.

We found that there was no significant correlation between PSQI distribution and BMI (P> 0.05). Abdulghani HM et al.[13] measured the level of stress according to none, mild, moderate, and severe categories. The prevalence of stress was measured and compared with the five study variables, such as gender, academic year, academic grades, regularity to course attendance, and perceived physical problems. The response rate among the study subjects was 87% (n=892). The total prevalence of stress was 63%, and the prevalence of severe stress was 25%. The prevalence of stress was higher (p<0.5) among females (75.7%) than among males (57%) (Odds ratio=2.3, χ^2=27.2, p<0.0001). The stress significantly decreased as the year of study increased, except for the final year. The study variables, including being female (p<0.0001), year of study (p<0.001), and presence of perceived physical problems (p<0.0001), were found as independent significant risk factors for the outcome variables of stress. Students' grade point average (academic score) or regularity to

stress level (27-40) in 30 (15%) students. A attend classes was not significantly associated with the stress level. The prevalence of stress was higher during the initial three years of study and among the female students. Physical problems are associated with high stress levels. Preventive mental health services, therefore, could be made an integral part of routine clinical services for medical students, especially in the initial academic years, to prevent such occurrence.

LIMITATIONS OF THE STUDY: The shortcoming of the study is small sample size and the study conducted at single centre.

CONCLUSION

Authors found that most of the individuals slept well and experienced modest levels of stress. Nonetheless, a strong relationship between stress level and sleep quality was found. It's interesting to note that there was no relationship between body fat or BMI and sleep quality.

REFERENCES

1. Galland BC, Gray AR, Penno J, Smith C, Lobb C, Taylor RW. Gender differences in sleep hygiene practices and sleep quality in New Zealand adolescents aged 15 to 17 years. Sleep Health. 2017;3(2):77-83.
2. Kalyani N, Jamshidi N, Salami J, Pourjam E. Investigation of the relationship between psychological variables and sleep quality in students of medical sciences. Depress Res Treat. 2017;2017:7143547.

3. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health. 2010;46(2):124-32.

4. Knutson KL, Rarhouz PJ, Yan LL. Intra individual daily and yearly variability in actigraphically recorded sleep measures: The cardia study. Sleep. 2007;30(6):793-96.

5. Alotaibi AD, Alosaimi FM, Alajlan AA, Bin Abdulrahman KA. The relationship between sleep quality, stress, and academic performance among medical students. J Family Community Med. 2020;27(1):23-28.

6. Ranasinghe C, Gamage P, Katulanda P, Andraweera N, Thilakarathne S, Tharanga P. Relationship between Body mass index (BMI) and body fat percentage, estimated by bioelectrical impedance, in a group of Sri Lankan adults: A cross-sectional study. BMC Public Health. 2013;13:797.

7. Buysse DJ, Reynolds CF 3rd, 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.

8. Backhaus J, Junghanns K, Broocks A, Riemann D, Hohagen F. Test-retest reliability and validity of the Pittsburgh sleep quality index in primary insomnia. J Psychosom Res. 2002;53(3):737-40.

9. Andreou E, Alexopoulos EC, Lionis C, Varvogli L, Gnardellis C, Chrousos GP, et al. Perceived stress scale: Reliability and validity study in Greece. Int J Environ. Res. Public Health. 2011;8(8):3287-98.

10. Yussoff MS, Rahim AF, Yaacob MJ. Prevalence and sources of stress among Universiti Sains Malaysia medical students. The Malay J Med Sci. 2010;17(1):30.

11. Amin Y, Mushtaq S, Taj R, Sachdev S, Magray S. Perceived Stress and Sleep Quality among Medical Students and their Relationship with Body Mass Index and Body Fat: A Cross-sectional Study. Journal of Clinical & Diagnostic Research. 2023 Oct 1; 17(10).

12. Vagras PA, Flores M, Robles E. Sleep quality and body mass index in college students. The role of sleep disturbances. J Am Coll Health. 2014;62(8):534-41.

13. Abdulghani HM, AlKanhal AA, Mahmoud ES, Ponnamperuma GG, Alfaris EA. Stress and its effects on medical students: A cross-sectional study at a college of medicine Saudi Arabia. J Health Popul Nutr. 2011;29(5):516-22.