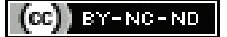


Sleep Quality, Daytime Sleepiness and Mental Health in Undergraduate Medical Students: A Cross-sectional Descriptive Study

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ABSTRACT

Introduction: Sleep deprivation is a growing problem, especially among medical students who must meet high academic standards, as well as, their parent's expectations. Since poor sleep quality and daytime sleepiness have important consequences in the mental health of medical undergraduate students, the management of these problems would begin with and be guided by assessment of these sleep-related and mental health parameters.

Aim: To evaluate the sleep quality and effects of sleep deprivation on the psychological well-being and mental health of undergraduate medical students.

Materials and Methods: This was a cross-sectional descriptive study conducted by Department of Psychiatry, G.S. Medical College and Hospital, Pilkhuwa, Hapur, Uttar Pradesh, India, on undergraduate students, for a period of a month in May 2022. Four hundred medical undergraduate students from 1st, 2nd, 3rd part 1 and 3rd part 2 Bachelor in Medicine and Bachelor in Surgery (MBBS) years, who fulfilled the inclusion and exclusion criteria, were enrolled in the present study after their informed consent was taken. Epworth Sleepiness Scale (EPSS), Pittsburgh Sleep Quality Index (PSQI), Depression Anxiety Stress Scale 21 (DASS-21), and Psychological General Well-Being Index (PGWBI) were used to assess the participants. Sleep quality and sleepiness were correlated with anxiety depression, stress, and subjective

general well-being using Spearman's coefficient with significance at 0.05 and 0.001 levels.

Results: The study participants were in the age group of 17-24 years and majority of the students (n=130, 32.5%) were 20-year-old. Females accounted for near half of the study participants (n=190, 47.5%). Most of the students in the participant group had poor sleep quality with a mean of 6.75±1.811 and issues of daytime sleepiness (10.68±3.481). The DASS-21 revealed severe anxiety (15.5±2.473) and moderate stress (22.89±3.396) levels. Significant positive correlation was seen between the anxiety (r=0.110; p-value <0.05) and stress (r=0.452; p-value <0.01) index with EPSS. A significant positive correlation was found between anxiety (r=0.118, p-value <0.05), stress (r=0.410; p-value <0.01) and psychological well-being (r=0.119; p-value <0.01) and PSQI score.

Conclusion: The study revealed that, many undergraduate medical students in different semesters slept insufficiently and struggled with daytime tiredness. Among the students, higher stress and anxiety levels, along with a low level of subjective psychological well-being were discovered. Additionally, the study revealed higher levels of anxiety and stress in medical undergraduates, who had poorer sleep quality and excessive daytime sleepiness. Also, students with poor quality of sleep had lower psychological general well-being.

Keywords: Anxiety, Depression, Pittsburgh sleep quality index, Psychological

INTRODUCTION

A physiological function that is vital to life is sleep. Its quality is closely related to both physical and mental health as well as other well-being indicators. A person's lifetime risk of stress, anxiety, depression, and other mental disorders may be increased if they report poor sleep quality and other sleep-related disruptions [1].

There are broadly two stages of sleep [2]: Rapid Eye Movement (REM) sleep and Non Rapid Eye Movement (NREM) sleep. Throughout a sleep cycle, which lasts between 90 and 110 minutes, REM and NREM sleep alternate in cycles. Adults often experience four to six cycles each night. People are readily aroused during REM sleep because it resembles an awake state. This is the phase where dreams typically take place. Contrarily, NREM sleep is thought to be the deepest period of sleep. Both heart rate and blood pressure sharply decrease during this stage. NREM sleep is divided into four stages. There is little to no eye movement. NREM sleep stages 1 and 2 are light sleep stages. Stages 3 and 4 of profound sleep are characterised by decreased functioning and brain waves. NREM stages 3 and 4 are essential for the recovery of bodily functions. The development of stronger muscles and bones, the bolstering of the immune system, and the regeneration of new tissue are a few examples of these rejuvenating processes [3,4].

About 75-80% of human sleep is NREM sleep. Inadequate NREM can produce detrimental impacts on emotional health, which can then result in the risk of suffering from and emergence of psychiatric disorders [5]. The quantity of sleep is also crucial and positively correlates with mental and motor acuity. The schedule of classes, especially early morning classes and studying till late night can cause sleep deprivation which affects cognitive performance. It includes the ability to think creatively and make flexible decisions. Daytime somnolence and its inevitable results are also one of the main results of the sleep loss [6].

Students who get too little sleep tend to experience difficulty in sleeping more frequently. According to research by Pace-Schott E et al., over the past 30 years, university students' average sleep duration has significantly dropped [7]. This study shows how much such sleep loss affects the body's systems and organs. Lack of sleep is a widespread issue in society and can have detrimental effects on one's physical and psychological well-being. Young medical students in their early years struggle to get enough sleep since they stay up late to study for exams in medical school and then spend a lot of time in the hospital. Students' stress levels are rising which in turn gives rise to various mental health issues. A recent Indian study examining the sleep quality, daytime sleepiness and the various factors affecting sleep habits of medical undergraduates,

interns and postgraduates in a medical institute found nearly 30% of the study sample having abnormal sleep quality and excessive sleepiness in daytime [8]. One section of the general population that appears to be particularly susceptible to poor sleep is medical students, possibly as a result of their prolonged and intense study schedules. The academic demands of medical school can lead to severe stress. Studies have supported the idea that, the quality of sleep is crucial for both physical and mental health, including an adequate level of neuropsychological functioning [9-11].

The human body needs sleep to function at its best. Important biological functions and mental functions can suffer greatly when sleep is lacking. Unfortunately, lack of sleep is becoming a more widespread problem in modern culture, especially among medical students who must meet high academic standards as well as their parents' expectations. Now-a-days, sleep deprivation is the main contributor to psychiatric disorders, especially among young medical students.

A preliminary assessment of burden of sleep-related problems and their mental health repercussions in medical undergraduate students would guide their management. A study in India assessed the sleep quality and daytime sleepiness in medical undergraduate students [8]. The present study was conducted in a recently established medical college and also added a novel variable- an assessment of mental health parameters. The aim of the study was to evaluate the sleep quality and effects of sleep deprivation on the psychological well-being and mental health of the undergraduate medical students. The primary objective of the study was to evaluate the quality of sleep and daytime sleepiness in undergraduate medical students and the secondary objective of the study was to find a correlation between sleep quality and daytime sleepiness with psychological well-being, and sleep quality and daytime sleepiness with mental health parameters. Further, the study compared students reporting higher levels of anxiety, stress, and depression with those who had lower levels of these mental health parameters to determine if the difference between them was significant or not. The present study hypothesised that, many medical undergraduates would have impaired sleep and ensuing daytime sleepiness, and that these disturbances would affect their psychological well-being and mental health.

MATERIALS AND METHODS

This cross-sectional descriptive study was conducted by the Department of Psychiatry, G.S Medical College, a tertiary care Medical College and Hospital in a suburban area of western Uttar Pradesh, India, for a period of one month in May 2022 with purposive sampling. The study sample included the existing students in the college. Before beginning the study, permission from the Institutional Ethics Committee was obtained (vide letter no. GSMCH/2022/IEC/15 dated 28.04.2022).

Inclusion and Exclusion criteria: The study included 400 medical students from a total of 416 medical undergraduate students from the 1st, 2nd, 3rd part 1 and 3rd part 2 MBBS years; students appearing in exams shortly were not included. Exclusion criterion was students who were undergoing treatment for a previously diagnosed major mental or physical disorder/disease. Of the 16 excluded students, 12 had submitted incomplete forms and four were excluded as they had not met the inclusion criterion.

Study Procedure

All subjects provided their written informed consent. The nature of the study and the level of involvement in terms of sharing the details, were fully disclosed to each participant in the study.

A semi-structured datasheet was made by the authors to collect the socio-demographic details of the participants. This included various details such as age, gender, MBBS year and whether they had past or family history of psychiatric illnesses.

The following scales were used to evaluate daytime sleepiness, quality of the sleep, the mental health parameters and are freely available for use:

Epworth Sleepiness Scale (EPSS) [12]: It was used for assessing daytime sleepiness due to deprivation of sleep. The questionnaire asks the subject to rate his or her probability of falling asleep on a scale of increasing probability from 0-3 for eight different situations that most people engage in during their daily lives. Higher scores imply more sleepiness, with scores of 0-5 suggestive of lower normal daytime sleepiness; 6-10 of higher normal; 11-12 of mild excessive; 13-15 of moderate excessive and 16-24 of severe excessive daytime sleepiness.

Pittsburgh Sleep Quality Index (PSQI) [13]: It is a self-reporting questionnaire to assess the quality of sleep over a period of one month. It has 19 items in 7 components which are measured on a 0-3 interval such that adding up the seven component scores gives the global score that ranges from 0-21. The global PSQI score is inversely related to the sleep quality, and scores above 5 signify significant disturbances in sleep.

Depression Anxiety Stress Scale 21 (DASS-21) [14]: It is a self-reporting inventory consisting of 21 items to assess the emotional state of the individual over a period of one week. It has three subscales of anxiety, depression and stress, with each subscale having seven items. The cut-off scores for the subscales are below 10 for depression, below 8 for anxiety and below 15 for stress. The severity of the subscales are further qualified as being mild, moderate, severe and extreme.

Psychological General Well-Being Index (PGWBI) [15]: It is a 22-item self-administered standardised measure of subjective psychological well-being. The individual items are rated on a 6-point scale with domains of well-being including emotional states such as anxiety and depression, positive well-being, general health, vitality and self-control.

STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS), version 22.0, was used for data entry and statistical analysis. Descriptive statistics were used for socio-demographic and clinical variables. The frequencies of the categorical variables in socio-demographic characteristics were calculated, whereas for age and the clinical parameters of EPSS, PSQI, DASS-21 and PGWBI, the mean and standard deviation were calculated. Comparisons between the groups of the Stress- and Depression- subscales of DASS-21 were done using Independent t-test. Comparison in the anxiety subscale of DASS-21 was not done as there was no student in the no-anxiety group. Non parametric correlations between the clinical parameters were done using Spearman's rho with 2-tailed significance at 0.05 and 0.001 levels.

RESULTS

A total number of 400 students were enrolled in the present research. The socio-demographic variables are in [Table/Fig-1]. The study participants were in the age group of 17-24 years and majority of the students (n=130, 32.5%) were 20-year-old. Females accounted for near half of the study participants (n=190, 47.5%). Students from all the MBBS years were almost equally represented in the study. While none of the students had a past psychiatry history, a positive family psychiatric history was found in only 8 (2%) students.

Sleepiness in daytime and quality of sleep were assessed by the EPSS and PSQI, respectively [Table/Fig-2]. Majority of the students (n=360, 90%) had an EPSS score of 10 or higher and the mean EPSS score was found to be 10.68 (3.481), suggestive of high daytime somnolence. The mean of global PSQI scale was found to be 6.76 (1.811) which was above the cut-off of 5, clearly suggestive that the overall sleep quality was poor in almost all of the undergraduate medical students.

Socio-demographic characteristics	
Age (years, Mean±SD)	20.39±1.486
Gender n (%)	
Male	210 (52.5)
Female	190 (47.5)
Education	
1 st MBBS	99 (24.75)
2 nd MBBS	101 (25.25)
3 rd MBBS Part 1	100 (25.0)
3 rd MBBS Part 2	100 (25.0)
Past psychiatric history	
Present	0
Absent	400 (100)
Family psychiatric history	
Present	8 (2.0)
Absent	392 (98.0)

[Table/Fig-1]: Socio-demographic characteristics of medical undergraduate students (N=400).

Variables	Mean±SD
Epworth Sleepiness Scale (EPSS)	10.68±3.481
Global Pittsburgh Sleep Quality Index (PSQI)	6.75±1.811
Depression Anxiety Stress Scale-21 (DASS-21)	
Anxiety	15.56±2.473
Stress	22.89±3.396
Depression	5.76±3.977
Psychological General Well-Being Index (PGWBI)	40.75±7.481

[Table/Fig-2]: Clinical parameters of medical undergraduate students.

The scores of individual subscales of DASS-21 and PGWBI are in [Table/Fig-2]. Almost 67% of the students (n=268) had DASS-21 anxiety score of more than 15. The mean of DASS-21 anxiety subscale was found to be 15.50 (2.621), which indicates severe anxiety levels. The authors also found that nearly all students (n=399) were suffering from stress, out of which 249 students (62.25%) had a score of 22 or above which indicates moderate to severe level of stress. The stress scores resulted in a mean of 22.82, which implies that most of the students were suffering from moderate level of stress. Only 87 of the 400 participating students (21.75%) reported having a score higher than 9 in DASS-21 depression subscale. The mean score of depression subscale was found to be 5.76 (3.977), which was below the cut-off score of 10 for depression. The mean score of PGWBI was 40.75 with almost all the students had lower scores on PGWBI.

None of the students scored below the cut-off for anxiety in the DASS-21 Anxiety subscale, and had atleast mild anxiety or higher. Comparison of students with and without stress [Table/Fig-3] showed that the difference in anxiety was significant (t=2.476, p<0.05). When students with and without depression were compared with each other [Table/Fig-3], the difference was found to be significant (t=25.766, p<0.01).

Groups	n (%)	Mean±SD	Student's t-test t-value, p-value; df=398
Stress	398 (99.5)	22.92±3.360	2.476, 0.014*
No stress	2 (0.5)	17.00±7.071	
Depression	86 (21.5)	11.76±1.946	25.766, 0.001**
No depression	314 (78.5)	4.11±2.555	

[Table/Fig-3]: Comparison between the subscales of DASS-21 scores.
*p-value <0.05 was statistically significant; **p-value <0.001 was statistically highly significant

The correlations between EPSS and DASS and between PSQI and DASS are given in [Table/Fig-4]. There was significant weak positive

correlation (Spearman's rho value=0.110, p<0.05) between EPSS with DASS-21 anxiety score. The correlation between global PSQI with the DASS-21 anxiety scores were also found to be significantly weak positive (Spearman's rho value=0.118, p<0.05). The correlation between the stress levels was also seen to be significantly moderately strong positive with EPSS (Spearman's rho value=0.452, p<0.01) and PSQI (Spearman's rho value=0.410, p<0.01). The correlations between depression and EPSS (Spearman's rho value=0.070, p<0.05) and between depression and PSQI (Spearman's rho value=-0.197, p<0.05) were not found to be significant in this study. While the correlation between PGWBI with PSQI was found to be significantly weak positive (Spearman's rho value=0.119, p<0.05), that with EPSS was not significant (Spearman's rho value=0.035, p<0.05).

Variables		EPSS score	PSQI
DASS-21 anxiety	Rho	0.110*	0.118*
	p-value	0.028	0.018
DASS-21 stress	Rho	0.452**	0.410**
	p-value	0.001	0.001
DASS-21 depression	Rho	0.070	-0.197
	p-value	0.529	0.073
PGWBI	Rho	0.035	0.119*
	p-value	0.48	0.017

[Table/Fig-4]: Bivariate correlation coefficients of Depression Anxiety Stress Scale-21 (DASS-21) subscales and Psychological General Well-Being Index (PGWBI) with Epworth Sleepiness Scale (EPSS) and Global Pittsburgh Sleep Quality Index (PSQI); (Spearman's rho/p-value).
*p-value <0.05 was statistically significant; **p-value <0.001 was statistically highly significant

DISCUSSION

The present study endeavoured to evaluate sleep quality and daytime somnolence of undergraduate medical students and their relationship with emotional states and psychological well-being. Similar studies have been conducted in India [8] and in the Indian subcontinent- in Nepal [16] and Pakistan [17]. Some of the studies had smaller sample sizes of 150 [8], 280 [16] and 217 [17], or did not assess daytime sleepiness [16,17], or did not incorporate tools to assess mental health consequences [8,17]. The present study tried to overcome some of the limitations. This study had almost similar age range, gender and semester-wise representation as was found in similar studies of comparable sample sizes examining sleep patterns of medical undergraduates [8,16,17]. The mean age in the study was 20.39 (1.48) years which is comparable to the mean ages in years of 22.4 (0.50) in the study by Giri PA et al., 21.1 (1.78) by Waqas A et al., and 21.39 (1.6) by Sundas N et al., [8,16,17]. Females constituted 47.5% of the study sample, which compared to 60%, and 52.5% was lower [8,17], and compared to 43.7% [16] was almost similar. Of the 400 students that took part in the study, the MBBS- year-wise percentage was 1st MBBS: 99 (24.75); 2nd MBBS: 101 (25.25); 3rd MBBS Part 1: 100 (25) and 3rd MBBS Part 2: 100 (25) was suggestive of equal year-wise representation in the study when compared to other similar studies by Waqas A et al.,: 1st (22%), 2nd (25%), 3rd (18.3%) and final year (34.7%), and by Sundas N et al.,: 1st (25.3%), 2nd (16.6%), 3rd (27.6%) and 4th (30.4%) [16,17].

Most of the medical students in the study had high scores with a mean of 10.68 (3.48) on the EPSS. This implies that many medical undergraduates had daytime sleepiness. A study [18] of Brazilian medical students had found higher EPSS scores of 10.00 (3.69) which is comparable to the EPSS score in the present study. Furthermore, a study [19] of medical and non medical undergraduates found that more than 64% of medical undergraduates had a sleep score of >9 which increases the probability of sleeping in daytime and a higher risk in medical students in comparison to students of nursing and pharmacy.

The mean PSQI score in this study was found to be 6.75 (1.811), which is suggestive of poor sleep quality, as global PSQI score above the cut-off score of 5 is regarded as significant sleep disturbance. A large multicentric study of college students had also found lower total scores 6.87 (3.29) in PQSI, which is close to the score in this study [20]. Similar studies of medical students in the subcontinent reveals lower PSQI scores and more medical students having poor sleep quality [16,17,21]. While the study by Waqas A et al., had a PSQI score of 8.1 (3.12) with over 77% falling into the category of poor sleepers [16], the study by Sundas N et al., had 44.23% of students who had a PSQI score less than 5 [17]. The mean PSQI score was 7.3 (1.5) and nearly 40% of the students were classified as poor sleepers in the study involving medical students in Karachi [21]. A study of 308 Indian medical students' use of analgesics as self-medication and its association with quality of sleep using the PSQI found that 122 (39.6%) medical undergraduate students were categorised as poor sleepers with the global PSQI score more than 5 [22].

It becomes quite essential that medical students who have a tough syllabus, tight academic schedules and clinical postings and the stress of frequent examinations and high expectations must have good sleep in terms of both quality and quantity and have negligible daytime sleepiness so that their academics are not affected. Curcio G et al., in their review of studies on relationship between sleep, learning and memory processes suggest that sleep duration and quality are strongly correlated with student learning and academic achievement [23]. A study conducted by Bahammam AS et al., using the EPSS found a negative association between students' academic performance and various sleep variables [24]. Students who received better grades in college slept for longer periods of time during the week and went to bed earlier than average students who scored higher on the EPSS and reported feeling sleepy more frequently.

Nearly, all of the participants in the study reported feeling stressed and anxious, and the subjective psychological well-being score was found to be low. However, not many students had a cut-off for depression. It is commonly established that academic pressures and other elements can significantly affect student's physical and mental well-being in medical schools [25]. A study of medical students in Lahore [16] using the Perceived Stress Scale-14 found nearly 60% of medical undergraduates reported to have high stress levels from academic reasons. Frequent examinations, concerns about academic performance, the burden of the academic curriculum and lack of leisure time were among the major reasons of academic stress. Psychosocial stressors such as unexpected high parental expectations, poor cafeteria food quality, loneliness, living away from home also played a significant contribution.

The present study found significant positive correlations between EPSS and PSQI with the anxiety subscale of DASS-21 [Table/Fig-4]. This implies that students who had more daytime sedation were also the ones who had clinically significant levels of anxiety and the overall poor sleep quality correlated with clinically significant anxiety levels. Similarly, it was found that higher daytime sedation and poorer sleep quality in medical undergraduates who were more likely to have higher levels of stress as obtained in the correlations of the sleep scales with the stress subscale of DASS-21. The study showed that overall sleep quality also affected the psychological general well-being of the students.

In their longitudinal study of college students using PSQI and DASS-21, Zou P et al., found a bidirectional association between sleep quality and the individual subscale DASS-21 scores [26]. The global PSQI score was strongly correlated with the scores on DASS-21 in the initial assessment and during the follow-up. The scores of depressive, anxious, and stress-related subscales were correlated with the sleep quality both at baseline and in the follow-up.

These relationships between daytime sleepiness and poor sleep quality and the emotional dimensions of the DASS-21 have both immediate and important mental health repercussions. Initial sleeplessness, dreams that keep you awake, night time eating habits, daily tiredness, and sleeping during the day were all linked to depression and anxiety in a group of Estonian medical students [27]. Sleep disturbances can either cause or precipitate psychiatric disorders, may often be the initial symptom and significant complaint in many psychiatric disorders and can occur as a co-morbid psychiatric disorder [28].

In the John Hopkins longitudinal study, 1053 medical students were followed-up for over 30 years and their problems in sleep, depression and psychiatric distress were recorded [29]. Those who had reported insomnia in medical school and difficulty in sleeping under stress were more likely to have clinical depression compared to those who did not have insomnia and difficulty sleeping under stress. According to that study, insomnia was a sign of psychological distress throughout the period of 30 years. According to a Brazilian study [30], medical students who reported excessive tiredness, occasional sleep disruption, insomnia, or less than seven hours of sleep per day had a cumulative risk ratio of 5.47 for minor psychiatric illnesses. The DASS-21 Depression subscale scores and the EPSS and PSQI scores did not correlate in the study. In contrast, in another study [31], a strong correlation was found between poor sleep quality and depression.

The results of the present study's observations clearly demonstrated that, the study group's participants had poor sleep quantity and quality, which had a major negative impact on their mental health, in line with the study hypothesis. The strength of the present study was that the sample size which is comparable to similar studies. The study included medical students from all academic years and had both male and female students in near equal proportions. Future studies could be multicentric-involving more medical colleges, could use the scales employed in this study backed by polysomnography findings for more objectivity, could evaluate students for longer periods than a week as required in the scales, and also include interventions for sleep disorders to evaluate whether improvement in sleep quality would have corresponding better outcomes in mental health in medical undergraduate students.

Limitation(s)

The present study had some limitations. The self-reporting of sleep habits which depended on the students' subjective views, raising the chance that the students may not have accurately described their sleeping patterns and the day time sleepiness. Even the DASS-21 and PGWBI are self-reporting questionnaire. No inferences about the long-term consequences of inadequate sleep can be made by the present study, since it was a cross-sectional study.

CONCLUSION(S)

The present study made it quite evident that undergraduate medical students, who were enrolled in various semesters had inadequate sleep and also struggled with daytime sleepiness. The majority of the participants had anxiety and stress-related problems. Sleep was also discovered to have an impact on psychological health. Those medical undergraduate students who reported poorer sleep quality and increased daytime sedation had higher levels of anxiety and stress. Also, students with poor quality of sleep had lower psychological general well-being. Much emphasis has to be given, to the sleep of medical undergraduate students.

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