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Original Research Article

Sleep, stress and memory: Investigating cognitive function in first professional medical students in Central India: A cross sectional study

Nandini Daga[1], Madhur Gupta[2], Shatakshi Dwivedi[2], Arti Kasulkar[3]*

[1]N.K.P. Salve Institute of Medical Sciences & Research Centre and Lata Mangeshkar Hopspital, Nagpur, Maharashtra, India

[2]Dept. of Biochemistry, N.K.P. Salve Institute of Medical Sciences & Research Centre and Lata Mangeshkar Hopspital, Nagpur, Maharashtra, India

[3]Dept. of Forensic Medicine and Toxicology, N.K.P. Salve Institute of Medical Sciences & Research Centre and Lata Mangeshkar Hopspital, Nagpur, Maharashtra, India

Abstract

Introduction: Students often believe that studying late betters exam results, but studies show that prolonged wakefulness and reduced sleep decrease memory capacity. Researches also have demonstrated that both sleep duration and quality are necessary for memory function. Medical students face high academic stress, leading to reduced sleep, which may reduce cognitive performance. Stress is a key factor influencing sleep quality and therefore is a very important variable. The study was aimed to investigate the impact of perceived stress and sleep quality on everyday memory in first year professional medical students.

Materials and Methods: A sample size of 157 first professional medical students in a medical school was considered for a cross-sectional study in central India. Participants completed self-administered questionnaires after providing informed consent. The study used three validated tools: Perceived Stress Scale, Sleep Quality Scale, and the Everyday Memory Questionnaire. The institutional ethics committee granted the ethical approval before conducting this study.

Results: Results showed that 35.6% of students sometimes had difficulty falling asleep. Many reported that poor sleep caused irritability and trouble in concentrating. 31% felt their sleep was sometimes enough, while 21.5% rarely or never felt that it was. Stress was prevalent, with 48.3% feeling unable to manage and 81% feeling stressed occasionally. Frequent memory errors, like the need to double-check completed tasks, were reported and related with the high stress and reduced hours of sleep.

Conclusion: The results demonstrated a noteworthy connection between perceived stress, everyday memory problems and insufficient sleep quality in medical students. These findings enunciate the need for early interventions focusing on stress reduction strategies to promote students' psychological health and academic success.

Keywords: Sleep, Stress, Everyday Memory, First year medical professional students.

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1. Introduction

As student often believe that studying late is beneficial for exam preparation; however, studies indicate that prolonged wakefulness and restlessness can negatively impact memory capacity in college students.[1] In contrast, Phan et al. (2019) reported the efficacious effects of adequate sleep hours on memory power. A distinct study also shows that capacity of memory is reduced by inadequate sleeping hours, decreased sleep efficiency which could serve as a sign of memory dysfunction.[2] Memory consolidation is due to the role of Adult-born neurons in neural activity during Rapid Eye Movement Sleep and high brain plasticity. Increasing hippocampal neurogenesis leads to the forgetting of recently acquired contextual fear memories but spares older memories, suggesting an age-dependent sensitivity of memories to neurogenesis-induced forgetting.[3]

Corticotropin-Releasing Hormone neurons inhibition during stressful experiences helps in improved sleep and memory consolidation.[4] An impactful and a long term dislodgement of REM sleep from a daily routine of a person's life results in Pre-sleep Hyper Arousal and Increased risks of Insomnia.[5] From a biomedical perspective, sleep disorders

*Corresponding author: Arti Kasulkar
Email: artinarde@rediffmail.com

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like delayed sleep phase syndrome (DSPS), which can lead to social dysfunction and stress, or sleep disturbances resulting from chronic stress, are often considered 'maladaptive' or 'pathological.[6,7]

A comprehended conclusion of these afore mentioned findings demonstrate that a sleep which has a characteristics of sufficient number of sleep hours along with its fair quality is considered as signs of Good Memory. The most commonly used definition of stress coping by Lazarus and Folkman is "constantly changing cognitive and behavioural efforts to manage specific external or internal demands that are far beyond the existing resources of the person".[8] All students face pressures which are intrinsic and extrinsic demanding constant pressures, to perform at their highest level.[3] This may be one of the reasons that they feel to decrease the time to sleep less so as to increase the time to study. Medical Curriculum in general , are designed in a such a way, that it creates an overwhelming competitive ambiance amongst medical students which often restricts medical students to form close bonds of friendship amongst peers, refraining the medical students from the constant emotional support which would have otherwise helped them in their overall mental health optimisation.[6] Extensive academic curriculum in medical colleges is sources of increasing stress and low moods in medical students.[10]

A study on navigating the medical journey: Insights into medical students' psychological wellbeing, coping, and personality, enumerates the reciprocity amongst individualistic coping methods and personal default characteristics which includes neuroticism, extraversion, flexible and adaptive approach to fresh life experiences, situational reaction time and agreeableness.[10] The significance of adaptability skills, especially for medical students becomes all the more important as medical students face stress in significantly higher incidences as compared to other fields. Medical students with high self-emotional appraisal ability are more aware of changes in their emotional patterns, and they are also more likely to make plans and engage in active coping.[8]

Emotional intelligence is independent of gender and thus can be used by both males and females as a powerful tool for avoiding stress and enrichment of Coping mechanisms. Females being more emotionally structured, use behavioural and avoidant coping while males deal by active coping.[8] According to Soderstrom Studies, individuals equipped with high hardiness personality traits typically follow constructive coping mechanisms and are less prone to mental illness.[11] An integrative study between sleep, stress and memory is of profound relevance as these three attributes are experienced by human lives on a daily basis and a major deflection in these aforementioned attributes can lead to serious devastating health issues.

1.1. Stress and sleep

The impact of internal factors and external factors plays a key role in deciding the sleep outcome i.e. the quality of sleep and also the quantity of sleep. One of the notable internal factors impacting sleep is stress. Verlander et al.'s research have clearly mentioned that stress have a more negative effect on sleep as compared to other factors in consideration for assessment of sleep .An assessment through Self-report measures which considered personality mediators, emotional responses and environmental factors , were used to find out the relationship between sleep and stress.[12] The study found that emotional responses to stress are the potent predictors of sleep related complaints. These results indicate that stress is the utmost significant factor, affecting sleep quality and duration, beyond the influence of other variables.

Impairment in regulation of emotions i.e. a significant increment in its sensitivity, intensity and difficulties faced during adaptation of emotions for better coping has an important role in inducing sleep disturbances. These sleep disturbances thus lead to altered memory and its processing. In a chronic setting of such conditions, foundations of Psychiatric disorders are laid.[5]

An intricate study by Hawsawi, A.A et al on exploring access to support services for medical students , revealed six core themes which can be used as practise points in a Medical College settings to improve medical student's mental health in a holistic manner. Self-perception of being judged for seeking help with regards to mental health wellbeing and Possibility of suboptimal confidentiality factors can refrain students for taking the first step towards self-help.[13] Medical students with DASS-21 scores above the normal ranges are found to be using Social Media as maladaptive coping mechanisms.[14,15]

The aim of this study is to find out the relationship between perceived stress, sleep quality and memory amongst the First Professional MBBS students of medical college in Central India. The keen observation and henceforth deciphering the relationship between aforementioned three variables is of immense significance as each variable plays a significant role in maintainence of human body homeostasis.

2. Materials and Methods

After 200 students being administered with the questionnaire, a sample size of 157 first professional medical students consented for this cross-sectional study. They were all requested to complete a self-administrative questionnaire through google forms. Demographic data was collected using a validated, self-administered questionnaire. Permission for conducting the study was obtained from the institutional ethics committee

Students with known diagnosed sleep disorders such as insomnia, sleep apnea were excluded from the study. Others excluded are Students with diagnosed psychiatric conditions

influencing memory or stress levels such depression or anxiety disorders or students currently on medications affectingsleep like sedatives or stimulants. Students who do not complete the questionnaires fully or refuse consent were also not a part of the study.

2.1. Sleep quality scale (SQS)

The SQS, consists of 28 items, assesses six domains of sleep quality: problems with initiating and maintaining sleep, overall sleep satisfaction, restoration after sleep, daytime symptoms and difficulty waking. Pittsburgh Sleep Quality Index (PSQI) has a profound correlation with Sleep Quality Scale (SQS).[16]

2.2. Everyday memory questionaire (EMQ)

The Everyday Memory Questionnaire was indigeneously designed for patients recovering from head injuries and since then, has been amended for use in both clinical and non-clinical scenarios. This 28-item scale includes 22 items reflecting genuine memory difficulties and six bogus items that represent atypical memory problems to assess response validity. Each item describes a common daily activity that may involve a memory lapse. Responses are rated on a scale with 5 numerical pointers: 0 Pointer indicates once or less in the past month, 1 Pointer indicates more than once a month but less than once a week, 2 Pointer indicates about once a week, 3 Pointer indicates more than once a week but less than once a day, and 4 Pointer indicates once or more per day.[17]

2.3. Perceived stress scale

The testimony of stress is most commonly done by The Perceived Stress Scale (PSS), whose development occurred in 1983. An individual emotions and its direct relation with the perceived stress can be understood by the help of PSS. The Perceived stress scale makes you emotionally more aware as the questions asked in the PSS are related to an individual's emotional well being from the last one month. For each question in the PSS, a score has to be indicated by the considered individual and this score will be a numerical equivalent of whatever feelings have been experienced by concerned individual in last one month. Score range for PSS is between 0 and 40. PSS scores anywhere from 0 to 13 low perceived stress, PSS scores from 14 to 26 indicates moderate perceived stress, and PSS scores from 27 to 40 indicates high perceived stress.[18]

3. Results

Of the 157 students who responded in the study, majority reported that they sometimes have difficulty in falling asleep (35.6%). A majority reported that poor sleep makes it difficult for them to concentrate and makes them irritated. 31% people feel that their sleep hours are enough sometimes and 8.2% that they are never enough while 13.3% feel that they are rarely enough (**Table 1**).

Table 1: Sleep quality scale data (n=157)

Statement	Never	Rarely	Sometimes	Often	Always
I have difficulty in falling asleep	27 (17.1%)	49 (31%)	56 (35.6%)	15 (9.5%)	10 (6.3%)
I wake up while sleeping	46 (29.2%)	55 (35%)	39 (24.8%)	14 (8.9%)	3 (1.9%)
Once I wake up in the middle of the night, I have difficulty getting back to sleep	43 (27.3%)	59 (37.5%)	42 (26.7%)	9 (5.7%)	4 (2.5%)
It's difficult for me to concentrate if I am sleep deprived.	11 (7%)	16 (10.1%)	52 (33.1%)	40 (25.4%)	38 (24.2%)
My sleep hours are enough	13 (8.2%)	21 (13.3%)	50 (31.8%)	49 (31.2%)	24 (15.2%)
Poor sleep makes me irritated	9 (5.7%)	23 (14.6%)	47 (29.9%)	36 (22.9%)	42 (26.7%)

Table 2: Perceived stress scale data (n=157)

Statement	Never	Rarely	Sometimes	Often	Always
How frequently do you feel that you cannot control important things in your life?	5 (3.1%)	17 (10.8%)	79 (50.3%)	36 (22.9%)	20 (12.7%)
How frequently in the last month have you felt stressed or nervous?	6 (3.8%)	22 (14%)	53 (33.7%)	51 (32.4%)	25 (15.9%)
In the last month, how frequently did you feel you couldn't cope up with the things you had to do?	10 (6.3%)	22 (14%)	59 (37.5%)	44 (28%)	22 (14%)
In the last month, how frequently have you felt things were going your way?	14 (8.9%)	47 (29.9%)	56 (35.6%)	30 (19.1%)	10 (6.3%)

Table 3: Everyday memory questionnaire data (n=157)

Statement	A	B	C	D	E
Having to check whether you've done something that you should've?	26 (16.5%)	29 (18.4%)	43 (27.3%)	36 (22.9%)	23 (14.6%)

You said you would or planned to do but completely forgotten to do it	36 (22.9%)	45 (28.6%)	32 (20.3%)	29 (18.4%)	15 (9.5%)
You are not able to remember the original place where the things are kept or you are searching for at the wrong place	57 (36.3%)	45 (28.6%)	20 (12.7%)	14 (8.9%)	21 (13.3%)
When talking to someone losing thread of what you were saying and maybe saying- 'what was I talking about?'	58 (36.9%)	36 (22.9%)	19 (12.1%)	17.1%)	17(10.8%)

(A- Once or less in last month; B - More than once a month but less than once a week; C- About once a week, D- More than once a week but less than once a day. E - Once a day or more)

Table 4: Relationship between stress, sleep and memory in students (n=157)

Variables Compared	Correlation Coefficient (r)	Significance (p)
Stress vs Sleep Quality	–0.62	< 0.01
Stress vs Memory Errors	0.58	< 0.01
Sleep Quality vs Memory Performance	–0.55	< 0.01

An overwhelming majority revealed that they have felt nervous or stressed in the last month and that they couldn't cope with the things they had to do (48.3%) and the percentage rises to 81% considering the people who answered sometimes. 29.9% have rarely felt that things are going their way and 35% that they sometimes do and sometimes do not (**Table 2**).

A majority of people responded positively when asked if they have to check if they've done something which closely correlates with their sleep hours being less and feeling nervous or stressed (**Table 3**).

A strong interrelationship was observed among perceived stress, sleep quality, and everyday memory performance in first-year MBBS students. Statistical correlation showed that higher perceived stress scores were significantly associated with poorer sleep quality and increased frequency of memory lapses. Students reporting frequent difficulty in falling asleep or maintaining sleep also exhibited higher stress levels on the Perceived Stress Scale (PSS). Participants with inadequate or poor-quality sleep demonstrated greater irritability and lack of concentration, indicating a direct impact of sleep deprivation on cognitive efficiency. Those with higher stress levels (PSS $\geq$ 27) were more likely to report everyday memory problems such as forgetting tasks, misplacing items, and losing the thread of conversation, as assessed by the Everyday Memory Questionnaire (EMQ).

Overall, the findings suggest a negative correlation between stress and sleep quality ($r = –0.62$, $p < 0.01$) and a positive correlation between stress and memory errors ($r = 0.58$, $p < 0.01$). Conversely, better sleep quality correlated positively with memory performance ($r = –0.55$, $p < 0.01$). Thus, high stress adversely affects both sleep and memory, while good sleep contributes to better cognitive functioning as depicted in **Table 4**.

4. Discussion

Perceived adverse academic, personal and organisational factors contribute to poor wellbeing specifically, life satisfaction was negatively correlated with perceived stress, depression, and anxiety (10). Our study's findings are very similar to a number of previous studies conducted that state that stress, sleep and memory are close knit.[20] Consistent with recent findings from King Saud University[19] and a Medical school in Pakistan, our study too, confirms the conclusive findings which are similar to the existing studies with regards to sleep i.e. substandard sleep quality and High stress levels are significantly associated.[20]

This study has been conducted to decipher the relationship between perceived stress, sleep quality, and everyday memory amongst the first-year MBBS. Findings revealed that a considerably large number of students experienced difficulty falling asleep, frequent stress, and memory lapses, suggesting strong correlation between these three variables. The commonness of sleep hindrances in the student genre is in accordance with existing literature highlighting poor sleep as a common issue in college students. Research shows that inadequate or inferior-quality sleep negatively affects cognitive functions, particularly memory and attention(3). In our study, more than one-third of participants reported repeated struggles in falling asleep, which made them irritable and affected their ability to focus on their work. Our findings are similar Phan et al., who showed that sleep duration is directly related to memory performance.[19] Similarly, reduced sleep quality has been associated to diminished memory function.[20]

Stress emerged as a major factor, with nearly 50% of the subjects reporting the same. 81% experienced these feelings from time to time, with significance in medical students, wherein academic pressure, time constraints, and lifestyle changes are the major contributors to psychological burden which is akin to the study of Cohen et al.[18]

In our study, the relationship between stress and sleep has been established. Verlander et al. found that stress were the best predictor of sleep complaints,[12] which is in alignment with our study where increased stress levels were related with reduced sleep quality, which may suggest that that stress might interfere with sleep and is a vicious cycle.

The third aspect of our study, everyday memory, also revealed a important association with both stress and sleep. Many participants reported frequent memory slips. This advocates the idea that both psychological and physiological stressors can impair cognitive functions.[17]

The observed relationship among perceived stress, sleep quality, and memory performance in this study aligns with previous research emphasizing the bidirectional influence of psychological and physiological factors on cognitive function. High stress levels were significantly correlated with reduced sleep quality, consistent with findings by Verlander et al.,[12] who identified stress as a potent predictor of sleep disturbances in students. Furthermore, our results echo the conclusions of Phan et al. (2), who demonstrated that insufficient sleep duration impairs memory consolidation. The negative correlation between stress and sleep quality, coupled with the positive correlation between stress and memory lapses, suggests a mediating effect of stress on cognitive efficiency, likely through dysregulation of neuroendocrine responses such as cortisol release. These outcomes support existing evidence that chronic stress and sleep deprivation synergistically contribute to impaired memory and decreased academic performance in medical students.[18-20]

While this study provides valuable insight, there are several limitation. The first being its cross-sectional design, it interferes with the ability to infer causation. The associations identified can suggest correlations but not directionality or long-term effects. Secondly, the data collection which was based on self-reported measures, may have lead to bias. Though validated tools were used, certain modifications done to the questionnaires may have affected the reliability of the responses received. Additionally, external factors such as caffeine intake, screen time, academic schedule, and lifestyle habits, which could influence both sleep and memory, were not controlled for. The study was also limited to a single institution and a relatively small, homogeneous group of first-year MBBS students, which may affect the generalizability of the results. Future studies with longitudinal designs, larger and more diverse samples, and inclusion of objective sleep and stress measurements (e.g., actigraphy or cortisol levels) are recommended to strengthen the validity of the findings.

5. Conclusion

The present study highlights a significant interrelationship among perceived stress, sleep quality, and everyday memory performance in first-year MBBS students. The findings reveal that higher stress levels are closely associated with poorer sleep quality and increased memory lapses, underscoring the cumulative effect of academic and emotional pressures on cognitive efficiency. Poor sleep not only reduces concentration but also aggravates stress, creating a self-perpetuating cycle that impairs learning and memory retention. These results reinforce the need for early interventions and wellness programs in medical schools that focus on stress management, sleep hygiene, and mental health awareness. Promoting balanced routines and coping strategies may not only improve students' psychological well-being but also enhance academic performance and long-term professional competence. Thus, the study justifies the inclusion of structured stress-reduction and sleep-optimization strategies as essential components of medical education.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

1. Almojali AI, Almalki SA, Alothman AS, Masuadi EM, Alaqeel MK. The prevalence and association of stress with sleep quality among medical students. *J Epidemiol Glob Health.* 2017;7(3):169-74. https://doi.org/10.1016/j.jegh.2017.04.005.
2. Phan DV, Chan CL, Pan RH, Yang NP, Hsu HC, Ting HW, et al. Investigating the effect of daily sleep on memory capacity in college students. *Technol Health Care.* 2019;27(2):183-194. https://doi.org/10.3233/THC-181350.
3. Chavan P, Kitamura T, Sakaguchi M. Memory processing by hippocampal adult-born neurons. *Neurobiol Learn Mem.* 2025;220:108062. https://doi.org/10.1016/j.nlm.2025.108062.
4. Wiest A, Maurer JJ, Beier KT, Weber F, Chung S. Role of Hypothalamic CRH Neurons in Regulating the Impact of Stress on Memory and Sleep. *J Neurosci.* 2025;45(27):e2146242025. https://doi.org/10.1523/JNEUROSCI.2146-24.2025.
5. van Trigt S, van der Zweerde T, van Someren EJW, van Straten A, van Marle HJF. A theoretical perspective on the role of sleep in borderline personality disorder: From causative factor to treatment target. *Sleep Med Rev.* 2025;81:102089. https://doi.org/10.1016/j.smrv.2025.102089.
6. Schaefke B, Li J, Zhao B, Wang L, Tseng YT. Slumber under pressure: REM sleep and stress response. *Prog Neurobiol.* 2025;249:102771. https://doi.org/10.1016/j.pneurobio.2025.102771.
7. Galgani A, Scotto M, Faraguna U, Giorgi FS. Fading Blue: Exploring the Causes of Locus Coeruleus Damage Across the Lifespan. *Antioxidants (Basel).* 2025;14(3):255. https://doi.org/10.3390/antiox14030255.
8. Zhang N, Ren X, Xu Z, Zhang K. Gender differences in the relationship between medical students' emotional intelligence and stress coping: a cross-sectional study. *BMC Med Educ.* 2024;24(1):810. https://doi.org/10.1186/s12909-024-05781-9.
9. Al-Najdi S, Mansoor A, Al Hayk O, Al-Hashimi N, Ali K, Daud A. Silent struggles: a qualitative study exploring mental health challenges of undergraduate healthcare students. BMC Med Educ. 2025;25(1):157. https://doi.org/10.1186/s12909-025-06740-8.
10. Hawsawi AA, Nixon N, Nixon E. Navigating the medical journey: Insights into medical students' psychological wellbeing, coping, and

personality. *PLoS One.* 2025;20(2):e0318399. https://doi.org/10.1371/journal.pone.0318399

11. Liu H, Chen J, Peng Q, Zhang H, He Y. Hardiness personality and mental health of financially struggling medical students in private universities in China: the intervening roles of coping styles and gender. *Front Public Health.* 2024;12:1458049. https://doi.org/10.3389/fpubh.2024.1458049
12. Verlander LA, Benedict JO, Hanson DP. Stress and sleep patterns of college students. *Percept Mot Skills.* 1999;88(3 Pt 1):893–8. https://doi.org/10.2466/pms.1999.88.3.893.
13. Hawsawi AA, Nixon N, Stewart E, Nixon E. Exploring access to support services for medical students: recommendations for enhancing wellbeing support. *BMC Med Educ.* 2024;24(1):671. https://doi.org/10.1186/s12909-024-05492-1.
14. Shiraly R, Roshanfekr A, Asadollahi A, Griffiths MD. Psychological distress, social media use, and academic performance of medical students: the mediating role of coping style. *BMC Med Educ*. 2024;24(1):999. https://doi.org/10.1186/s12909-024-05988-w.
15. Gooderham GK, Handy TC. Attention and spatial navigation in everyday life: Physical activity is associated with subjective aspects of cognitive function. *PLoS One.* 2025;20(4):e0321062. https://doi.org/10.1371/journal.pone.0321062.
16. Shahid A, Wilkinson K, Marcu S, Shapiro CM. Sleep Quality Scale (SQS). In: Shahid A, Wilkinson K, Marcu S, Shapiro CM, editors. STOP, THAT and One Hundred Other Sleep Scales. New York (NY): Springer; 2011:367–71. https://doi.org/10.1007/978-1-4419-9893-4_85
17. Royle J, Lincoln NB. The Everyday Memory Questionnaire-revised: development of a 13-item scale. *Disabil Rehabil.* 2008;30(2):114–21. https://doi.org/10.1080/09638280701223876.
18. Cohen S, Kessler RC, Gordon LU, editors. Measuring stress: A guide for health and social scientists. New York (NY): Oxford University Press; 1997.
19. Waqas A, Khan S, Sharif W, Khalid U, Ali A. Association of academic stress with sleeping difficulties in medical students of a Pakistani medical school: a cross sectional survey. *Peer J.* 2015;3:e840. https://doi.org/10.7717/peerj.840.
20. Lo JC, Ong JL, Leong RL, Gooley JJ, Chee MW. Cognitive Performance, Sleepiness, and Mood in Partially Sleep Deprived Adolescents: The Need for Sleep Study. *Sleep*. 2016;39(3):687-98. https://doi.org/10.5665/sleep.5552.

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