e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(5); 285-290

Original Research Article

Quality of Sleep & Stress: A Dynamic Correlation

Mohd Abass Dar[1], Nazir Ahmad Var[2], Saboor Ahmad Naik[3]

[1]Senior Resident, Department of Physiology, GMC Doda, J&K
[2]Assistant Professor, Department of Microbiology, GMC Doda, J&K
[3]Demonstrator, Department of Microbiology, GMC Doda, J&K

Received: 25-02-2024 / Revised: 23-03-2024 / Accepted: 26-04-2024
Corresponding Author: Dr. Mohd Abass Dar
Conflict of interest: Nil

Abstract:
Background: As we all are aware about the fact that proper Sleep is vital for the body and mind. But unfortunately there are sufficient gestures or adequate information about the relationship between sleep quality, stress, and academic performance in the literature of medical sciences.
Aim: This study was performed to determine the association and prevalence of stress with sleep quality among young adults of college going students in India.
Methods: A study was done among 220 medical students of Index Hospital & Research Centre Indore using a random sampling technique. All students get intimated about an electronic self-administered questionnaire was used about the current standard and overall grade point average, and other demographic and lifestyle factors. Kessler Psychological Distress Scale (K10) and Pittsburgh Sleep Quality Index (PSQI) were used to assess the stress and sleep quality.
Results: The total students who experienced some level of psychological stress were 64.8%. The prevalence of poor quality sleep was observed 73.4%. Study shows strong correlation between poor quality sleep & sleep (Cramer's value was obtained $V = 0.259$, $P < 0.001$) and daytime naps ($P = 0.027$), and the observation clarified that the significant predictor of poor sleep quality is elevated stress.
Conclusion: Increased stress levels were closely and adequately significant with the poor quality sleep in the medical students. And as per the standards of our observation no sort of correlation or a vital significance was observed with the academic performance. For future concern, as the fact our study was very small and we robustly recommend future work should be done on a large scale based sampling and we wish to establishing courses through myriad platforms focusing on guiding & educating the students about dynamic sleep, hygiene and last but not the least with harsh and day to day frustrated and stressful surrounding.
Keywords: Stress, Quality, Sleep, Poor, Hygiene, Education.

Introduction

In human physiology sleep is considered an essential therapeutic part, and it is considered as pivotal and very important for normal functioning, mental health, and good quality of life [1].

Although sleep is a vital process, we still do not fully understand why we sleep, what induces sleep, what induces wakefulness and how many hours are needed to achieve restorative sleep. Learning, memory processing, cellular repair and brain development are among the most important functions of sleep [2-4]. In neuroscience sleep deprivation has a wide range of ruined effects on human system and is associated with fatigue, daytime sleepiness, and declined neurocognitive performance. [5] Cognitive performance in students, including concentration and estimated efforts to complete tasks, is negatively affected by sleep deprivation[6]. The prevalence of poor sleep quality varies from country to country.

Of note is the observation that significant inter individual differences exist in neurobehavioral responses to sleep deprivation that are not attributable to variations in sleep history. Recent functional brain imaging studies on experimentally sleep-deprived subjects have confirmed these findings [7-9].

There are three ways through which partial sleep deprivation can occur. The first involves preventing sleep from being physiologically consolidated and is referred to as sleep fragmentation, which can occur in certain sleep disorders (e.g., untreated obstructive sleep apnea).

During sleep fragmentation, the normal progression and sequencing of sleep stages is typically disrupted to varying degrees, resulting in less time in consolidated physiological sleep, relative to time in bed. The second type of partial sleep deprivation involves loss of specific physiological sleep stages, and is, therefore, referred to as selective sleep stage deprivation. This is presumed to be less common than the other types, but prevalence estimates do not exist for any type of sleep restriction. Selective sleep stage deprivation can occur if sleep fragmentation is isolated to a specific sleep stage (e.g., when apneic episodes disrupt primarily one stage of sleep such as REM sleep, or when medications suppress a specific sleep stage).

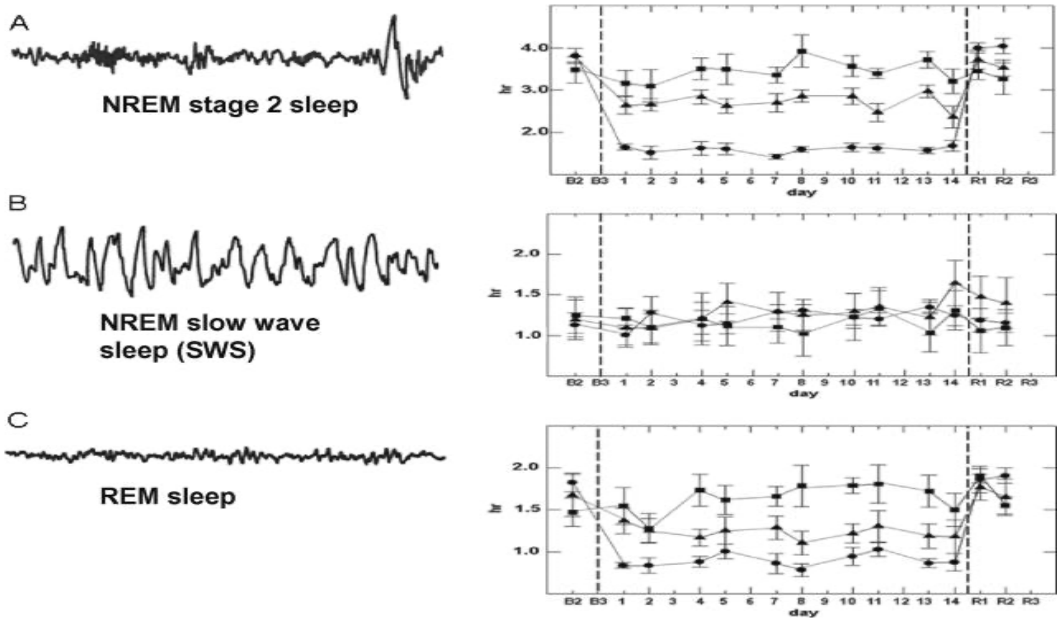

Figure 1:

Studies in humans half a century ago first demonstrated that sleep occurs in two distinct states: rapid eye movement (REM) sleep and non-REM (NREM) sleep (Aserinski and Kleitman, 1953). These sleep states exist in human fetuses and newborns, although their earliest age of appearance is controversial (Curzi Dascalova et al., 1988; Curzi-Dascalova and Challamel, 2000; Mirmiran et al., 2003a; Peirano et al., 2003).

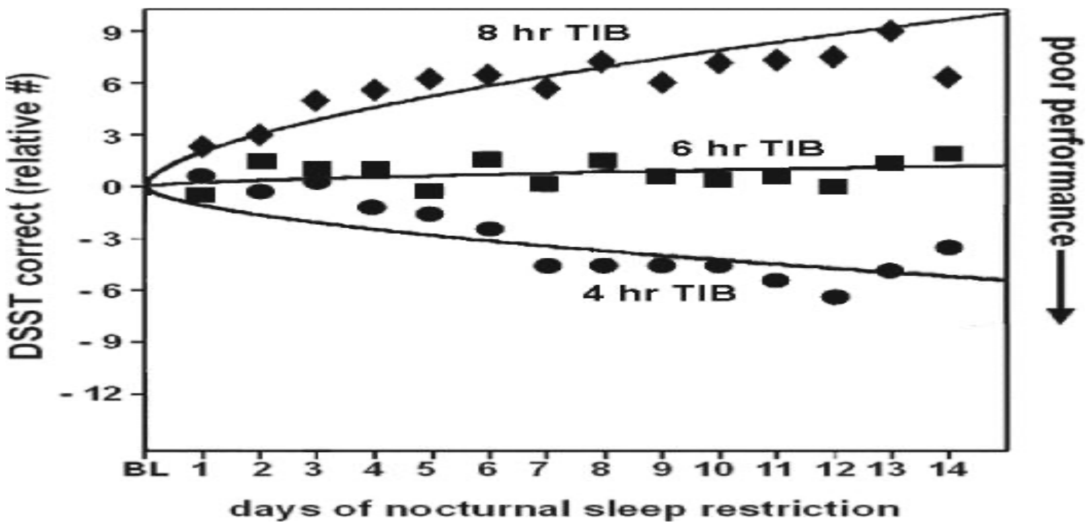

Figure 2:

The third type of partial sleep deprivation is sleep restriction, which is also referred to as sleep debt, which is characterized by reduced sleep duration. Sleep restriction is the focus of this review because it is common, it relates to the fundamental question of how much sleep people need, and there is considerable experimental evidence of its neurobehavioral and physiological effects. Of particular interest are the questions of what changes when sleep is steadily reduced from 8 hours' to 4 hours' duration each day (i.e., the range many people experience sleep restriction), and whether there are cumulative dose response effects of this reduction on sleep physiology and waking functions [10].

Studies using chronically catheterized fetal animals and imaging of the human fetus have emphasized the similarities between fetal and postnatal sleep states (Richardson et al., 1994; Morrison et al., 1997; Czikk et al., 2001; Czikk et al., 2002; Morrison et al., 2005). The current concept regarding REM sleep is that there is a controlling network composed of several areas of the forebrain and that brainstem structures may be responsible for its final expression (Pace-Schott and Hobson, 2002; McCarley, 2007). With respect to the development of NREM sleep, it also requires the establishment of a specific network of excitatory and inhibitory neural components, that includes the formation of thalamocortical and intracortical patterns of innervation (Curzi-Dascalova and Challamel, 2000; Pace-Schott and Hobson, 2002; McCarley, 2007).

Material and Methods

This study was performed to determine the association and prevalence of stress with sleep quality among young adults of college going students in India. A study was done among 220 medical students of Index Hospital & Research Centre Indore using a random sampling technique. All students get intimated about an electronic self-administered questionnaire was used about the current standard and overall grade point average, and other demographic and lifestyle factors. Kessler Psychological Distress Scale (K10) and Pittsburgh Sleep Quality Index (PSQI) were used to assess the stress and sleep quality.

Students who were having psychiatric problems were excluded. The sample size required for this study was calculated as 220 participants for 97% confidence level and a margin of error of 3%, the calculations were made using the Raosoft sample size calculator [11]. The randomly ask students in both female and male section to fill the questionnaire using Google forms and consisted of three parts: the first part inquired about demographic information, habits, and educational achievement. The second part was used to assess the stress using Kessler Psychological Distress Scale (K10), developed by Kessler and colleagues [12] this instrument has been applied extensively in many epidemiological studies to estimate current (1-month) distress and severity associated with psychological symptoms. The K10 questionnaire was observed to have excellent psychometric properties with a Cronbach's α of 0.94, it composes of ten items; each item has five response categories: (1) "none of the time"; (2) "a little of the time"; (3) "some of the time"; (4) "most of the time"; and (5) "all of the time". The scores ranged from 10 to 50 and classified according to the following: less than 20 are likely to be well, from 20 to 24 were classified as mild, from 25 to 29 were classified as moderate, 30 and more are likely to have severe stress. The last part was to measure the quality of sleep using Pittsburgh Sleep Quality Index (PSQI),[18] which is the gold standard questionnaire for assessing subjective sleep quality and has been validated in both clinical and nonclinical populations [13,14]. Only, self-rated questions are included in the scoring. Each component has a score range of 0 to 4; 0 indicates no difficulty, whereas 4 indicates sever sleep difficulty. The seven component scores are then added to one global score, which ranges from 0 to 21, where "0" indicates no difficulty at all and "21" indicates severe difficulties.

Results

Stress: The mean stress score among the students was 27 ± 8.66, and the overall students who experienced stress were 64.8%, 21.76% of them had been observed by mild stress, 17.2% were found in moderate stress, and 27.89% were found in severe stress. No sound statistically significant difference between stress level and gender was observed (P = 0.198), marital status (P = 0.387), living with family (P = 0.590).

Demographics: The total students who experienced some level of psychological stress were 64.8%. The prevalence of poor quality sleep was observed 73.4%. Study shows strong correlation between poor quality sleep & sleep (Cramer's value was obtained V = 0.259, P < 0.001) and daytime naps (P = 0.027), and the observation clarified that the significant predictor of poor sleep quality is elevated stress.

The total responses were 220 medical students that responded and completed the questionnaire, 56.3% of them were males. The mean age of the participants was 23.27 ± 1.7 years. Students' demographics demonstrated in Table 1.

Table 1: Students' demographics

Characteristics	Levels	n	Percentage
Gender	Male	165	50.6
	Female	161	49.4
Marital status	Single	320	98.2
	Married	4	1.2
	Divorced	2	0.6

Living with family	Yes	299	91.7
	No	27	8.3
Academic year	Second	80	24.5
	Third	65	19.9
	Fourth	60	18.4
	Fifth	63	19.3
	Sixth	58	17.8
Academic score (GPA out of 5)	4.76-5	60	18.4
	4.51-4.75	73	22.4
	4.01-4.50	105	32.2
	3.51-4.00	61	18.7
	<3.50	27	8.3
Caffeine consumption	Daily	167	51.2
	Weekly	72	22.1
	Prior examination only	53	16.3
	Never	34	10.4

Quality of sleep: The Chi-square test of independence showed a strong association between stress and poor sleep quality (value of Cramer's V = 0.371, P < 0.001).

Logistic regression showed that Kessler score was a significant predictor of PSQI score (β =0.155; OR = 1.167; 95% CI 1.036—1.315; P = 0.011). The mean global PSQI score was 7.41 ± 3.66. The prevalence of poor sleep quality (total PSQI score ≥ 5) was 76.4% (n = 2 49). There was a significant difference between sleep quality and caffeine consumption (P = 0.007). Otherwise, there was no apparent significant difference with sleep quality and the academic year (P = 0.693) nor living with family (P = 0.067).

Table 2: PSQI Components

Components	Levels	n	Percentage
Sleep latency	<15 min	122	37.4
	16-30 min	100	30.7
	31-60 min	64	19.6
	>60 min	40	12.3
Sleep quality	Very good	41	12.6
	Fairly good	150	46.0
	Fairly bad	94	28.8
	Very bad	41	12.6
Sleep duration	>7 h	86	26.4
	6-7 h	83	25.5
	5-6 h	80	24.5
	<5 h	77	23.6
Use of sleep medication	Yes	56	17.2
	No	270	82.8

Further analysis did not reveal any statistical significance between the quality of sleep and GPA (P = 0.413). The students who estimated their sleep quality as very good sleep quality were 41 (12.6%), fairly good 150 (46%), fairly bad 94 (28.8%), very bad 41 (12.6%) students. Of the PSQI, the subjective sleep quality, sleep latency, sleep duration, and use of medications are shown in Table 2.

Discussion

The variation in the prevalence of poor sleep quality reported in previous studies could be due to the difference in the study population or the different assessment methods used to measure sleep quality. Some reported reasons by students for having difficulty sleeping in our study include; stress, overthinking, studying, coffee consumption, and family-related issues. The availability and use of stimulants (like coffee) are related to changes in sleep patterns, an essential modifiable lifestyle risk factor for students. Caffeine is the most popular psychoactive substance used globally. According to a recent systematic review of epidemiologic research and randomized clinical trials, caffeine use has been found to harm both subjective and objective sleep quality. According to this review, caffeine was associated with perceived sleep quality, decreased total sleep time and efficiency, and prolonged sleep latency [15]. The results of this study highlighted a high prevalence of stress, anxiety, and depression among healthcare students.

Anxiety was reported by half of students, stress affected nearly three-quarters, and depression affected one-third of participants.

Our findings, which indicate a higher prevalence of stress, are consistent with previous research among Indian medical students but greater than what was reported globally (31.0–64.0%). Participants in the study reported high levels of anxiety and depression [16,17,18]. The depression rate is consistent with the national and international rates among medical students, and the anxiety level was comparable to the documented prevalence in earlier studies among medical students worldwide and in India. This study also confirms that stress level is significantly associated with poor sleep quality.

Psychological distress considered as a triggering factor for sleep disturbance. In response to stressors, physiological changes take place to help the body coping with the situation. However, chronic activation of these stress responses, which include the sympathetic–adrenal– medullary axis and the hypothalamic–pituitary–adrenal axis, can give rise to the persistent production of epinephrine and cortisol, which called stress hormones [19,20,]. Similarly, sleep deprivation can affect the circadian rhythm of cortisol secretion.

The PSQI demonstrated robust known-group validity based on both proposed cut-off points and other sleep disorder assessments. In addition, the discrimination between good and poor sleepers was found according to different cut-off scores of psychological or medical variables. These results were further confirmed by regression analyses which revealed that depression, anxiety, and stress predicted poor sleep quality [21,22,23].

However, few studies performed ROC curve analysis, and future investigation should test the critical points for distinguishing poor and good sleepers, especially when a multidimensional factor structure is proposed also confirmed known-group validity of AIS in different target populations [24,25], of ISI for different criteria, of MSQ subscales in detecting hypersomnia and insomnia problems (or compared to PSQI, of JSS-4 in proposing normative values, and of LSEQ and SLEEP-50 as standardized tools for screening multiple sleep complaints.

Importantly, for both AIS and ISI the proposed cut-off values allowed for the discrimination between insomniacs and non-insomniacs with an objective confirmation using actigraphic data [26,27]. However, only 9 out of the 21 studies included performed the ROC curve analysis, thus not only limiting the possibility of testing the sensibility and specificity of original cut-off points in different cultures and population but also of comparing different tools with each other in terms of validity. Future studies are needed to bridge this gap. In a similar way, the ESS demonstrated a strong ability to detect individuals with differences in daytime sleepiness, such as OSA and narcolepsy patients [28-29].

In addition, we found four articles which clearly demonstrate a responsiveness of the ESS to CPAP treatment with a significant drop in the total score, suggesting that the ESS is able to discern the severity of OSAS [30,31,32,33]. However, in our review we did not find any study that performed a ROC curve analysis in order to test the cut-off points for the detection of the EDS: these types of studies are recommended.

Conclusion

Increased stress levels were closely and adequately significant with the poor quality sleep in the medical students. And as per the standards of our observation no sort of correlation or a vital significance was observed with the academic performance. For future concern, as the fact our study was very small and we robustly recommend future work should be done on a large scale based sampling and we wish to establishing courses through myriad platforms focusing on guiding & educating the students about dynamic sleep, hygiene and last but not the least with harsh and day to day frustrated and stressful surrounding.

References

1. Altevogt BM, Colten HR. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. Washington, D.C: National Academies Press; 2006.
2. Aldabal L, Bahammam AS. Metabolic, endocrine, and immune consequences of sleep deprivation. Open Respir Med J. 2011; 5:31–43.
3. Pilcher JJ, Walters AS. How sleep deprivation affects psychological variables related to college students' cognitive performance. J Am Coll Health. 1997; 46:121–6.
4. Azad MC, Fraser K, Rumana N, Abdullah AF, Shahana N, Hanly PJ, et al. Sleep disturbances among medical students: A global perspective. J Clin Sleep Med. 2015; 11:69–74.
5. Lemma S, Gelaye B, Berhane Y, Worku A, Williams MA. Sleep quality and its psychological correlates among university students in Ethiopia: A cross-sectional study. BMC Psychiatry. 2012; 12:237.
6. Tononi G, Cirelli C. Sleep function and synaptic homeostasis. Sleep Med Rev. 2006; 10(1): 49–62.
7. Dinges DF. The state of sleep deprivation: from functional biology to functional consequences. Sleep Med Rev. 2006; 10(5):303–5.
8. Stickgold R, Walker MP. Sleep-dependent memory consolidation and reconsolidation. Sleep Med. 2007; 8(4):331–43.

9. Peirano PD, Algarin CR. Sleep in brain development. Biol Res. 2007; 40(4):471–8.
10. Durmer JS, Dinges DF. Neurocognitive consequences of sleep deprivation. Semin Neurol. 2005; 25(1):117–29.
11. Banks S, Dinges DF. Behavioral and physiological consequences of sleep restriction. J Clin Sleep Med. 2007; 3(5):519–28.
12. Van Dongen HP, Maislin G, Mullington JM, Dinges DF. The cumulative cost of additional wakefulness: dose-response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. Sleep. 2003; 26(2):117–26.
13. Van Dongen HP, Baynard MD, Maislin G, Dinges DF. Systematic interindividual differences in neurobehavioral impairment from sleep loss: evidence of trait-like differential vulnerability. Sleep. 2004; 27(3):423–33.
14. Beebe DW, Difrancesco MW, Tlustos SJ, McNally KA, Holland SK. Preliminary fMRI findings in experimentally sleep-restricted adolescents engaged in a working memory task. Behav Brain Funct. 2009; 5:9.
15. Chee MW, Chuah LY. Functional neuroimaging insights into how sleep and sleep deprivation affect memory and cognition. Curr Opin Neurol. 2008; 21(4):417–23.
16. Van Dongen HPA, Rogers NL, Dinges DF. Understanding sleep debt: theoretical and empirical issues. Sleep Biol Rhythms. 2003; 1:4–12.
17. Lemma S, Gelaye B, Berhane Y, Worku A, Williams MA. Sleep quality and its psychological correlates among university students in Ethiopia: A cross-sectional study. BMC Psychiatry. 2012; 12:237.
18. Suchecki D, Machado RB, Tiba PA. Stress-induced sleep rebound: Adaptive behavior and possible mechanisms. Sleep Sci 2009; 2:151-60. 40. Padgett DA, Glaser R. How stress influences the immune response. Trends Immunol. 2003; 24:444-8.
19. Hall JE. Pocket Companion to Guyton and Hall Textbook of Medical Physiology E-Book. Elsevier Health Sciences; 2015.
20. Leproult R, Copinschi G, Buxton O, Van Cauter E. Sleep loss results in an elevation of cortisol levels the next evening. Sleep. 1997; 20:865-70.
21. Shah M, Hasan S, Malik S, Sreeramareddy CT. Perceived stress, sources and severity of stress among medical undergraduates in a Pakistani medical school. BMC Med Educ. 2010; 10:2.
22. Hamad Alsalhi A, Almigbal T, Hamad Alsalhi H, Batais M. The relationship between stress and academic achievement of medical students in King Saud University: A cross-sectional study. ABSTRACT. 2018. 60-5.
23. Abdulghani HM, Alrowais NA, Bin-Saad NS, Al-Subaie NM, Haji AM, Alhaqwi AI. Sleep disorder among medical students: Relationship to their academic performance. Med Teach. 2012; 34(Suppl 1):S37-41.
24. Watson E, Coates A, Kohler M, Banks S. Caffeine consumption and sleep quality in Australian adults. Nutrients. 2016; 8:479.
25. Březinová V. Effect of caffeine on sleep: EEG study in late middle age people. Br J Clin Pharmacol. 1974; 1:203-8.
26. Hindmarch I, Rigney U, Stanley N, Quinlan P, Rycroft J, Lane J. A naturalistic investigation of the effects of day-long consumption of tea, coffee and water on alertness, sleep onset and sleep quality. Psychopharmacology. 2000; 149:203-16.
27. 49. AlSharif SM, Al-Qathmi MS, Baabdullah WM, Alhrkan TA, Fayoumi YA, Alhejaili FF, et al. The effect of caffeinated beverages on sleep quality in college students. Saudi J Intern Med. 2018; 8:43-8.
28. Gupta S, Choudhury S, Das M, Mondol A, Pradhan R. Factors causing stress among students of a Medical College in Kolkata, India. Educ Health. 2015; 28:92.
29. Dahlin M, Joneborg N, Runeson B. Stress and depression among medical students: A cross-sectional study. Med Educ. 2005; 39:594-604.
30. Castaldelli-Maia JM, Martins SS, Bhugra D, Machado MP, De Andrade AG, Alexandrino-Silva C, et al. Does ragging play a role in medical student depression—causes or effect? J Affect Disord. 2012; 139:291-7.
31. Kawada T, Katsumata M, Suzuki H, Shimizu T. Actigraphic predictors of the depressive state in students with no psychiatric disorders. J Affect Disord. 2007; 98:117-20.
32. Jeon HJ, Roh M-S, Kim K-H, Lee J-R, Lee D, Yoon SC, et al. Early trauma and lifetime suicidal behavior in a nationwide sample of Korean medical students. J Affect Disord. 2009; 119:210-4.
33. Ahaneku JE, Nwosu CM, Ahaneku GI. Academic stress and cardiovascular health. Acad Med. 2000; 75:567-8.