ISSN: 0975-833X

Available online at http://www.journalcra.com

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

International Journal of Current Research
Vol. 13, Issue, 05, pp.17484-17488, May, 2021

DOI: https://doi.org/10.24941/ijcr.41441.05.2021

RESEARCH ARTICLE **OPEN ACCESS**

ASSESSMENT OF RELATIONSHIP BETWEEN BMI AND QUALITY OF SLEEP IN ACADEMIC PERFORMANCE

Ch Gowtham Reddy, M Laasya, G N Manikanta,[1] M S R Bapi Raju[2]

[1]Student, Shri Vishnu College of Pharmacy, Bhimavaram, West Godavari district, Andhra Pradesh, India
[2]Assistant Professor, Department of Pharmacy Practice, Shri Vishnu College of Pharmacy, Bhimavaram, West Godavari district, Andhra Pradesh, India

ARTICLE INFO

Article History:
Received 19th February, 2021
Received in revised form
15th March, 2021
Accepted 15th April, 2021
Published online 28th May, 2021

Key Words

BMI, Health Risk,
Sleep, PSQI, Overall Grade.

ABSTRACT

Individuals who are overweight or obese have greater risk of disease compared to those who are in healthy weight range. Sleep is a recurring state of mind and body, which is distinguished by altered alertness, relatively inhibits or decreases the sensory activities, voluntary muscle movements during the rapid eye movement (REM) sleep. The changes during sleep were recorded and monitored using electroencephalography (EEG), electrooculography (EOG), and electromyography (EMG). The circadian clock regulates the sleep cycle. Sleep disturbances, especially obstructive sleep apnoea (OSA) and insufficient sleep duration will affect physical, mental, and social well-being. The sample consists of 244 college students of B. Pharm, M. Pharm, first 4 years of Pharm D from Shri Vishnu college of pharmacy in the west Godavari, Andhra Pradesh. The PSQI utilized in assessing sleeping patterns. BMI calculated using self-reported height and weight. Descriptive statistics, chi-square, and logistic regression analyses were performed using IBM SPSS 20. The results were, overall sleep quality rating during the past month was 46.7% (fairly good), 40.2% (very good). No statistically significant difference in the BMI was found between those who achieved >71.7% and <71.7% overall grade. The conclusion is, overall data revealed impairment with the sleep duration and patterns of college students. Poor-quality sleep increases the risk for health problems. This study shows that sleep disturbances are significantly linked to overweight and obesity. We suggest the need of wellness programs and health initiatives to promote healthy sleeping habits among college students.

Citation: Gupta, D., Kapoor, A., Puri, P., Tewari, A., Agarwal, S. and Trivedi, N.. "Assessment of relationship between bmi and quality of sleep in academic performance*", 2021. International Journal of Current Research, 13, (05), 17485-17488.*

INTRODUCTION

BMI (Body mass index): The body mass index (BMI) is a physical measurement which is used to assess an individual's total amount of the body fat. The BMI was invented by the mathematician Belgian polymath Adolphe Quetelet in the 1800s, and sometimes it is known as the Quetelet index. The BMI can be calculated by dividing a person's weight in kilograms (kg) by a person's height in meters squared (m^2). It is expressed as kg/m^2 (1)

Corresponding author:** ***G N Manikanta,
Student, Shri Vishnu College of Pharmacy, Bhimavaram, West Godavari district, Andhra Pradesh, India.

Individuals who are overweight or obese have greater risk of disease compared to those who are in healthy weight range. The risk of disease is directly proportional to BMI.
The risks are:

- Type -II Diabetes
- Hypertension
- Asthma
- Atherosclerosis
- Sleep apnea

Waist circumference (WC) is a good indicator of abdominal fat present and this can be used to indicate health risks.

WC is usually measured by putting an unstretched tape around the narrowest level of a person's waist over light or no clothing.[2]

For men:

> 94 cm (37 inch) – indicates increased risk
> 102 cm (40 inch) – will substantially increase risk
For women:
> 80 cm (31 inch) – indicates increased risk
> 88 cm (35 inch) – will substantially increase risk

The risk also varies based on ethnicity and health risk are higher with a lower WC in certain ethnic groups including Aboriginal, Pacific Islander, South Asian, Chinese and Japanese populations.[3]

Sleep: Sleep is a recurring state of mind and body, which is distinguished by altered alertness, relatively inhibits or decreases the sensory activities, and also decreases the activity of almost all voluntary muscles during the rapid eye movement (REM) sleep.[4] It is characterized from wakefulness by a decreased ability to react to stimuli, but more reactive when compared to coma or disorders of consciousness. In quiet waking, the brain utilizes 20% of the total body's energy consumption, thus this reduction has a remarkable effect on total energy consumption.[5] During slow-wave sleep, humans secrete large amounts of growth hormone. All sleep, even during the day is correlated with secretion of prolactin[6]. The changes occurring during sleep can be recorded and monitored by using electroencephalography (EEG) of the brain waves, electrooculography (EOG) for eye movements, and electromyography (EMG) of skeletal muscle activity. Simultaneous collection of the data from these is called polysomnography, and these were performed in a specialized sleep laboratory.[7][8] Sleep researchers use simplified electrocardiography (EKG) to record the activities of the heart.[8]

The body alternates in sleep periods between two distinct modes: REM sleep and non-REM sleep. Although REM stands for "rapid eye movement", this mode includes virtual paralysis of the body. During sleep, various body systems are in an anabolic state, which helps to restore the immune, nervous, muscular and skeletal organizations.[9] The internal circadian clock regulates the sleep cycle.[10] Person may suffer from certain sleep disorders like dyssomnias such as insomnia, narcolepsy, hypersomnia and sleep apnea; parasomnias such as sleepwalking and REM sleep behavior disorder; and circadian rhythm sleep disorders. By using artificial light, human sleep patterns can be altered.[11]

Quality of sleep: The quality of sleep may be evaluated from both objective and a subjective point of view. Objective sleep quality refers to how much difficulty in falling asleep and remaining in a sleeping state for a person, and how many times the person wakes up during a single night. Poor sleep quality disturbs the sleep transition cycle between the different stages of sleep.[12] Whereas subjective sleep quality refers to a sense of being rested and restored after waking from sleep. A study by A. Harvey et al. (2002) was found that insomniacs were more demanding in their sleep quality evaluation than the individuals with no sleep problems.[13]

Homeostatic sleep tendency must be balanced against the circadian element for satisfactory sleep.[14][15] Besides the messages from the circadian clock, this tells the body it needs to sleep.[16] The timing is correct when the following two circadian markers, melatonin and minimum core body temperature occur after the middle of the sleep episode and before awakening.[17] Sleep is vital for physical and mental well-being. Sleep disturbances, especially obstructive sleep apnoea (OSA) and insufficient sleep duration, affect physical, mental, and social well-being. College is a time marked by the difference, when many students experience self-determination and freedom from direct supervision for the first time when there is an increase in academic and social pressures, and erratic schedules. Major changes in lifestyle, such as inappropriate diets, alcohol consumption, and lack of sleep, can be pernicious to the student's well-being. In a study in which the sleep/wake patterns altered during switching from high school to college, Carskadon and Davis found a remarkable decline in the number of hours of sleep, as well as delay in the onset of night time sleep, as students metamorphosed to college. In addition to the duration of sleep, the quality of sleep seems to be altering and having an impact on college student's well-being. Although it is well entrenched that contrast between caloric intake and physical activity are the major factors accountable for the current obesity problem, there is emerging corroboration suggesting that other factors may be principal contributors to the obesity problem. One of the factors in question is sleep. It has been shown that during normal sleep, glucose consumption and glucose production drop simultaneously during the first part of the night and rise concurrently during the predawn hours. Scheen et al identified, however, that when the subjects are maintained at rest but sleep deprived, the pattern of glucose utilization is changed, and later the levels of glucose become constant throughout the night. Following Scheen et al's landmark study, a number of studies have shown that the metabolic changes associated with intervention of normal sleep patterns may contribute to the development of obesity, cardiovascular disease, insulin resistance, and diabetes.[18]

Previous studies have suggested the remarkable connection between sleep disturbance and insulin resistance, in which short sleep duration and poor sleep quality come up with increasing risk for metabolic syndrome, impaired glucose tolerance and type 2 diabetes mellitus. Epidemiologic studies have also provided the evidence that insufficient sleep can cause obesity and also weight gain. A cross-sectional population-based study in the United States reported that insufficient sleep duration was remarkably associated with all categories of abnormal body weight like underweight, overweight, and obesity, whereas longitudinal observation in a large national cohort of Thai adults didn't show any significant association of short sleep duration with underweight.[19]

METHODOLOGY

The sample consists of 244 college students of B. Pharm, M. Pharm, first 4 years of Pharm D from Shri Vishnu college of pharmacy in the west Godavari, Andhra Pradesh. Data was collected between July 2017, and September 2018. The sample size taken was 244 and 107 were responded.

Material: The PSQI was utilized to assess sleeping patterns. The PSQI is a standardized, quantitative measure of sleep quality with demonstrated high levels of consistency, reliability, and validity. It is composed of 19 self-reported questions grouped into 7 component scores. The 7 components were scored following the algorithm proposed by Buysse et al. Accordingly, each component score is weighted equally on a 0–3 scale, with lower scores indicating no problems and higher scores indicating progressively worsening problems as follows: (1) subjective sleep quality (very good to very bad), (2) sleep latency (15 to > 60 minutes), (3) sleep duration (7 to < 5 hours), (4) sleep efficiency (85% to < 65% hours sleep/hours in bed), (5) sleep disturbances (not during the past month to 3 times per week), (6) use of sleeping medications (none to 3 times a week), and (7) daytime dysfunction (not a problem to a very big problem). The 7 component scores were added to yield a global score ranging from 0 to 21 that was treated as a continuous variable.

The reliability of the PSQI global score was satisfactory in our sample, yielding a Cronbach's a of .702. For clinical use, Buysse and colleagues proposed a cut-off score of 5 to indicate good quality sleep and > 5 to indicate poor sleep quality. Overweight and obesity were defined as recommended by the Clinical Guidelines for the Identification, Evaluation and Treatment of Overweight and Obesity in adults. BMI was calculated using self-reported height and weight as: weight (kg)/(height (m))^2. A dichotomous variable was created using BMI 25 as cut-off to identify those exceeding the recommended weight (overweight and obese). Self-reported and clinically measured height and weight have been found to be highly correlated, but with an underreporting bias of about 1 unit. Although self-reported BMI is not recommended as a clinical tool, it is considered an important health surveillance tool that is valid for epidemiologic research, in particular with younger adults.

Method: All data were collected online. We have modified a few questions to determine the relationship between BMI and quality of sleep impact on academic performance. Later, a link was forwarded to the students. Participants were directed to complete the College Student's Health Profile Questionnaire. This survey consisted of questions addressing demographics, self-reported height and weight, PSQI, academic performance. 107 students were responded among 244 participants. We have extracted the data from the responses of the students, BMI was calculated using WHO tool kit. From this we analysed the data by comparing the BMI and sleep score with academic performance. As a result, the number of subjects included in the calculations of the descriptive estimates varied, ranging from 244 in the calculations of the PSQI global score and 107 subjects included in the calculations of all other components of the PSQI. Descriptive statistics, chi-square, and logistic regression analyses were performed using IBM SPSS 20 (IBM SPSS Statistics for Windows, version 20.0). We use the odds ratio (OR) and 95% confidence interval (CI) to show the estimated effect of the PSQI global score and each one of the 7 components on BMI; ORs greater than 1 indicate increased risk.

RESULTS

Among 107 responders, 67.2% were <66 kg and 32.7% were >66 kg; 9.3% were < 5.04 meters square and 90.7 were > 5.04 meters; 26.1% students going to bed earlier than 10.00 PM and 73.8% were going to bed after 10.00 PM; 40.2% reported that they fall asleep within or less than 15 min and 59.8% fall asleep after 15 min; 51.4% sleeping 6-7 hrs and 33.6% sleeping > 7hrs; 80.4% students not taken any sleep medications during the past month and 3% taken three or more times a week; 60.7% not felt trouble to be awake during daily activities during the past month; rating of overall sleep quality during the past month was 46.7% (fairly good), 40.2% (very good); habitual sleep efficiency was very good for >85%.

Correlations

		BMI	PQSI Score	Academic Score
BMI	Pearson Correlation	1	.179	-.156
	Sig. (2-tailed)		.066	.110
	N	106	106	106
PQSI Score	Pearson Correlation	.179	1	-.255**
	Sig. (2-tailed)	.066		.008
	N	106	106	106
Academic Score	Pearson Correlation	-.156	-.255**	1
	Sig. (2-tailed)	.110	.008	
	N	106	106	106

**. Correlation is significant at the 0.01 level (2-tailed).

A total of 2 branches of a college were included 107 students.11.2% were overweight and 0.9% were normal. Obese class1-35.5%, obese class2-20.5%, obese class3-31.7%. The students from age groups 18 to 24 year were in the study, in those 60.7% of the students were female, 39.30% students were male. No statically significant difference in the BMI was found between those who achieved >71.7% of the overall grade compared with those who achieved <71.7%. Students who achieved >71.7% overall grade are more likely to be active in their academics ($p<0.05$), getting optimal sleep ($p<0.05$).

DISCUSSION

Our findings showed that students achieved an average GPA of 71.7%. Not all studies have found a positive relationship between BMI and academic performance; some studies suggest that there is no relationship and others show an inverse relationship. One study confirmed this finding; they showed poor academic achievement strongly linked with short sleep duration that correlated with somnolence, which leads to reduce attention. Our study demonstrates that no correlation exists between consuming fast food and academic performance, but other studies have shown that having too much junk food and an unhealthy diet affecting academic performance by decreasing it and limiting the amount of information to the brain. Our study's strengths include the assessment of the factors that may affect academic performance and deviations in BMI, which includes socioeconomic status, dietary habits, sleeping habits, and physical activity.

CONCLUSION

The present study was done in a small population because of which the correlation between BMI and PQSI may not be proven in a statistical way. The extension of the study is requested to get a clear picture of relation. The most of the results were correlated with other studies done in other areas. We feel that such a study needs to be done in college and school students so that Although it is well established that an imbalance between caloric intake and physical activity are key

factors responsible for the current obesity problem, there is growing interest in studying the environmental and behavioural factors that may be contributing to the problem. Emerging evidence suggests an association between body weight and problems in sleeping patterns, particularly its duration and quality. Furthermore, research studies exploring the association between sleep and BMI among adolescents suggest that the relationship is complex. In many studies sleep duration and disturbances are combined to estimate sleep quality, making it difficult to evaluate their independent effects on BMI. We used the PSQI global score and its 7 individual components (i.e., subjective quality, latency, duration, efficiency, disturbances, medication, and daytime dysfunction) to examine the sleep patterns of college students and to evaluate the relationship between the different components of sleep quality and overweight/obesity. Overall, the data revealed a major problem with the sleep pattern of college students. In addition to short sleep duration, college students experienced fragmented sleep, as well as poor sleep quality as measured by the PSQI.

Consistent with the hypothesis that sleep fragmentation may be responsible for increased body weight, our results show that after controlling for age and sex, sleep duration was not a significant predictor for BMI, but sleep disturbances were. Probing further, we also found an interaction between sleep disturbances and age suggesting that as students age, sleep disturbances may have a larger effect on BMI. That is, regardless of the amount of time spent sleeping, sleep disruptions may have a significant influence on weight, and this influence may be augmented by age. These findings are consistent with the hypothesis that sleep restrictions alter the circulating levels of metabolically relevant hormones such as leptin and ghrelin, resulting in alterations of glucose homeostasis and appetite regulation. On the other hand, the interaction effect of age and sleep disturbances is congruent with evidence showing age-related changes in sleep timing and structure. Our results suggest a need to attend to the quality of sleep, particularly in young adults. Furthermore, there is evidence that sleeping problems for many adult insomniacs begins early in life. In addition to effects on grades and daily activities, poor-quality sleep puts college students at risk for health problems of long-lasting consequences, including excessive body weight. In turn, excessive body weight brings with it an increased risk for diabetes, cardiovascular disease, and some cancers.

Excess body weight has also been associated with nonfatal disorders that impact the patients' quality of life, such as osteoarthritis and asthma. In the near future, the increased morbidity associated with excess body weight may have a negative impact on life expectancy, as suggested by Calle et al. Calle et al's study of more than 1 million American adults found that among people who never smoked, heavier men and women had a higher mortality risk from all causes, whereas those with a BMI < 25 had the lowest mortality risk. Estimates based on current trends in the age of onset of excess body weight suggest that chronic conditions and disabilities associated with excess weight may increase dramatically in the younger generations, with negative consequences to their quality of life and life expectancy. A large proportion of college students experience sleep disturbances. This study shows that sleep disturbances are significantly linked to overweight and obesity. Our findings suggest the need to expand efforts of wellness programs and health initiatives to promote healthy sleeping habits among college students. These initiatives ought to also include educational components supporting healthy eating and physical activity among college students, emphasizing their intricate relationship, as well as the health benefits associated with undisturbed sleep.

ACKNOWLEDGEMENT

We want to acknowledge the contribution of Shri Vishnu college of pharmacy and Dr Bapi raju in the design of the study questionnaire and the management of data collection

Student consent: obtained

Funding: This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

REFERENCES

1.https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi.
2. Snijder MB, van Dam RM, Visser M, Seidell JC. 2006. What aspects of body fat are particularly hazardous and how do we measure them? *Int. J. Epidemiol.*, 35(1):83-92.
3. Gill T, Chittleborough C, Taylor A, Ruffin R, Wilson D. 2003. Body mass index, waist hip ratio, and waist circumference: which measure to classify obesity. *Int J Public Health.*, 48(3):191-200.
4. Ferri R., Manconi M., Plazzi G., Bruni O., Vandi S., Montagna P., Zucconi M. 2008. "A quantitative statistical analysis of the submentalis muscle EMG amplitude during sleep in normal controls and patients with REM sleep behaviour disorder". Journal of Sleep Research. 17 (1): 89–100.
5. Siegel Jerome M. 2008. "Do all animals sleep?". Trends in Neurosciences. 31 (4): 208–213.
6. Eve Van Cauter & Karine Spiegel 1999. "Circadian and Sleep Control of Hormonal Secretions", in Turek & Zee (eds.), Regulation of Sleep and Circadian Rhythms, pp. 397–425.
7. Brown RE, Basheer R, McKenna JT, Strecker RE, McCarley RW 2012. "Control of sleep and wakefulness". *Physiological Reviews*. **92** (3): 1087–187.
8. Rosa Peraita-Adrados, "Electroencephalography, Polysomnography, and Other SleepRecording Systems"; Chapter 5 in Parmeggiani & Velluti (2005).
9. "Sleep-wake cycle: its physiology and impact on health" (PDF). National Sleep Foundation.
10. Bingham, Roger; Sejnowski, Terrence; Siegel, Jerry; Dyken, Mark Eric; Czeisler, Charles (February 2007). "Waking Up to Sleep"(Several conference videos). The Science Network. Archived from the original on 24 July 2011. Retrieved 25 January 2008.
11. Randall, David K. (19 September 2012). "Book excerpt: How the lightbulb disrupted our sleeping patterns and changed the world". National Post. Archived from the original on 7 April 2019. Retrieved 31 August 2016. "... the sudden introduction of bright nights during hours when it should be dark threw a wrench into a finely choreographed system of life.
12. Barnes, C.M.; Lucianetti, L.; Bhave, D.P.; Christian, M.S. 2015. "You wouldn't like me when I'm sleepy: Leaders'

sleep, daily abusive supervision, and work unit engagement". *Academy of Management Journal*. 58 (5): 1419–1437.
13. Harvey, A.G.; Payne, S. 2002. "The management of unwanted pre-sleep thoughts in insomnia: Distraction with imagery versus general distraction". *Behaviour Research and Therapy*. 40 (3): 267–277.
14. Zisapel N. 2007. "Sleep and sleep disturbances: biological basis and clinical implications". *Cellular and Molecular Life Sciences*. 64(10): 1174–1186.
15. Dijk DJ, Lockley SW. 2002. "Functional Genomics of Sleep and Circadian Rhythm Invited Review: Integration of human sleep-wake regulation and circadian rhythmicity". *Journal of Applied Physiology*. 92 (2): 852–862.
16. De Benedictis, Tina; Larson, Heather; Kemp, Gina; Barston, Suzanne; Segal, Robert, 2007. "Understanding Sleep: Sleep Needs, Cycles, and Stages". Helpguide.org. Archived from the original on 24 January 2008. Retrieved 25 January 2008.
17. Wyatt JK, Ritz-De Cecco A, Czeisler CA, Dijk DJ (1 October 1999. "Circadian temperature and melatonin rhythms, sleep, and neurobehavioral function in humans living on a 20-h day". *American Journal of Physiology*. 277 (4): R1152–R1163.
18. Vargas PA, Flores M, Robles E. 2014. Sleep quality and body mass index in college students: the role of sleep disturbances. *J Am Coll Health*., 62(8):534-41.
19. Park SK, Jung JY, Oh CM, McIntyre RS, Lee JH. 2018. Association Between Sleep Duration, Quality and Body Mass Index in the Korean Population. *J Clin Sleep Med.*, Aug 15;14(8):1353-1360.

****