

Original Research Article

Prevalence of Poor Sleep Quality and its Association with Body Mass Index among Medical Students in Puducherry

Ramit Kundu¹, Jean Fredrick², Basanta Manjari Naik³, G.S.Gaur⁴, Kalaiarasi⁵

¹MBBS Student, JIPMER, Puducherry, ²Assistant Professor, Department of Physiology, Mahatma Gandhi Medical College & amp; Research Institute, Puducherry, ³Associate Professor, Department of Physiology, JIPMER, Puducherry, ⁴Professor, Department of Physiology, JIPMER, Puducherry, ⁵Junior Resident, Department of Physiology, JIPMER, Puducherry

Abstract

Introduction: Increase in the incidence of obesity globally is leading to several public health concerns. Poor sleep quality among obese and overweight individuals was reported by several large population studies. Altered sleep pattern was reported among medical students due to several factors such as high academic demands, social obligations, mobile usage and watching television. Studies assessing the sleep quality and its association with body mass index were not studied in the recent times. In this study we intend to assess the prevalence of poor sleep quality and its association with BMI among medical students in Puducherry.

Methodology: Sleep quality was assessed using the Pittsburg Sleep Quality Index. 125 students consented and participated in the study by submitting the questionnaire and volunteering for anthropometric measurements. PSQI questionnaire was analyzed and a total score of 5 or more was considered as poor sleep quality. BMI was calculated by Quetelet's index and Body fat percentage was calculated from the skinfold thickness measured.

Results: 52 % of the students were found to have poor sleep quality. There were no significant differences in mean PSQI values between male and female students. 43% of the students were found to have high BMI. There was no association between PSQI and BMI among the medical students.

Conclusion: There is a high prevalence of poor sleep quality among the medical students. Prevalence of high BMI is also seen in the study population indicating a risk for the development of obesity. Poor sleep quality and hence sleep deprivation may lead to poor academic performance.

Keywords: *Pittsburg Sleep Quality Index; Poor sleepers; Body fat percentage.*

Introduction

An alarming increase in the incidence of obesity is seen worldwide. Obesity and overweight have been known to cause many public health problems including cardiovascular and endocrine disorders. Large population

studies in the US has linked obesity and overweight to an increase in the incidence of sleep disturbances among the students¹. Prevalence of sleep disorders among the general population is found to be increased globally in the recent times². Sleep-wake cycle is influenced by several factors such as physiological functions and work schedules. The sleep-wake cycle of medical students was influenced by insufficient sleep duration, delayed sleep onset and occurrence of napping episodes during the day³. Several studies have assessed the sleep behavior among the students and reported that students alter their sleeping pattern due to academic and social obligations

Corresponding author:

Dr. G.S.Gaur

Professor, Department of Physiology,
JIPMER, Puducherry, Mobile: 9994470395
Email: drgsgaur@yahoo.com

⁴. Academic demands ⁵, prolonged exposure to light by mobile, computers and televisions, social interaction with peers, etc., are found to be the factors which disturb the sleeping habits among the students ⁶. Excessive daytime sleepiness seems to be prevalent among students who have reduced sleep durations of 1-2 hours a day. Reduced daytime alertness, impaired cognitive performances and thereby diminished academic performance were found to occur among the students due to sleep deprivation ⁷. Medical students are more vulnerable to sleep-related problems due to tough syllabus and heavy workload because of clinical postings ⁸.

Sleep quality can be assessed subjectively by recalling over the previous month by Pittsburg sleep quality index (PSQI) which is a 19-item self-rated questionnaire. The 19 questions are combined into 7 clinically-derived component scores, each weighted equally from 0-3. The 7 component scores are added to obtain a global score ranging from 0-21. PSQI score ≥ 5 indicates poor sleep quality ^{9,10}. Several studies have validated the questionnaire on their clinical and psychometric properties on different study populations ^{11,12}. Keeping the PSQI cut off score as 5 to identify the sleep disorder, sensitivity and specificity were found to be 89.6% and 86.5% respectively ¹⁰. Screening for the poor quality of sleep among the medical students would help us to reduce the health-related issues among the medical students and improve their academic performance. Most of the studies have assessed the association between sleep quality and academic performance. Studies assessing the quality of sleep among the medical students and the association of body mass index (BMI) on sleep quality has not been studied among the medical students in Puducherry. The objective of this study is to assess the prevalence of poor sleep quality and its association with BMI among medical students.

Materials and Method

The study complied with the ethical standards of the declaration of Helsinki. The institutional ethical committee approval was obtained before the commencement of the study. Written informed consent was obtained from medical students after explaining the study procedure. Students with a known history of sleep disorders with or without medications and known case of any endocrine disorders were excluded from the study.

A sample size of 125 was calculated by using 'n Master 2.0' software taking an average proportion of sleep disturbances of 32% in the general population ¹³ and 19 % among medical students ¹⁴. The sample size was calculated by keeping the precision at 5% and confidence interval at 95%.

125 students (75 male and 50 female) students were recruited in the study. They submitted their questionnaires and volunteered for the measurement of anthropometric parameters. For assessing the sleep quality, PSQI was used which constitutes a total of 19 self-rated questions and another 5 questions rated by a roommate or a bed partner if available. All questions are provided with responses ranging from 0 to 3. For final scoring only self-rated questions are used which together makes seven components with a range of 0 to 3 points. All the seven component score are finally added to obtain the global score of PSQI which ranges from 0-21 points where 0 indicate no difficulty in sleep and 21 indicate severe sleep difficulty. A total score of 5 or more is suggestive of poor sleep quality.

Anthropometric parameters such as height, weight, Waist circumference, hip circumference and skinfold thickness (pectoral, axillary, subscapular, triceps, abdominal, suprailiac and quadriceps) were recorded in the obesity research laboratory of Department of Physiology. The skinfold thickness was measured using a Harpenden skinfold caliper following the guidelines of the International Society of Advancement of Kinanthropometry (ISAK) ¹⁵. Body fat percentage (PBF) was calculated as per the equation by Jackson and Pollock ¹⁶. The PBF of 25% or more in males and 32% or more in females are considered to be abnormal. BMI was calculated using Quetelet's index and students with BMI ≥ 23 Kg/m² were considered to be at high risk ¹⁷.

Statistical Analysis

Statistical analysis was done using SPSS software (Version 8). Descriptive results were represented as frequency, percentage, mean and standard deviation. Independent 't' test was used to test for the differences for Age, BMI, WHR, PBF and PSQI global score between genders. Pearson's Chi-square test was done to assess the differences in frequency distributions between variables. Univariate logistic regression analysis was used to find the association of PSQI with BMI and PBF. A p-value <0.05 was considered significant.

Results

The study participants were between 18 and 20 years of age. There was no significant difference in mean values of age, BMI and PSQI score between male and female participants. PBF and WHR were significantly higher among female participants compared to male participants. There was no significant difference between the mean values of PSQI between male and female participants (Table 1)

Table 2 shows that 43 % of the study population was found to have high BMI ($BMI \geq 23 \text{ Kg/m}^2$) out of which 32% were males and 11 % were females. 79 % of participants had increased WHR out of which 59% were males and 20 % were female participants. 11 % of the participants had high PBF out of which 4 % were males and 7 % were female participants.

Sleep Quality: As measured by PSQI (table 2), 52% of the students were poor sleepers out of which 33% were males and 19 % were females. Table 3 shows that 25 % of the poor sleepers had high BMI. There was no association of sleep quality with BMI or PBF. 61 % of the students reported that they go to bed after 12 am. 22% of the students reported having a sleep latency of ≥ 30 minutes with a mean sleep latency of 17.3 ± 18.7 minutes. 56 % of the students reported having slept for less than 7 hours per night with mean sleep duration of 6.28 ± 1.03 hours ranging from 2 to 8 hours per night. 26 % of the students reported < 85 % sleep efficiency. During daytime while performing activities, 30% of students had trouble staying awake less than once a week, 24% once or twice a week and 5 % three or more times a week.

Discussion

The current study provides evidence for high prevalence of poor sleep quality (52 %) among medical students. The prevalence of poor sleep quality among medical students is comparable with other studies which assessed the sleep quality among medical students. In an international survey on general population conducted by Leger et al, 32.6 % of the population was affected from insomnia¹³. Feng et al assessed the quality of sleep among the medical students in China and reported that 19.17 % of the students were poor sleepers¹⁴. Almojali et al reported 76 % poor sleepers among medical students and also reported that poor sleep quality is three times higher among students with higher stress and also affected

the academic performance of the students¹⁸. Usage of mobiles, computers and watching televisions at night increases the poor quality of sleep among students⁶. A higher number of male students (32.8 %) were found to have poor sleep quality which was also consistent with findings by Almojali et al. Several studies reported that perceived stress and high academic demands were found to be the reasons for poor sleep quality and hence leading to sleep deprivation¹⁹. Sleep deprivation has been found to affect the architecture of sleep and circadian rhythm²⁰. Sleep duration of at least 7 hours a day is optimal for an adult to maintain a good health²¹. Majority of students were found to have reduced sleep duration in this study. Medical students sleep for short duration due to increased academic demands and they tend to utilize the time for reading²². Reduced sleep duration in the night causes sleep debt which further leads to excessive daytime sleepiness^{23,24}. There was also an increase in the prevalence of high BMI among the students which may be attributed to sedentary lifestyle and poor dietary habits. However, there was no association between sleep quality and BMI in this study. Vargas et al assessed the sleep quality among 515 college students and reported that 51 % of them were poor sleepers. There was an association between sleep quality and BMI with increased odds ratio which contradicts with our results.

We conclude that there is a high prevalence of poor sleep quality among medical students. BMI, PBF and sleep quality could not be associated in our study. Prevalence of high BMI is also seen in the study population indicating a risk for the development of obesity. Poor sleep quality and hence sleep deprivation may lead to poor academic performance. There is a need to educate the students to maintain proper sleep hygiene and also to perform a regular physical activity to reduce the risk of obesity. The limitation of this study is that assessment of body composition by methods such as Dual X-Ray Absorptiometry which would have given us more accurate values on PBF was not done. Recruitment of more sample size could have helped us to elicit the association of sleep quality with BMI and PBF.

Conflict of Interest: No conflict of interest

Source of Funding: This study was approved and funded by ICMR short term studentship program (Reference ID: 2015-04787)

Ethical Clearance: This study was approved by the institutional ethics committee (Human studies) of

JIPMER, Puducherry.

Table 1: Baseline characteristics of the study population

Parameters	Male (75)	Female (50)	Total (125)
Age	18.9 ± 0.7	18.8 ± 0.7	18.84 ± 0.69
BMI	22.9 ± 3.5	21.8 ± 3.7	22.6 ± 4.21
Waist Hip Ratio (WHR)	0.99 ± 0.03	0.81 ± .007*	0.99 ± 0.02
Body Fat percent (PBF)	17.38 ± 4.3	26.74 ± 4.9*	21.12 ± 6.5
PSQI score	4.96 ± 2.25 (74)	4.67 ± 1.9 (48)	4.84 ± 2.14 (122)

Data are represented as mean ± SD (number of students)

* P< 0.05. Independent t-test was done to find the gender difference between the mean values of WHR and PBF.

Table 2: Gender differences of study variables

	Male	Female	Total
Body Mass Index			
High BMI [BMI ≥ 23 Kg/m ²]	40 (32 %)	14 (11.2 %)	54 (43.2 %)
Normal BMI [BMI < 23 Kg/m ²]	35 (28%)	36 (28.8 %)	71 (56.8 %)
Waist Hip Ratio			
High Risk >0.89 for male >0.81 for female	74 (59.2 %)	25 (20%)	99 (79.2 %)
Low risk < 0.89 for male <0.81 for female	1 (0.8%)	25 (20%)	26 (20.8 %)
Body Fat Percentage			
High Risk > 25 % for male > 32 % for female	5 (4%)	9 (7.2 %)	14 (11.2 %)
Low Risk < 25 % for male < 32 % for female	70 (56 %)	41 (32.8 %)	111 (88.8 %)
PSQI			
Good sleeper (PSQI Score < 5)	34 (27.9 %)	25 (20.5%)	59 (48.7 %)
Poor sleeper (PSQI Score > 5)	40 (32.8 %)	23 (18.9 %)	63 (51.6 %)

Data represented as frequency (percentage)

Pearson's chi-square test was used to assess the association between PSQI and gender.

Table 3: Association between the quality of sleep and BMI.

PSQI and BMI	High BMI	Normal BMI	Total
Good sleeper (PSQI Score < 5)	22 (18.03 %)	37 (30.3 %)	59 (48.36%)
Poor sleeper (PSQI Score > 5)	31 (25.4 %)	32 (26.22 %)	63 (51.6%)

Data represented as frequency (percentage)

References

- Vargas PA, Flores M, Robles E. Sleep Quality and Body Mass Index in College Students: The Role Of Sleep Disturbance. *J Am Coll Health*. 2015;62(8):534-541.
- Azad MC, Fraser K, Rumana N, et al. Sleep disturbances among medical students: a global perspective. *J Clin Sleep Med*. 2015;11(1):69-74.
- Sharma A, Dixit AM, Krishnappa K, Sharma R, Shukla SK, Jain PK. A comparative study of sleep habits among medical and non-medical students in Saifai , Etawah. 2018;5(9):1-6.
- Wolfson AR, Carskadon M a. Understanding adolescents' sleep patterns and school performance: a critical appraisal. *Sleep Med Rev*. 2003;7(6):491-506.
- Ez Elarab H, Rabie MAM, Ali DH. Sleep behavior and sleep problems among a medical student sample in relation to academic performance: A cross-sectional questionnaire-based study. *Middle East Curr Psychiatry*. 2014;21(2):72-80.
- Mesquita G, Reimao R. Quality of sleep among university students. *Arq Neuropsiquiatr*. 2010;68(5):720-725.
- Gaultney JF. The prevalence of sleep disorders in college students: impact on academic performance. *J Am Coll Health*. 2011;59(2):91-97.
- Ez ElArab H, Rabie MAM, Ali DH. Sleep behavior and sleep problems among a medical student sample in relation to academic performance. *Middle East Curr Psychiatry*. 2014;21(2):72-80.
- Buysse DJ, Reynolds CF, 3rd, Monk TH BS and KD. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;(28):193-213.
- Buysse DJ, Hall ML, Strollo PJ, et al. Relationships between the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and clinical/polysomnographic measures in a community sample. *J Clin Sleep Med*. 2008;4(6):563-571.
- Cole JC, Motivala SJ, Buysse DJ, Oxman MN, Levin MJ, Irwin MR. Validation of a 3-factor scoring model for the Pittsburgh Sleep Quality Index in older adults. *Sleep*. 2006;29(1):112-116. doi:10.1093/sleep/29.1.112.
- Carpenter JS, Andrykowski MA. Psychometric evaluation of the Pittsburgh Sleep Quality Index. *J Psychosom Res*. 1998;45(1):5-13.
- Léger D, Partinen M, Hirshkowitz M, Chokroverty S, Hedner J. Characteristics of insomnia in a primary care setting: EQUINOX survey of 5293 insomniacs from 10 countries. *Sleep Med*. 2010;11(10):987-998.
- Feng G, Chen J, Yang X. Study on the status and quality of sleep-related influencing factors in medical college students. *Zhonghua liu xing bing xue za zhi*. 2005;26(5):328-331. <http://www.ncbi.nlm.nih.gov/pubmed/16053754>.
- Arthur Stewart, Tim Olds Arthur Stewart and Lindsay Carter Mike Marfell-Jones, Mike Marfell-Jones IS for A of K. *International Standards for Anthropometric Assessment*. revised. International Society for the Advancement of

- Kinanthropometry, 2011
16. Chambers AJ, Parise E, Mccrory JL, Cham R. A comparison of prediction equations for the estimation of body fat percentage in non-obese and obese older Caucasian adults in the United States. *J Nutr Heal Aging*. 2014;18(6):586-590.
 17. Barba C, Cavalli-Sforza T, Cutter J, et al. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet*. 2004;363(9403):157-163.
 18. 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):169-174.
 19. Patrick Y, Lee A, Raha O, et al. Effects of sleep deprivation on cognitive and physical performance in university students. *Sleep Biol Rhythms*. 2017;15(3):217-225.
 20. Elmenhorst EM, Elmenhorst D, Luks N, Maass H, Vejvoda M, Samel A. Partial sleep deprivation: Impact on the architecture and quality of sleep. *Sleep Med*. 2008;9(8):840-850.
 21. Cappuccio FP, D'Elia L, Strazzullo P, Miller MA. Sleep duration and all-cause mortality: A systematic review and meta-analysis of prospective studies. *Sleep*. 2010;33(5):585-592.
 22. Ahrberg K, Dresler M, Niedermaier S, Steiger A, Genzel L. The interaction between sleep quality and academic performance. *J Psychiatr Res*. 2012;46(12):1618-1622.
 23. Giri P, Baviskar M. Study of Sleep Habits and Sleep Problems Among Medical Students of Pravara Institute of Medical Sciences Loni, Western Maharashtra, India. *Ann Med Heal Sci Res*. 2013:51-54.
 24. Zailinawati AH, Teng CL, Chung YC, Teow TL, Lee PN, Jagmohani KS. Daytime sleepiness and sleep quality among Malaysian medical students. *Med J Malaysia*. 2009;64(2):108-110.