



Original Research Article

Correlation between body mass index and sleep patterns & duration among medical students

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ABSTRACT

Introduction: Obesity and its associated risks are a leading public health concern. Sleep deprivation is speculated to boost appetite. Medical students are prone to sleep deprivation.

Objective: a): To study Sleep duration & pattern of study population using the Pittsburgh Sleep Quality Index (PSQI). b): To correlate between Body Mass Index (BMI) and Sleep duration & pattern among study population.

Materials and Methods: Medicals students (n=247; males=133 & females=114) of age group 18-23 years were properly examined to exclude those suffering from any major diseases, psychiatric problems, alcoholics or sleep medication. Height & weight were examined to calculate BMI and it was graded according to ICMR guidelines. Sleep quality & duration was assessed by a self-report questionnaire, PSQI. Pearson's correlation was used to find the association among parameters.

Results: 41.3%(102) had overweight BMI of ≥ 23 ; 38.1%(94) had poor sleep quality with PSQI score > 5 and 43.3%(107) are sleep deprived with sleep duration 5-6 hours. Analysis showed highly significant negative correlation between BMI & sleep duration with 'p' value < 0.01 and also highly significant positive correlation between BMI & PSQI score with 'p' value < 0.01 .

Conclusions: It was found that with increase in BMI there is decrease in sleep duration as well as reduction in sleep quality which again leads to obesity as a vicious cycle. Hence proper education about sleep and life style modification is needed to medical students to prevent obesity and its associated comorbidities among them.

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1. Introduction

Currently obesity has become pandemic in the world and it poses major health threat and in India also the prevalence is increasing at an alarming rate. It is one of the major risk factors for cardiovascular¹ and metabolic disorders,² and other adverse health outcomes, among which many are leading causes of death in the world. Many researches have shown the association of lifestyle behavioral factors like imbalanced diet and lack of physical exercise as the causes of obesity. Now we have recognized other lifestyle factors are also linked to it. Recently sleep has been identified as one among them which may play a key role.

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With emerging technologies and advent of artificial lighting, television, internet, social media, and shift working, the sleep duration is curtailed. Because of this in our society, sleep deprivation has become a routine in approximately 25% of the population with reduced alertness.^{3,4} Certain experiments have shown neuroendocrinal influence of appetite in healthy individuals by sleep curtailment.⁵ Many prospective and cohort studies have found short sleep duration causing obesity over time.⁶⁻¹¹

Sleep deprivation also alters thermoregulation and could increase opportunities to eat and boost appetite by increasing ghrelin and decreasing leptin levels.⁵

To our knowledge, no particular studies have shown exact association or correlation of sleep duration and

body mass index among medical fraternity, who are prone to sleep deprivation because of frequent change in their work schedule like night duties, long duties and attending emergencies etc.^{12,13}

Hence in the present study, we aimed to find out the correlation between body mass index and sleep pattern & duration among medical students taking into account of their stressful situations like extended study hours because of heavy syllabus, frequent internal assessments causing sleep deprivation. Underlying hypothesis is that there is an association between short sleep duration and high body mass index.

2. Materials and Methods

2.1. Study design

Cross-sectional study

2.2. Study setting

Department of Physiology, Mysore Medical College & Research Institute, Mysuru.

Sample size was estimated with reference to the Proportions of BMI in the study by Israel, et al (2016),¹⁴ applying 5% chance and 10% absolute error, unit confidence interval was calculated to be 234. In the present study 247 subjects were considered.

2.3. Inclusion criteria

Medical students who had completed minimum 6months of MBBS course and aged between 18-23 years.

2.4. Exclusion criteria

Students were excluded if any of the following were there: any Endocrine disorders like Diabetes Mellitus, Hypothyroidism, Cushing's disease, Polycystic Ovarian Disorder etc., family history of obesity, alcoholism, any severe painful injury in the past 3 months, any psychiatric illness or Sleep disorders, those on sedatives or steroids and exam going students.

Informed written consent was taken and detailed History was recorded. Anthropometric parameters like Height and Weight were recorded. BMI was calculated using the formulae.

$BMI = \frac{Weight\ in\ Kg}{(Height\ in\ m)^2}$ and grading was done using ICMR guidelines.¹⁵

Assessment of sleep duration and patterns was done by PSQI - A self-administered questionnaire, which has high Test-retest reliability and good validity.¹⁶⁻¹⁸ It assesses sleep of an individual in the past 1 month. It is a 7 Component scoring index of sleep which include Subjective Sleep Quality, Sleep Latency, Sleep Duration, Efficiency, Disturbances, Medication and Daytime Dysfunction. There

are 4-point scale in each component, ranging from 0 to 3, to a Global PSQI Score of 0-21 and score >5 is considered Poor Sleep Quality.

Statistical analysis was done using MS excel and SPSS v17. Chi-square test was applied to check the association of BMI with different parameters included in the study. Pearson Correlation was used to check the relationship between BMI, sleep duration and PSQI score. P value <0.05 was considered statistical significance.

3. Results

The study included 247 subjects aged 18 to 23 years, with 114 females and 133 males. Table 1 gives the descriptive data of age, BMI, Sleep duration and PSQI rating of the study population. Subjects had a mean BMI of 21.77 Kg/m² with std. deviation of 3.376. 43.3% (107) had normal BMI and 41.3% (102) had BMI of ≥ 23 Kg/m².

Mean Sleep Duration of the subjects was 6.59 hours with std. deviation of 1.256. 43.3% (107) were sleep deprived with sleep duration 5-6 hours.

Mean PQSI rating of the subjects was 4.36 with std. deviation of 2.682. 38.1% (94) had poor sleep quality with PSQI score >5.

Pearson correlation was done among the parameters of BMI, Sleep Duration and PSQI score as they followed normal distribution. Table 2 shows the correlation of these parameters. BMI is significantly correlated negatively with sleep duration and positively with PSQI score. PSQI is negatively correlated significantly with sleep duration.

Lower sleep duration of 5-6 hours was observed in 107 (43%) students. Association between BMI and Sleep duration was statistically significant ('p' value <0.05). Near majority of overweight subjects i.e. 45 (75%) out of 60, had 5-6 hours of sleep and all obese subjects had < 6 hours of sleep among which 60% (25) had < 5 hours and 40% (17) had 5-6 hours of sleep. (Figure 1)

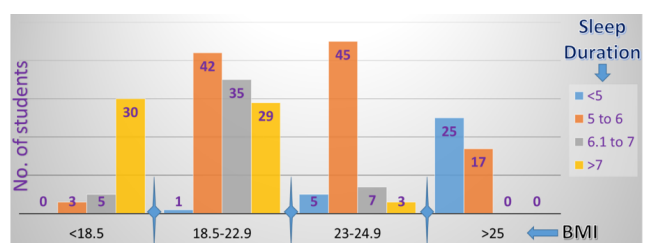


Fig. 1: Association between BMI & sleep duration

Pearson Chi-Square value = 206.977 ('p' Value < 0.05)

There was a significant association between BMI and PSQI score ('p' value <0.05). Out of 153 subjects with PSQI <5, 36 (23.5%) were underweight and 100 (65%) were normal weight. Out of 94 subjects with PSQI >5, 43 (46%) were overweight and 42 (45%) were obese.(Figure 2)

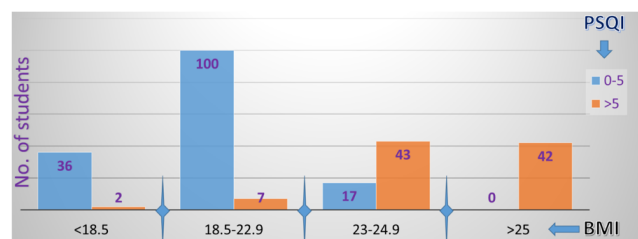
Table 1: Characteristics of participating students (n=247).

Characteristics	Number of participants	% of participants
Age (years)		
<20	131	53%
>20	116	47%
Body mass index		
<18.5	38	15.4%
18.5-22.9	107	43.3%
23-24.9	60	24.3%
25-30	39	15.8%
>30	3	1.2%
Sleep durations		
<5	31	12.6%
5-6	107	43.3%
6.1-7	47	19.0%
>7	62	25.1%
Pittsburgh sleep quality index (PSQI)		
0-5	153	61.9%
>5	94	38.1%

Table 2: Correlation among BMI, Sleep Duration and PSQI.

Correlations		Sleep Duration	PSQI
BMI	Pearson correlation	- 0.703**	0.864**
	'p' value	< 0.05	< 0.05
Sleep Duration	Pearson correlation		- 0.744**
	'p' value		< 0.05

**Highly significant

**Fig. 2:** Association between BMI & PSQI

Pearson Chi-Square value = 159.529 ('p' Value < 0.05)

4. Discussion

This cross sectional study, done using PSQI questionnaire, showed >24% were overweight and >17% were obese. More than 56% subjects were sleeping <6 hours and >38% had poor sleep quality. Physicians and medical students who are trained to improve the health of others succumb to the development of obesity and its complications, due to many reasons and one important reason is irregular sleep patterns and low sleep durations. According to study done by Bleich, et al (2012),¹⁹ normal weight physicians could counsel and provide better recommended obesity care to their patients than obese physicians.

The study showed highly significant positive correlation of BMI with PSQI score i.e. as the BMI increases the sleep quality decreases. These findings were similar to study done by Patel and Hu (2008),²⁰ which suggested poor quality sleep induces lethargy which in turn reduces the enthusiasm to do physical activity and reduces the desire to do exercise. They also found independent association of weight gain linked to short duration of sleep.

BMI showed highly significant negative correlation with sleep duration in the study. It is similar to the findings of the study done by Israel, et al (2016),¹⁴ which showed a higher number of subjects sleeping 5 to 6 hours and a strong negative correlation of their sleep duration with BMI. This means, as the sleep duration decreases that person tends to gain weight. One of the reason for this is depicted in the study done by Taheri, et al (2004),²¹ which found out that subjects who slept less had low leptin & elevated ghrelin levels. These neuroendocrine fluctuations increase the appetite of an individual leading to weight gain.

According to the study done by Perla, et al (2014),²² poor sleep quality rather than short sleep duration, predicted overweight among young adults.

5. Conclusion

There was significant negative correlation of BMI found with both sleep duration and sleep quality. It was found that

short Sleep Duration and poor Sleep Quality is significantly associated with High BMI.

6. Recommendation

Further studies by using objective measurements of sleep like Actigraphy, Polysomnography, Videosomnography will benefit in elaborating the findings and causal mechanisms can be explored. It is advisable to recommend healthy lifestyle with emphasis on proper sleep to general public.

7. Source of Funding

None.

8. Conflict of Interest

None.

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