"Is there an Association Between Self-Reported Sleep Duration, Body Mass Index and Waist-Hip Ratio in Young Adults? A Cross-Sectional Pilot Study"

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ABSTRACT

Introduction: Sleep is vital for mental and physical health of an individual. Duration of sleep influences the metabolism and regulates body weight.

Objective: To assess the cross-sectional association of sleep duration with body mass index (BMI) and waist-hip ratio in Malaysian students.

Methods: Eighty-nine Malaysian students of both genders, and with a mean (standard deviation) age of 21.2 (0.9) years were included. Institutional Ethics Committee clearance was obtained prior to the start of study. The subjects were interviewed regarding the average hours of sleep/day, their self-reported sleep duration was categorized as < 6hour/day (short sleep duration), 6-7hour/day and > 7hour/day. Their height (in meters), weight (in kilograms), waist and hip circumference (in centimetre) were measured. BMI and waist-hip ratio were calculated using appropriate formulas and expressed as mean (standard deviation). The duration of sleep was compared with BMI and waist-hip ratio using one way ANOVA.

Results: No statistical significance was observed when sleep duration was associated with BMI (p=0.65) and waist-hip ratio (p=0.95). Duration of sleep did not affect BMI and waist hip ratio in the Malaysian students in our study. The age and healthy lifestyle of the subjects in this study may have been a reason for no significant influence of short sleep duration on the BMI and waist-hip ratio.

Conclusion: No association was found between sleep duration with BMI and waist hip ratio in the Malaysian students.

INTRODUCTION

Sleep is important for many physiological processes to occur in the body and is vital for mental and physical health of an individual. Though sleeping patterns vary from individual to individual and depend on cultural to socioeconomic factors, it can be safely concluded that human adult require an average of 7 to 8 hours of sleep per day. The duration of sleep probably influences the metabolism and regulates body weight [1]. An intriguing association between short self-reported sleep duration (≥ 6 hour/day) and adiposity has been reported [2]. Obesity which has gained epidemic proportions over the past few decades is associated with various metabolic disorders and also has positive correlation with decreased life expectancy. Adults sleeping for short durations show higher BMI, increased waist and neck circumference compared to those who sleep 8 hours/day, emphasizing the association between short sleep duration, BMI and central adiposity [3]. In the present day circumstances where owing to overuse of communication networks (mobile phones, internet, smartphones, etc.) sleeping late into the night and thereby clocking lesser hours of sleep are becoming hallmarks of students' lives, its adverse effect on another pertinent issue at hands, which is obesity and its association with cardiovascular diseases, needs to be studied. This gains importance as along with smoking and alcohol, obesity is a leading cause of preventable death. The objective of this study was to assess the cross-sectional association of sleep duration with BMI and waist-hip ratio in Malaysian students studying, MBBS at MMMC (Manipal campus), Manipal University, Karnataka, India.

METHODS

Healthy Malaysian young adults of both genders were included in this cross-sectional study. The study was conducted at Melaka Manipal Medical College (Manipal campus) between March–July 2013. The subjects were interviewed regarding the average hours they slept per day. Those consuming alcohol and smoking cigarettes were excluded from this study. Self-reported sleep duration was categorized as < 6 hour/day (short sleep duration), 6-7hour/day and > 7hour/day. The height (meters), weight (kilogram), waist and hip circumference (centimetres) were measured. BMI was calculated using the formula, weight in kilograms (kilogram) divided by height in square meters (m^2) and categorized as underweight <18.5 kg/m^2, normal BMI 18.5 to 24.9 kg/m^2, overweight 25.0 to 29.9 kg/m^2 and obese ≥ 30 kg/m^2 [4]. Waist circumference was measured, midway between the lower rib margin and the iliac crest using a measuring tape. Hip circumference was measured at the level of the greater trochanter using a measuring tape. Waist-hip ratio was calculated by dividing the waist circumference by the hip circumference [5]. The waist-hip ratio with values between 0.81-0.89 was considered normal. The study was conducted in accordance to the provisions of the Helsinki Declaration of 1975 (revised in year 2000) and was approved by the institutional research committee at MMMC (Manipal campus) and Ethics Committee of Kasturba Hospital, Manipal, India.

STATISTICAL ANALYSIS

The data was expressed as mean (standard deviation) for BMI, waist-hip ratio and sleep duration. The height, weight, BMI and waist, hip and waist-hip measurements were compared with sleep duration using one way One-way Analysis of Variance (ANOVA) followed by Tukey's test. Data was analysed using SPSS 15.0. A p-value of < 0.05 was considered to be statistically significant.

	Self-reported Sleep Duration (hours)			p-value
	<6(n= 30)	6 to 7 (n=44)	>7 (n=15)	
Height (Mt) (Mean ± SD)	1.63 ± 0.08	1.65 ±0.07	1.68 ± 0.08	0.19
Weight (Kg) (Mean ± SD)	58.03 ± 10.60	61.59 ± 13.24	61.73 ± 9.62	0.40
BMI (kg/m²) (Mean ± SD)	21.71 ± 3.61	22.45 ± 4.16	21.76 ± 2.13	0.65
Waist (Cms) (Mean ± SD)	70.97 ± 8.67	73.92 ± 12.18	71.07 ± 7.40	0.42
Hip (Centimetres) (Mean ± SD)	88.53 ± 8.67	91.26 ± 9.06	88.57 ± 8.04	0.34
Waist-Hip ratio (Mean ± SD)	0.80 ± 0.07	0.81 ± 0.07	0.80 ± 0.07	0.95

[Table/Fig-1]: Comparison between self-reported sleep duration with height, weight, BMI, waist, hip and waist-hip ratio using one-way ANOVA (p < 0.05 considered as statistical significance)

RESULTS

The mean (standard deviation) age among the total 89 students included in this cross-sectional study was 21.20 (0.97) among whom, 39 (43.8%) were males and 50 (56.1%) were female students. Thirty (33.7%), 44 (49.4%), 15 (16.8%) among the total students slept for an average of < 6 hour/day, 6-7 hour/day and >7 hour/day respectively. Of the self-reported short sleep duration, 03 (10%) were categorized as underweight, 21 (70.0%) had normal BMI, 05 (16.6%) were overweight and 01 (3.3%) was categorized as obese. Among the group with 6-7 hours sleep duration per day, 05 (11.3%) students were underweight, 33 (75.0%) had normal BMI, 03 (06.8%) were overweight and 03 (06.8%) obese. Thirteen (86.6%) students had normal BMI and only 02 (13.3%) were overweight among the 15 students with self-reported sleep duration of > 7 hour/day. The mean (standard deviation) BMI was 21.7 (3.6), 22.4 (4.1), 21.7 (2.1) for students who slept < 6 hour/day, 6-7 hour/day and > 7 hour/day respectively. One-way ANOVA used to assess the relationship between the duration of sleep with BMI showed no statistical significance (p=0.65) [Table/Fig-1].

Thirteen (43.3%) students among 30 who reported as having short sleep duration had low waist-hip ratio while 17 (56.6%) had normal waist-hip ratio. The number of students who slept between 6 -7 hour/d were 20 (45.4%), 19 (43.1%) and 05 (11.3%) with low, normal and high waist-hip ratio respectively. Five (33.3%) students had lower waist-hip ratio whereas, 10 (66.6%) had a normal waist-hip ratio, among the 15 with sleep duration of > 7 hour/day. The mean (standard deviation) waist-hip ratio was 0.80 (0.07), 0.81 (0.07), 0.80 (0.07) in those with sleep duration of < 6 hour/day, 6-7 hour/day and > 7 hour/day respectively. Varied sleep durations showed no statistical significance when compared to waist-hip ratio in the three groups (p=0.95). Tukey's test was not performed since statistical significant was not obtained. No association was evident between duration of sleep with BMI and waist-hip ratio [Table/Fig-1].

DISCUSSION

Sleep duration of most students in professional courses is affected due to stress of examinations, academic responsibilities and peer pressure resulting in a disturbed sleep-wake cycle [6]. A study on Malaysian medical students documented the poor quality sleep, resulting in sleepiness during the day and also psychological distress [7]. Young adults with short sleep duration have shown to have poorer self-rated health compared to those with normal or >8 hours/day sleep duration [8]. In this study, our results show short and/or longer sleep duration had no significant effect BMI or waist-hip ratio in Malaysian students [Table/Fig-1]. Our results are similar to the conclusion drawn by Lai et al., who found that there was no association between the total sleep duration and BMI in a population of young Malaysian adults [9].

The age of the subjects in this study may have been a reason for no significant influence of short sleep duration on the BMI and waist-hip ratio. Determining cause-relation effect is a complex process; while many theories on ghrelin, leptin, cortisol with relation to sleep and hunger and obesity have been proposed; various studies have shown conflicting reports [10]. It can only safely be concluded that the study should be expanded to larger student population to shed further light on this unique relation between obesity and sleep deprivation. New dimensions can be added to the study by correlating with carbohydrate and lipid function tests. The study group selected and their setting presents an interesting picture which could have affected the result. The students who are enrolled in a professional course are liable to be physically active to meet the demands of everyday classes, practical work, and all of it shuttling between various classrooms and locations. Also the setting where they study, i.e., the University, has ample amenities and avenues for exercise amidst a thriving culture of healthy lifestyle. It might thus counter the ill effects of lesser duration of sleep, which could justify the result of our study.

LIMITATIONS: Low sample size was the main limitation of this study.

CONCLUSION

No association was found between sleep duration with BMI and waist hip ratio in the Malaysian students.

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