



Original Article

Correlation between obesity and sleep disturbance in Saudi medical students

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Abstract. [Purpose] The aim of the present study was to investigate the association between sleep duration, quality and obesity in the medical students of Saudi population. [Subjects and Methods] This is a cross-sectional study carried out in 408 medical students from King Khalid University Hospitals, Riyadh, Saudi Arabia, based on well-designed questionnaire study and consent form. [Results] The results of this study revealed 39.9% of subjects perform the exercise on regular basis and 61.5% of them reduced their weight, which may be due to diet plan (52.9%) also. Only 68.6% of the subjects were affected with the weight. The maximum number of subjects was lying down after the lunch (88.2%), sitting and reading (80.1%) are prone to develop obesity in future. [Conclusion] Our study confirms sleep disturbance has affected the weight gain and the maximum number of subjects was lying down after the lunch and sitting and reading will be prone to develop obesity in future.

Key words: Sleep, Weight gain, Obesity

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INTRODUCTION

The notion that inadequate of short or long sleep is a sufficient cause for overweight/obesity has been the subject of much controversy which was spurred by mixed epidemiologic evidence, with cross-sectional and longitudinal studies showing independent associations of inadequate sleep with overweight/obesity¹⁾. Both short and long sleep durations have been associated with increased risk of coronary heart disease, type 2 diabetes mellitus (T2DM) and with daytime sleepiness and waking unrefreshed. Short but not long sleep duration has been identified as a risk factor for hypertension²⁾. Earlier studies demonstrate the association between existence overweight or obese and sleep, specifically with shortened sleep duration, poor sleep quality, later bedtimes, and variable sleep times day-to-day^{3–6)}. The purported association between obesity and sleep is not still clear⁷⁾. The association between sleep duration and weight gain has been well established, although the different variables were observed in gender. The relation in men appears to be linear and negative, while in women, the relation between sleep duration and obesity risk seems to be high⁸⁾.

Medical students are a unique group of young adults whose academic commitments and lifestyle can impact their sleep habits and result in sleep deprivation⁹⁾. Physical activity, sleep, screen time i.e. TV viewing and eating habits are four key modifiable lifestyle behaviours that can influence body weight. Insufficient lack of sleep, viewing the TV and consumption of high calorie (sweetened) beverages are the major potential risk factors for prone of obesity¹⁰⁾. The relationship between race, ethnicity and obesity has been shown to exist after accounting for differences in socioeconomic status¹¹⁾. Short sleep is the common most frequent sleep behavior inspected and associated with obesity, hyperglycemia, and adverse changes

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in metabolic factors. Insufficient sleep is associated with poor impulse control, risk-taking behaviors, and other cognitive and psychological deficits that may contribute to weight gain. Other reports, however, suggest that short sleep may not independently influence obesity^{12, 13}. In general, the relationship between sleep/wake habits and the academic performance of medical students is insufficiently addressed in the literature⁹.

Therefore, we designed this study to investigate the association with sleep duration, quality and obesity in the medical students of Saudi population.

SUBJECTS AND METHODS

This is a cross-sectional study carried out in King Khalid University Hospitals, capital city of Saudi Arabia. The recruitment of the subjects began with the clearance of ethical approval and based on the design of the study subjects were selected from College of Medicine. Based on the questionnaire and sign of consent form, we have selected 408 students based on the sample size concluded from the earlier pilot study [Unpublished data]. The current study was explained to the students and assured that all their information will not be revealed and maintained confidentiality to all except for the publication.

We have used a standardized formula to estimate the sample size of this current study through the pilot study, which was carried out earlier by our group [Unpublished data].

- The sample size was calculated based on a pilot study that was conducted among 13 medical students in College of medicine, KKHU, Riyadh.
- 54% of had normal values concerning their sleeping pattern, while 46% didn't.
- $p=0.54$
- Confidence level=95%
- d (width of confidence interval)=5%

$$N = \frac{(Za)^2 p(1-p)}{d^2} = \frac{3.84 * 0.54 * 0.46}{(0.05)^2} = 381.7$$

We will be collecting 400 (males and females) for better accuracy of the data.

The four-page questionnaire consist of multiple information and the students were just to click Yes or no and need to click the correct answer if the option exceed more than 4 [For example: 0, 1, 2, 3, 4 and 5]. The details of the questionnaire were as follows (i) personal information, (ii) family histories of different diseases i.e., the subjects with advanced obesity for Diabetes Mellitus, Iron deficiency anemia, Vitamin D deficiency, Hypothyroidism, Depression, Polycystic ovary syndrome, Heart disease or Stroke, Musculoskeletal disorder (osteoarthritis/joint disease), Connective tissue disease (SLE or myositis), hypogonadism, (iii) habit of smoking, caffeine (iv) exercise/diet/lose weight and (v) sleep assessment and dozing i.e. Sleep assessment was categorized (a) sleep duration (b) pattern (Quality). The duration was assessed by obtaining the average total sleeping hours in 24 hours. Quality assessed "Epworth Sleepiness Scale" (ESS) in which the subject choose how they doze off/fall asleep in different situations on daily basis time (example: sitting, reading, driving...etc.]. However, in the initial page, we have explained about the study and participant details and signature in the consent form.

The age of students has been calculated with Years and weight was measured with kilograms (kgs) and height was measured with centimeters or meter square (cms/m²). Body mass Index (BMI) was calculated with formula BMI=weight (kg)/height (cms/m²)¹⁴. The below normal weight (<18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), obese (30.0–39.9 kg/m²), and extremely obese (40 kg/m²) was opted as per the World Health Organization criteria for BMI in our study. The BMI measurements were performed with trained women in health care centers. Height and body weight were measured without shoes and with light cloths. Height was measured to the nearest 0.5 cm and weight to the nearest 0.1 kg¹⁵.

Statistical Package for Social Sciences software was performed to carry the statistical analysis (SPSS 21.0 SPSS Inc., Chicago, IL, USA). We have performed Anova analysis to calculate the variable between 3 different groups.

RESULTS

In this cross-sectional study, we have recruited the total subjects about 408 medical students and among them 54.9% (224) participants are males and 45.1% (184) were females. The mean age of the total subjects was 20.7 ± 2.3 , among this the mean age of the males and females are 20.7 ± 2.3 and 20.7 ± 2.3 respectively. The anthropometric measurements of the students were described in Table 1. The weight, height and BMI of the total students were 69.4 ± 19.1 kgs, 167.4 ± 13.4 cms and 28.52 ± 14.2 . All the students were not in the underweight. The mean BMI of the male subjects are 25.3 ± 5.92 and females were 23.0 ± 4.9 . When we performed the Anova analysis with the 3 variants i.e. (i) total subjects (ii) male and (iii) females we find the BMI and weight as significant association and this indicates that male subjects were more prone to proliferate the weight as well as BMI.

Table 2 represents the elaborate details about exercise and diet plan. In this study, 37.2% of the participants were on

Table 1. Anthropometric measurements of medical students

S.No	Anthropometrics	Total subjects n=408	Males n=224	Females n=184
1	Age (years)	20.7 ± 2.33	20.7 ± 2.88	20.8 ± 1.43
2	Gender (male: female)	54.9%: 45.1%	100%: 0%	100%: 0%
3	Weight (kg)	69.1 ± 19.1	70.7 ± 18.4	59.4 ± 13.43
4	Height (m ²)	167.7 ± 13.4	174.3 ± 6.85	160.5 ± 6.58
5	BMI (kg/m ²)	28.52 ± 14.2	25.3 ± 5.92	23.0 ± 4.9
6	Family history of DM	07 (1.7%)	03 (1.3%)	04 (2.1%)

Table 2. Exercise and diet details of the selected students

S.No	n=408
1	Exercise 152 (37.2%)
2	Lose weight 229 (56.1%)
3	Diet plan 196 (48.0%)
4	Average sleep 7.1 ± 1.8
5	Day: Night 194 (47.6%): 214 (52.4%)
6	Affected weight 280 (68.6%)

Table 3. Sleep pattern assessments in the medical students

S.No	Sleep disorders	n=408
1	Sitting and Reading	327 (81.2%)
2	Watching Television	295 (72.3%)
3	Sitting in the inactive places	261 (64%)
4	Sleeping in the car (non-driver)	305 (74.8%)
5	Lying down after lunch	360 (88.3%)
6	Sitting and talking to others	128 (31.4%)
7	Sitting quietly after lunch without drinks	282 (69.2%)
8	Sleeping in the car, when signal is red	197 (48.3%)

Table 4. Association of variable forms of BMI in the medical students

S.No	Variables	Normal weight (n=259)	Over weight (n=95)	Obese (n=54)
1	Age	20.8 ± 1.97	20.50 ± 3.38	21.14 ± 1.56
2	Gender (M:F)	127 (31.1): 132 (32.4)	55 (13.5): 40 (9.8)	42 (10.3): 12 (22.2)
3	BMI (kg/m ²)	21.08 ± 2.51	27.21 ± 1.42	34.77 ± 4.83
4	Exercise	105 (25.7%)	43 (10.5%)	15 (3.7%)
5	Lose weight	125 (30.6%)	76 (18.6%)	50 (12.3%)
6	Diet plan	70 (27)	47 (11.5)	27 (6.6)
7	Average sleep	7.13 ± 2.02	7.11 ± 1.69	6.90 ± 1.55
8	Effected weight	1.57 ± 1.77	1.40 ± 0.61	1.87 ± 0.94
9	Watching television	1.05 ± 0.96	1.13 ± 1.78	1.22 ± 2.17
10	Lying down after lunch	1.87 ± 0.93	1.90 ± 2.03	1.94 ± 2.45
11	Sitting in the inactive places	0.97 ± 1.37	1.09 ± 1.85	1.05 ± 1.19

regular exercise with a mean age of 5days/week for up to 2 hours. However, 56.1% of them had lost weight with exercise (37.2%) and diet (48%). The remaining 62.8% of the participants skipped the exercise due to busy schedule with college 43.6% (178) and 78 (19.1%) of them were not interested to perform the exercise. The main reason for avoiding the exercise was most of the subjects were females. However, 56.1% (229) subjects lost their weight due to exercise and diet patterns. The diet pattern was followed by 48.1% (196) subjects with the help of dietician (12.2%) and family medicine (35.9%) and remaining 51.9% (212) subjects have avoided the diet pattern to lose the weight.

The mean of the sleeping time of all the subjects were 7.1 ± 1.8 and among this 52.4% sleep during night and rest of them (47.6%) sleeps during the day. However, 68.6% subjects were effected with the weight gain and rest of them i.e. 9.3% of the subjects were not affected and 22.1% of them are not sure whether they have or not affected with the weight. We have recorded the sleeping pattern assessments with the selected subjects in Table 3. The maximum number of subjects were lying down after the lunch (88.3%; $p < 0.05$), sitting and reading (81.2%; $p < 0.05$) are prone to develop obesity in future. The other disturbances such as sleeping in the car, besides the driver (74.8%; $p < 0.05$), watching televisions (72.3%; $p < 0.05$), Sitting quietly after the lunch (69.2%; $p < 0.05$), sitting in the inactive places such as in the public places like theatre or meeting spots

Table 5. Students carrying the variable family histories

S.No	Different family histories	Percentages
1	Medication	18.1%
2	Caffeine	73.7%
3	Smoking	10.5%
4	Pulmonary disorder	12.9%
5	Hypogonadism	0
6	Connective tissue disease	0.2%
7	Musculoskeletal disorder	1.9%
8	Heart disease/stroke	0.7%
9	Polycystic ovarian syndrome	8.7%
10	Depression	8.1%
11	Hypothyroidism	2.2%
12	Vitamin D deficiency	38.3%
13	Iron deficiency anemia	12.9%
14	Diabetes	1.7%

(64%; $p < 0.05$), sleeping in the car for short duration of time i.e. red signal (48.3%; $p < 0.05$) and sitting and chitchatting with others (31.4%; $p < 0.05$).

The details of the family histories of recorded diseases have been characterized in [table 5](#). In this study, we have recorded the 14 variables of which consists of family history of the diseases as well as the common and routine habits that were prone to develop the diseases. The family history of diabetes was found to be 1.7% and the heart disease/stroke was found to be 0.7%. This data represents the lowest percentage of effecting the metabolic diseases. The maximum number of family histories in Iron deficiency anemia (12.9%), Vitamin D deficiency (38.3%) and hypothyroidism (2.2%) was found in the female subjects. Although, the family history of polycystic ovarian syndrome (8.7%) was purely recorded from the female subjects. The 8.1% of the family history was recorded as depression. The musculoskeletal and pulmonary disorders family histories were recorded as 1.9% and 12.9% respectively. The family histories of connective tissue diseases were found to be 0.2% and we could not find any family history in the hypogonadism i.e. 0%. In our study, we could find the history of caffeine as the largest family history among the studied group, which was recorded as 73.7%. The smoking history was found to be 10.5% and medication history to be 18.1%.

DISCUSSION

At present, there is no maximum information around the sleep disorders and weight gain which leads to obesity in medical students. Therefore, we carried out a cross-sectional study in KKHU with 408 medical students. The result of our study have carried out this study in medical students of KKHU and our results have revealed the positive association between lack of sleep leads to weight gain and then to obesity. The present study is in agreement with the prior studies supporting the relation between short sleep and lack of sleep with weight gain, leads to obesity^{8, 16–18}. Steptoe et al.²) studied have been carried out in 17,465 university students (young adults) in 27 countries and reported that short sleep duration (<7 hours) increased the adjusted odds of poor health in both men and women, whereas no relationship was found between long sleep duration (>8 hours) and health outcomes¹⁹. Alotair et al.²⁰) has been carried out a study differentiating between the genders in the Saudi population with obstructive sleep apnea. We found that controlling for energy balance, depression, and demographic variables did not mitigate the relationship between sleep and weight⁸).

This is the first study carried out in Saudi Arabia on Medical students. The correlation was connected between obesity and disturbance of sleep. Haghighatdoost et al.²¹) has concluded from their study that short sleepers had significantly lower diet quality indices and higher values of BMI and waist circumferences, as well as a higher percentage of obesity and abdominal adiposity compared to longer sleepers, without any significant differences in physical activity levels. [Table 4](#) explains about the variable characters associated to develop the weight and which leads to obesity. In this table, we have shown the difference between underweight (BMI; <24.9 kg/m²), overweight (BMI; 25.0–29.9 kg/m²) and obesity (BMI; 30.0 kg/m²) with the selected parameters and compare in the 3 groups to see the difference for the development of weight gain, leads to obesity. The selected variables showed positive associations for BMI, exercise and diet pattern to lose weight, effect of watching television ($p < 0.05$) and negative associations such as age, average sleep, effected weight, lying down after lunch and sitting in the inactive places ($p > 0.05$). the underweight subjects have the high frequency percentage in losing the weight (30.6%) by performing the exercise (25.7%) and diet (27%) on the regular basis compare with the overweight and obese. The duration of sleeping between 5–6 hours are prone to weight gain. The obese subjects have the less activity in exercise and diet for losing

the weight and the average sleep duration was found to be less and this leads to the weight gain and we can find the relation between obesity and lack of sleep in the medical students. The subjects who are failed to reduce the weight loss can follow the Melam et al.¹⁵⁾ studies for brisk walking and aerobics. This is a kind of physical therapy exercise required to carry out for minimum 10–12 weeks to reduce the weight loss.

The current study is in agreement with the Roane et al.²²⁾ studies suggesting the future research should be studied in depth with the roles of sleep duration, sleep timing, and sleep variability and gender in weight gain (obesity). Sleep behaviors may be underlying, modifiable mechanisms that promote weight gain in different ways for men and women. Thus, more rigorous exploration into the independent, additive, and moderating roles of these modifiable mechanisms would provide valuable information to develop practical interventions for reducing weight gain, and potentially, obesity rates. The limitations of current study could be the neglecting nutritional details and we could have measure the hypertension in the medical students and this could fulfill in the future studies from our sample population. Our study concludes, sleep disturbance has affected the weight gain and the maximum number of subjects was lying down after the lunch and sitting and reading will be prone to develop obesity in future.

Conflict of Interest

None.

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