The Association Between Sleeping Hours and Body Weight

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Abstract

Background: In recent years, short sleep has been increasingly recognized as a risk factor for obesity. The study aimed to study association between sleep duration and body mass index. Material and methods: A cross sectional study for both gender with age between 18 to 65 years was done, Participants were directly interviewed the well-constructed Questionnaire at primary health care center in Afak at Al-Diwaniyah city during period of 2 months. This survey consisted of questions addressing demographics, height and weight were measured, Duration of the sleep-in hours per night, body exercise habits minimal 30 minutes per session and dietary habits were collected per questionnaire. A study protocols were approved by the Arab board of health specialization. Statistical analyses were performed using statistical package for the social sciences computer software program. Result: A total of 200 patients were enrolled in this study, the mean age was 32.4 years with female to male ratio was 3:1. The patients with short sleep duration was 41.5% (83) of patients, normal sleep duration was found among 51.5%(103) of patients and long sleep duration was found among 7%(14) of patients. The mean sleep duration shown a significant difference according to BMI of participants ($p<0.001$), with lowest mean found among obese patients. The mean sleep duration shown no significant difference according to frequency of exercise and general anxiety disorder score, also there were no significant correlation between sleeping hours and daily dietary intake. Conclusion: short sleep duration was more closely linked to obesity categories across BMI.

Keywords: Health; sleep; body weight

1. Introduction

Globally, overweight and obesity is a major public health concern, and there are more overweight or obese than underweight adults. In 2016, 39% men and 40% of women aged 18 and over, accounting for nearly 2 billion adults, were overweight, and 11% of men and 15% of women, more than half a billion, were obese worldwide. Both overweight and obesity have shown a marked increase over the past four decades (1). Obesity represents a major health challenge because it substantially increases the risk of diseases such as type 2 diabetes mellitus, fatty liver disease, hypertension, myocardial infarction, stroke, dementia, osteoarthritis, obstructive sleep apnea and several cancers, thereby contributing to a decline in both qualities of life and life expectancy. Obesity is also associated with unemployment, social disadvantages and reduced socio-economic productivity, thus increasingly creating an economic burden (2). Obesity is not caused by personal choice or by society but rather by the relationship between an individual and their environment. Obesity is the result of the interplay between heterogenic factors, deriving from a person's eating behavior, physical activity and individual energy expenditure determinants(3). Under this main assumption, the UK Foresight Programme Tackling Obesities' project identified seven main clusters (composed of relevant individual, social and environmental context factors and their interdependencies) that determine obesity for an individual or a group(3). These clusters include the following: physiology, individual psychology, individual physical activity, food consumption, food production, social psychology and physical activity environment.

Concurrent with the increase in overweight and obesity among population, there has been a change in sleeping patterns(4, 5). Insomnia and sleep difficulties have been widely studied in the general population(6). A short sleep duration and poor sleep quality is imposing a growing burden on public health which affecting approximately 20% of general population(7). With the steadily declined time devoted to sleep in working-aged adults for decades, accumulating evidence indicates that poor sleep quality is associated with a variety of cardio metabolic diseases(8). Also there were a significant relationship between sleep disturbance and insulin resistance, in which short sleep duration and poor

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sleep quality contributed to increasing risk for metabolic syndrome, impaired glucose tolerance and type 2 diabetes mellitus(9-11).

Over the past twenty years, a vast number of epidemiological studies emerge on the topic of obesity and sleep duration, with a focus on body mass index, as it is easy and cheap to measure and analyze. Such studies largely observe that cross-sectional a higher BMI is associated with shorter sleep and that in longitudinal studies shorter sleep duration is associated with increases in BMI over time(12, 13), but some research has found no relationship between the two(14, 15). thus, the objective of this study was to examine the association between sleep duration and body mass index (BMI) categories.

2. Patients and methods

A cross sectional study for both gender with age between 18 to 65 years was done, Participants were directly interviewed with well-constructed Questionnaire at primary health care center in Afak at Al-Diwaniyah city during period between 1st August to 1st October. This survey consisted of questions addressing demographics (age and gender), height and weight were measured, Duration of the sleep-in hours per night, body exercise habits minimal 30 minutes per session and dietary habits were collected per questionnaire. Sleep duration was classified into 3 groups—short (< 7 hours), normal (7–9 hours) and long sleep (> 9 hours)(16). A 7-item anxiety scale (GAD-7) was used to measure level of anxiety, the following cut-offs correlate with level of anxiety severity: Score 0-4 (Minimal Anxiety), Score 5-9 (Mild Anxiety), Score 10-14 (Moderate Anxiety) and Score greater than 15 (Severe Anxiety)(17). BMI cutoff point in analyses was under-weight (BMI < 18.5 kg/m2), normal weight (BMI 18.5 to < 25 kg/m2), overweight (BMI 25 to < 30 kg/m2), and obesity (BMI ≥ 30 kg/m2)(18). Any questionnaire with missed question were excluded from analyses. A study protocols were approved by the Arab board of health specialization. Statistical analyses were performed using statistical package for the social sciences (SPSS version 23) computer software program. Shapiro – Wilk test were used to determine whether the outcome variables were normally distributed. Variables were reported as means ± S.D, ANOVA test were used. Pearson correlation coefficients were computed to determine the bivariate relationship.

3. Result

A total of 200 patients were enrolled in this study, majority of patients were between 20-39 years with mean age was 32.4 years with female to male ratio was 3:1, table -1-.

Table -1- Demographic character of studied group.

Demographic character		Number	Percentage
Age in years	<20	7	1.8%
	20-29	83	41.5%
	30-39	73	36.5%
	40-49	23	11.5%
	≥50	14	7%
Gender	Female	151	75.5%
	Male	49	24.5%
Total		200	100%

The mean ±SD of sleep duration was 6.8±1.8 hours per night. with patients with short sleep duration was 41.5%(83) of patients, normal sleep duration was found among 51.5%(103) of patients and long sleep duration was found among 7%(14) of patients, figure -1-.

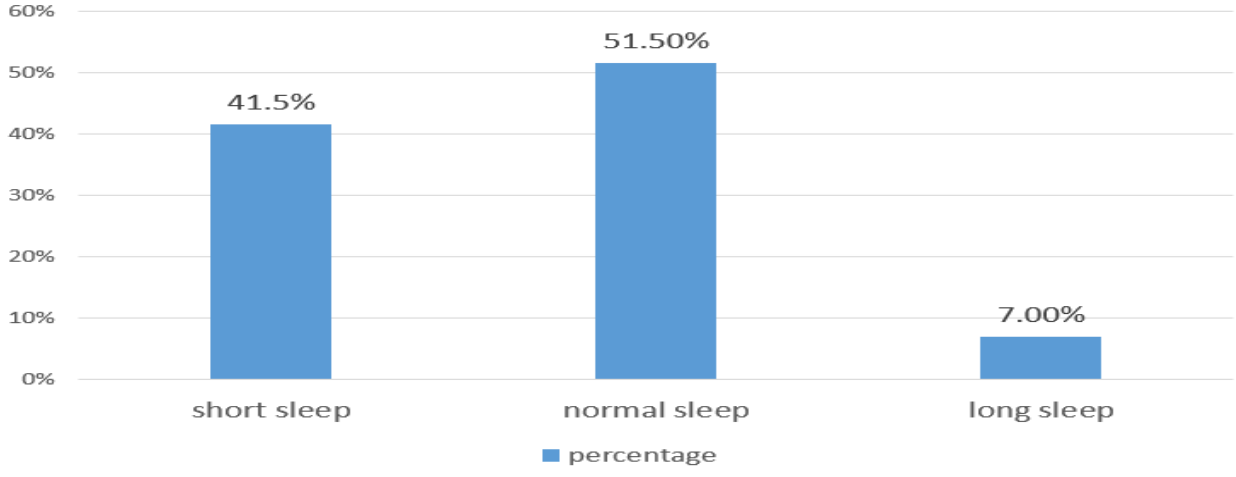

Figure -1- Sleep duration among studied group.

The mean sleep duration shown a significant difference according to BMI of participants (p<0.001), with lowest mean found among obese patients.

The mean sleep duration shown no significant difference according to frequency of exercise (p=0.16) and GAD score (p=0.15), table -2-.

Table -2- Relation of BMI, Exercise frequency and GAD score with sleeping hours.				
Variable		N0(%)	Mean ±SD sleeping hours	P value
BMI	Underweight	5(2.5%)	5.8 ±2.4	<0.001*
	Normal	63(31.5%)	7 ±1.5	
	Overweight	93(46.5%)	7 ±1.6	
	Obese	39(19.5%)	6.1 ±1.6	
Exercise	Never	92(23%)	6.8 ±1.8	0.16*
	Every 3 weeks	22(5.5%)	6.1 ±1.7	
	Every 2 weeks	12(3%)	6.5 ±1.3	
	Every week	37(9.3%)	6.7 ±1.4	
	Daily	37(9.3%)	7.3 ±1.6	
GAD	Minimal anxiety	40(10%)	7.1± 1.4	0.15*
	Mild anxiety	84(21%)	6.9 ±1.5	
	Moderate anxiety	43(10.8%)	6.7 ±1.8	
	Sever anxiety	33(8.3%)	6.2± 1.9	
Total		200(100%)		
* ANOVA test, significant p value ≤0.05.				

The daily intake regard carbohydrate, protein and fat shown no significant correlation with sleeping hours (p>0.05), table -3-

Table -3- Correlation between daily intake and sleeping hours.		
Variable	Sleeping hours	
	Correlation coefficient	P value
Total daily protein	0.056	0.43*
Total daily carbohydrate	-0.04	0.51*
Total daily fat	0.014	0.84*
*Correlation test, significant p value ≤0.05.		

4. Discussion

The last two decades have yielded a very large number of epidemiological studies on the relationship between sleep duration and BMI/obesity, both in children and adults. The current study investigated the associations between sleep duration and different BMI category in a sample of Iraqi adults. In addition, this study also analyzed the other factors that may affect with duration of sleep. A study reported an average sleep duration of 6.8±1.8 hours per night with 41.5% of participant reported short sleep duration, this in line to other study like Saudi study that reported mean of sleep duration was 6.4±1.7 hours per night with 33.8% reported short sleep duration of less than 7 hours per night(19). Another study reported an average sleep duration of 6.5±1.7 hours(20) other study conducted in northeast China reported an average sleep duration of 6.9±1.6 hours per night(21). The USA general population reported sleep duration of less than 7 hours in approximately a third of the population(22).

Much more recently, a two studies one of them was a bidirectional analysis of this association in middle-aged and older adults was published one of them found that prospectively, longer sleep duration was associated with a lower BMI and additionally, that a one-unit increase in BMI (kg/m2) was related to 1.2 min shorter sleep (23). other big study showed that over the follow-up period and after adjustment for multiple confounders (demographics, health behaviors, health problems), increase BMI was associated with decreases in sleep duration, with an effect size of 0.42 min(24). The current study findings shown that a significant decrease in sleeping hours with increase BMI, with a similar finding was documented by previous studies have also demonstrated that short sleep duration could contribute to weight gain(15, 25). That finding may related to a short sleep duration < 7 hours may induce adverse metabolic milieu associated with obesity. Current evidence also supports the general recommendation for obtaining 7 or more hours of sleep per night on a regular basis to promote optimal health among adults aged 18 to 60 years(26). Also We know that the deprivation of sleep produces hyperphagia (as a possible mechanism leading to the obesity)(27) also there is a general consensus that sleep participates in the regulation of many physiological functions and sleep deprivation is a common phenomenon in modern society on the whole world. Maybe, the deprivation of sleep is like a strong stress for the organism, because it was ascertained that plasma cortisol concentrations decline a few hours after onset of sleep and for example the level of cortisol increased in young, healthy adult males more when sleep was restricted to 4 hours' period, than when the sleep period was

extended to more than 8 hours periods(28).

The current study also shown that even the difference in the mean duration of sleep was no significant but the mean duration of sleep increase with increased frequency of exercise, and this result go with Experimental evidence has suggested that exercise may be associated with better sleep quality (29, 30).

And as Previous studies have reported a bidirectional association of anxiety and depression with insomnia(31, 32). the current study shown even no significant difference in the mean duration of sleep with anxiety score but the mean sleeping hours decrease with increase anxiety score. Other a recent study done in Saudi shown that poor sleep hygiene was associated with stress, anxiety(33).

In the present study the dietary habit shown no significant correlation with sleeping hours this was constant with Kuwaiti study that shown the intake of fruits and vegetables among boys and girls was not significant with sleep duration(34).

The study had many limitations as the study depend on subjective report for daily sleep and some people misreport the number of hours they sleep. For example, they may not know and might guess their sleep duration, they may have irregular sleep patterns making it difficult to estimate, or they might not be keen to provide a true report if they have atypical sleep durations. Some people may report the number of hours they sleep from the time they actually go to bed, rather than the time they fall asleep. This time between full wakefulness and sleep onset is known as sleep latency and is deferent from sleep duration. Importantly, though, most normal sleepers who do not suffer from a sleep disorder (particularly insomnia) tend to report similar sleep duration estimates to those observed in the laboratory under Polysomnography.

5. Conclusion

The study demonstrated that short sleep duration was more closely linked to obesity categories across BMI. Additionally, short sleep duration also showed a significant association with anxiety score.

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