Association of Obesity with Sleep Pattern among Adults in an Urban Area of Southern India

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Abstract

Introduction: The prevalence of obesity has become one of the major health problems in the country. Though sleep is not the only factor for obesity pandemic, it contributes by affecting the energy balance (Difference between number of calories taken each day and number of calories burnt).

Objective: The objective is to study the sleep pattern among the study participants and to find out if there is an association between sleep pattern with obesity and overweight.

Methodology: This was a cross sectional study conducted among 250 adult participants in an urban area of Southern India selected by purposive sampling method. A pre-tested semi-structured questionnaire was used for data collection and the data was analysed using SPSS software.

Result: Among 250 participants, about 114 of them experience disturbed sleep due to various reasons like overthinking, workplace/ family related problems, indigestion, anxiety, nightmares which indirectly affects their eating habits.

Conclusion: Poor sleep quality indirectly serves as a cause for obesity, which is one of the major modifiable risk factors for non-communicable diseases. Life style modification is required for prevention and treatment of obesity.

Keywords: Insomnia • Overweight • Energy balance • Eating habits

Introduction

Obesity being a major contributor of chronic disease including musculoskeletal disorders. Since 1975, obesity has been nearly tripled worldwide. In 2016, overweight has been noted among more than 1.9 billion adults, 18 years and older. Of these over 650 million were obese. In most of the world's population it has been reported that when compared to underweight, overweight and obesity kills more people. 39 million youngsters beneath the age of five have been obese or overweight in 2020. Over 340 million youngsters and youth elderly five-nineteen have been obese or overweight in 2016 [1].

Though there are many life style habits leading to obesity, lack of sleep in quantity and quality also significantly contributes to weight. Sleep is an essential factor the entire body's functions and health. In fact, it helps in maintaining the ideal functioning of a variety of physiological performances like body's defense mechanism, emotional and mental health body metabolism and hormonal balance, as well as many forms of learning and remembering [2]. Various studies have spotlighted the pessimistic effects of sleep deprivation on mental and physical well-being, even it can affect the cognitive functions like remembering and controlling emotions, as well as hunger regulation. Numerous studies have highlighted that quality of sleep can influence metabolism of glucose and it can get in the way of secretion of certain anabolic hormones as prolactin, Growth Hormone (GH) and testosterone; also it can alter the amount and timing of catabolic hormones like glucocorticoids, catecholamines; lastly, can changes in dietary regulation [3-6].

According to various epidemiological research, reduced sleep duration and low sleep quality have been linked to an increased risk of obesity, diabetes, Hence the present study is conducted with following objective.cardiovascular diseases, and high mortality [7-13].

Objective

The main goal of this research is to study the sleep pattern among the study participants and to find out if there is an association between sleep pattern with obesity and overweight.

Materials and Methods

Study design, study area and study population

This is a cross-sectional study carried out in Anakaputhur, Kancheepuram district, in an urban field practise area. The eligible persons in the age group from 18 to 70 years, visiting the outpatient care department of urban health centre in Anakaputhur area were requested to participate in this study and this research took place from November 2019 until May 2020.

Sample size and sample technique

The sample size was estimated based on prevalence of obesity (52.4%) found in a study done by Murugan Rajalakshmi, et al. using the formula [14]:

$$N = Z^2 PQ/L^2$$

Here: Z-Value of alpha error, Prevalence (P)=52.4%, Q=100−P=47.6%, Precision (L)=7. The sample size estimated was 204 and considering a 20% non-response, the sample size was rounded off to 250 as the sample size.

Sampling method and study tool

All the patients visiting the outpatient care department of urban health center in Anakaputhur area whose age is 18 years above and those who were staying in Anakaputhur area for a minimum of period of 6 months from November 2019 to May 2020 and gave consent to participate in this study were included as study participants. Subjects with BMI over 25 to 30 were designated as overweight and BMI over 30 were designated as obese.

Purposive sampling method was used for selecting the study participants and questioned on out-patient basis. A semi-structured questionnaire which was pre-tested has been used to elicit relevant information regarding their sleep pattern and obesity.

To elicit sleep hygiene, questions like duration of the participant's sleep, their sleep disturbance, hard of sleeping, day time sleeping were asked to the study participants. In the neighbouring primary care center, questionnaire was pilot tested among 40 persons those who were visiting the outpatient department. The questionnaire was adjusted and used after taking into account the replies and criticism obtained. Finally, the questionnaire was created to collect data on the study participants' socio-demographic characteristics, information regarding their sleep hygiene and obesity.

Data entry and analysis: Microsoft Excel was used to enter the data. After entering the data, it was cleaned and checked for consistency. SPSS 20.0 was used to conduct the analysis. The frequency was reported as a percentage, and the significance of the relationship with the parameters was determined using the *Chi square* test. P-value of less than 0.05 was deemed significant.

Ethical approval and informed consent: Institutional ethical committee approved this study and the participant's consent was obtained before the study.

Results

Among 250 participants, 40% were in the age group of 18-30 years. About 51% were males and 49% were females. Nearly 55% belonged to class I socioeconomic status. There is statistically significant association between inadequate sleep and obesity (P<0.05). There is also statistically significant association between overthinking/anxiety related problems, personal and health problems with obesity (P<0.05)

About 114 of them experience disturbed sleep due to various reasons like overthinking, workplace/family related problems, indigestion, anxiety, nightmares which indirectly affects their eating habits (Tables 1 and 2).

Table 1. Socio-demographic factors of the study participants.

S. no.	Variable	Frequency	Percentage
1	Age		
	18-30	100	40
	31-50	80	32
	51-70	70	28
2	Sex		
	Male	128	51.2
	Female	122	48.8
3	Socio economic status		
	Class I	137	54.8
	Class II	82	32.8
	Class III	13	5.2
	Class IV	10	4
	Class V	8	3.2

Table 2. Association between sleep problems and obesity.

Variables	Obese		*Chi-square*	P-value	Odds ratio	% confidence interval
	Yes (114)	No (136)				
Sleep hygiene						
Inadequate	74 (51.39%)	70 (48.61%)	4.58	0.032	1.74	1.0465-2.9074
Adequate	40 (37.74%)	66 (62.26%)				
Overthinking/Anxiety related problems						
Yes	67 (53.6%)	58 (46.4%)	6.44	0.011	1.91	1.1575-3.1751
No	47 (37.6%)	78 (62.4%)				
Insomnia						
Yes	84 (51.53%)	79 (48.47%)	5.29	0.021	1.86	1.0931-3.1676

No	32 (36.36%)	56 (63.64%)				
Personal/health problems						
Yes	80 (51.28%)	76 (48.72%)	4.80	0.028	1.8576	1.0989-3.14
No	34 (36.17%)	60 (63.83%)				

Discussion

The research has highlighted that duration and quality of sleep can also be a risk factor for overweight and obesity in the study participants, according to the findings. As a result, getting enough sleep is essential for maintaining a healthy weight. Many studies conducted among child participants have discovered that youngsters aged 5 to 9 years old who has decreased duration of sleep *i.e.*, less than 10 hours per night has 1.5 to 2-fold risk of becoming obese when compared to those who get enough sleep; while obesity is 50% more likely in adults who sleep less than 6 hours every night. This population has fewer external constraints on sleep scheduling due to work requirements and so is at greater risk for irregular sleep patterns. This age group is also at greater risk of obesity complications such as diabetes and cardiovascular disease [15].

The link between a lack of sleep and a high incidence of obesity and type 2 diabetes mellitus has been spotlighted by many epidemiological and experimental studies. Furthermore, for persons who sleep less than 8 hours, there is a rise in BMI proportional to the loss in sleep. 16 longitudinal studies have supported that there is a link between sleep duration and weight gain in women. Indeed, regardless of sleep length, obesity was linked to those who are going too late to bed was mentioned in studies including school children and adolescents (8-17 years old). The link between the risk of becoming obese and sleep deprivation has been hypothesised using biological and behavioural theories. Increased food consumption during night hours, reduced physical activity and expenditure of energy, and alterations in metabolism of glucose may all play a significant role in the link between lower sleep duration and increased body weight and the risk of developing type II diabetes mellitus [16-18].

Ultimately, the link between poor sleep quality and insulin sensitivity, insulin resistance, and low glucose tolerance, can lead development of type 2 diabetes mellitus, this has been found by experimental and observational researches. In studies, estimating Glucose Tolerance Test (GTT) for the persons who has restriction of sleep duration by 4 hours for 6 nights there is a decrease in glucose tolerance level. Restriction of sleep (<6.5 hours per night) for an extended period can result in 40% reduction of glucose tolerance level. Studies conducted by Bergman and Yaggi have shown a significant reduction in insulin sensitivity during night-time sleep [19,20].

Conclusion

Poor sleep quality indirectly serves as a cause for obesity, which is one of the major modifiable risk factors for non-communicable diseases. Adults aged between 18-30 years were more sleep derived with increased incidence of obesity. The reasons for disturbed sleep were due to overthinking, workplace/family related problems, indigestion, anxiety, nightmares. These could have resulted an indirect effect on eating habits. In this study, more than half of the population are upper class individuals, which implies that sleep disturbance is higher in upper class people. Hence, life style modification is required to get good sleep, as it might have important clinical implications for prevention and treatment of obesity. As many studies on obesity with sleep disturbance focused on children, this study suggests that regularity of sleep is important in older individuals as well. Thus, future research on the development of sleep interventions as a means to prevent or treat obesity should include older individuals.

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