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Association of Obesity with Obstructive Sleep Apnea

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ABSTRACT:

Background: Obstructive sleep apnea (OSA) is a global disease with a rising incidence along with its co-morbidities, especially the metabolic syndrome. One of the main components contributing to sleep apnea is obesity. **Objective:** To evaluate the association of obesity with obstructive sleep apnea (OSA). **Method:** This cross-sectional analytical study was conducted in the Department of Otolaryngology, Sir Salimullah Medical College Hospital, Dhaka, and in Bangladesh ENT Hospital, Dhaka, from March 2019 to February 2020. One hundred patients with OSA were enrolled in this study. After taking the written consent, the clinical history, as well as the findings of the physical examination of each patient were recorded. Quantitative data were expressed as mean and standard deviation, and qualitative data were expressed as frequency and percentage. Statistical analysis was performed using SPSS-20. Ap-value <0.05 was considered statistically significant. **Results:** The mean age of the study subjects was 45.25±8.81 years within a range of 18-60 years. Males (73.0%) were predominant than female (27.0%). The male to female ratio was 2.7:1. The frequency of obesity was 89.0% among OSA patients. Most of the study subjects had severe OSA (69.0%) followed by moderate (22.0%) and mild (9.0%) in this study. The severity of OSA was significantly higher among obese patients. Apnoea-hypopnea index was significantly higher in obese (49.09±23.34) than non-obese patients (19.70±8.92).75.3% of obese patients had severe OSA, 19.1% had moderate OSA and 5.6% had mild OSA. There was a significant positive correlation of BMI with Apnoca-hypopnea index(r=0.84 and p=0.009). **Conclusion:** Obesity has an association with the obstructive sleep apnea (OSA).

KEYWORDS: obstructive sleep apnea, obesity, metabolic syndrome, cross-sectional study, BMI, Apnoea-hypopnea index, co-morbidities, prevalence, risk factors, sleep disorders

INTRODUCTION:

Obstructive sleep apnoea (OSA) is the most common serious sleep disorder globally, with a prevalence ranging between 9% and 38% depending on the population studied.[1] OSA is characterized by repeated episodes of upper airway obstruction during sleep, resulting in repetitive hypoxemia and intermittent pauses in breathing causing oxygen desaturation, arousal from sleep, and excessive daytime sleepiness: syndromes that are associated with impairment in quality of life, cognitive function, work performance, and an increased risk of road traffic accidents.[2-5] OSA is considered an independent risk factor for hypertension and has been associated with coronary artery disease, stroke, heart failure, arrhythmias, metabolic syndrome, and type 2 diabetes, particularly in middle-aged and older adults. There are well identified risk factors for OSA; prevalence of OSA increases in elderly populations, male populations and in those who are overweight or obese[7]. Links between increased weight and OSA have been well established in both children and adults. In children, obesity and morbid obesity increase the severity of OSA[8] with prevalence of OSA in obese children and adolescents ranging from 46 to 60%[9]. In obese adults, prevalence of OSA is nearly double or higher compared to those who are normal weight. Underlying mechanisms of OSA in overweight people include airway narrowing caused by increased neck circumference and airway obstruction caused from relaxed tongue soft tissue and throat muscles during

sleep[11]. In the Sleep Heart Health Study based on 5615 adults, the odds ratio for an AHI of 15 or greater with a BMI difference of 10 kg/m was 2.4. A longitudinal population-based study demonstrated that a 10%weight gain predicted a 32% increase in AHI whereas a 10% weight loss predicted a 26% decrease in AHI. Further more, a 10% increase in weight predicted a six-fold increased risk of developing moderate-to-severe SDB. This association was stronger for males than for females.

Likewise, other relevant anthropometric measures have been associated with OSA such as neck circumference[12] waist circumference, waist-hip ratio[13], and visceral adiposity[14].

The aim of this study is to find out the association of obesity with OSA and thus create public health awareness about obesity and OSA and thus prevent many diseases like type2 DM, hypertension, depression etc.

METHODOLOGY:

Study design: This study was designed as cross sectional analytical study.**Place of study:** The study was carried out in the Department of Otolaryngology at Sir Salimullah Medical College Mitford Hospital, Dhaka and in Bangladesh ENT Hospital, Dhaka. **Study period:** The study was conducted from March 2019 to February 2020 for a period of one year.**Study population:** All the patients with OSA in the Department of Otolaryngology at Sir Salimullah Medical College & Mitford Hospital, Dhaka and in Bangladesh ENT Hospital, Dhaka. **Study Procedure:** All patients with OSA in the Department of Otolaryngology at Sir Salimullah Medical College Mitford Hospital, Dhaka & Bangladesh ENT Hospital Dhaka were enrolled in this study. After taking the written consent, clinical history as well as the findings of physical examination of each patient was recorded. Measurement of BMI & Measurement of Blood Pressure was recorded.

Apnoea-Hypopnea Index (AHD):

To measure AHI polysomnography was done for six to eight hours after attachment of all the probes to the patient body. Graph was taken after the patient was in sleep. The AHI was calculated by dividing the number of apnea events by the number of hours of sleep. Severity of sleep apnoea was categorized as: Normal: AHI<5; Mild sleep apnea: AHI 5-15; Moderate sleep apnoea: AHI 16-30; Severe sleep apnoea: AHI>30.

Drug Induced Sleep Endoscopy (DISE): After sedation of the patient with a comfortable sedative (i.v. Midazolam / Propofol) in Operation Theater by an Anesthetist, endoscopy of upper airway (nose.nasopharynx), oropharynx, laryngopharynx was done by a 2 to 5 mm video laryngoscope and identify the site of obstructions.

Data collection technique

Data were collected using a preformed data collection sheet. The relevant socio-demographic data of these patients were collected and recorded.

Data management All data were compiled and edited meticulously. The data were screened and were checked for any missing values and discrepancy. All omissions and inconsistencies were corrected and were removed methodically.

RESULT AND OBSERVATIONS:

This cross sectional observational study was carried out in the Department of Otolaryngology at Sir Salimullah Medical College & Mitford Hospital, From March 2019 to February 2020 for a period of one year. A total number of 100 OSA patients were recruited according to selection criteria. The results are as follows:

Table 1: Distribution of the study subjects according to age (N=100)

Age(years)	Frequency(n)	Percentage (%)
18-30	9	9.0
31-40	29	29.0
41-50	32	32.0
51-60	30	30,0
Mean ± SD	45.25+8.81	
Min-max	24-60	

Table 1 shows distribution of the study subjects according to age. Maximum patients were in age group 41-50 years followed by s40 years (32.0%) and 51-60 years (30.0%).Mean age of the study subjects was 45.25±8.81 year within a range of 24-60 years.

Table 2: Apnoea hypopnea index in obese and nonobese patients:

	AHI (Mean ± SD)	P value
Obese	49.09+23.34	<0.001
Non obese	19.70±8.92	

Table 2 shows AHI index in obese and non-obese patients. It shows increase AHI in obese patients, means OSA patients are mostly obese.

Table 3: Association of gender with severity of OSA (N=100)

Severity of OSA	Male	Female	p-value
Mild	6(8.2)	3(11.1)	0.388
Moderate	14(19.2)	8(29.6)	
Severe	53 (72.6)	16 (59.3)	

Fisher Exact test was done to measure the level of significance Table 3 shows association of gender with severity of OSA according to Apnoea-hypopnea index of the study subjects. Severity of OSA was significantly higher in male patients than female patients. But there was no significant difference in severity of OSA between male and female.

Table 4: Association of age with severity of OSA (N=100)

Severity of OSA	Age			p-value
	≤40	41-50	51-60	
Mild	4(12.5)	5(12.8)	0(0.0)	0.186
Moderate	6(18.8)	11 (28.2)	5(17.2)	
Severe	22 (68.8)	23 (59.0)	24(82.8)	

Chi-Square test was done to measure the level of significance

Table 4 shows association of age with severity of OSA according to Apnoea-hypopnea index of the study subjects. Severity of OSA was among the elderly patients but there was no significant difference.

Table 5: Correlation of BMI with Apnoea-hypopnea index (N=100)

Age(Years)of patients	BMI (mean)	AHI (mean)	r value	P value
18-30 years	27.06	32.57	0..84	.009
31-40 years	32.10	44.58		
41-50 years	30.18	47.59		
51-60 years	30.64	36.94		

Pearson's correlation was done

Table 5 shows correlation of BMI with Apnoea-hypoapnoea index. There was significant positive correlation of BMI with Apnoca-hypoapnoea index.

DISCUSSION

Obstructive sleep apnea (OSA) is characterized by repetitive airflow reduction caused by collapse of the upper airway during sleep in addition to daytime sleepiness, clinical symptoms include fatigue, insomnia, and snoring. The condition is associated with adverse clinical outcomes, including cardiovascular disease, hypertension, cognitive impairment, and metabolic abnormalities[15]. Among the risk factors for OSA, obesity is probably the most important. Several studies have consistently found an association between increased body weight and risk of OSA. The aim of this study was to evaluate the association of obesity with Obstructive sleep apnoea (OSA).

In this study, maximum patients were in the age group 41-50 years followed by 51-60 years (30.0%) then≤ 40 years. The mean age of the study subjects was 45.25±8.81 years within a range of 24-60 years. The mean age was 51.4 years in the study conducted in Italy. One of the risk factors of OSA is middle-aged[16]. In this study, most of the OSA patients were more than 40 years old.

Males (73.0%) were predominant than female (27.0%). The male to female ratio was 2.7:1 in this study. Male gender is another risk factor of OSA (Luzzi et al.,2016).In the study of male to female ratio was 16.7:1 which indicates males are more vulnerable in OSA.

A complex relationship between OSA and obesity has been described, where both conditions influence one another. Prevalence of OSA among obese subjects exceeds 40%, 70% of adult OSA patients are obese[17] and some authors reported a relative risk of OSA from obesity of nearly 10 or more. In this study, the frequency of obesity was 89.0% among OSA patients. The prevalence of obesity in OSA was higher in this study because BMI for Asia pacific scale was used to differentiate obese from non-obese. For the Asia Pacific region obese was defined who's BMI>25 kg/m2 instead of BMI≥30 kg/m2 (WHO).

Most of the study subjects had severe OSA (69.0%) followed by moderate (22.0%) and mild (9.0%) in this study.

The severity of OSA was significantly higher among obese patients. Apnoea- hypopnea index was significantly higher in obese (49.09+23.34) than non- obese patients (19.70±8.92).75.3% of obese patients had severe OSA, 19.1% had moderate OSA and 5.6% had mild OSA.

There was a significant positive correlation of BMI with Apnoea-hypopnea index(r-0.84 and p-0.009) in this study. This finding is in accordance with the study of Schafer et al., 2002 and Peppard et al.,2000 but in contrast with the observation of others[18] Similarly, other authors observed that neck and abdominal fat, and neck circumference was more effective in predicting AHI and OSA severity than general obesity defined by BMI calculation[19].

CONCLUSION:

This study found a high prevalence of obesity among patients with obstructive sleep apnoea (OSA), with 89% of the study population being obese. The severity of OSA was significantly higher among obese patients, with a positive correlation between body mass index (BMI) and the Apnoea-hypopnea index (AHI). The majority of obese patients had severe OSA, emphasizing the need for weight management as an essential aspect of OSA treatment. Therefore, it can be inferred that obesity is strongly associated with OSA and that effective weight management could improve the management and outcomes of OSA patients. Further research and intervention strategies are necessary to address the alarming rise in obesity and OSA and their associated comorbidities.

CONFLICT OF INTEREST:

The authors declares that there is no conflict of interest regarding the publication of this article.

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