Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Otolaryngology & Head Neck Surgery

The Correlation between BMI and Severity of Obstructive Sleep Apnea: A Single-Center Study in Dhaka, Bangladesh

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DOI: 10.36347/sjams.2022.v10i09.013 | **Received:** 22.08.2022 | **Accepted:** 24.09.2022 | **Published:** 09.10.2022

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Abstract **Original Research Article**

Background: Obstructive sleep apnea (OSA) which is a very common form of sleep-disorder with associated health risks has been associated with much more insidious conditions, like hypertension, heart disease, diabetes, stroke and even daytime somnolence. But we have not enough research-based information regarding the co-relation between BMI and severity of obstructive sleep apnea. ***Aim of the Study:*** The aim of this study was to assess the co-relation between BMI and severity of obstructive sleep apnea. ***Methods:*** This was an observational study which was conducted in the Department of Otolaryngology &, Head Neck Surgery, Bashundara Ad-Din Medical College and Hospital, Bangladesh during the period from January 2121 to December 2021. A total of 57 patients with obstructive sleep apnea (OSA) were included as the subjects. The ethical committee of the mentioned hospital approved this study. All demographic data along with BMI and the severity of OSA of the participants were recorded and analyzed. Data were processed and analyzed by using MS Office and SPSS version 23 programs as per need. ***Results:*** In this study, in analyzing the correlation between BMI and severity of OSA as per patient's diagnosis and titration based on two nights' study, we observed that, there was not any significant correlation of BMI of the patients with mild, moderate or even severe stage OSA. In comparing the mild, moderate and severe cases of OSA with their mean BMI values 30.66±6.23, 28.47±6.78 and 30.43±4.32 and the P values were found as 0.755, 0.554 and 0.454 respectively. ***Conclusion:*** According to the findings of this study we can conclude that, there is not any significant correlation of patient's BMI with their mild, moderate or even severe conditions of obstructive sleep apnea.

Keywords: Co-relation, BMI, Obstructive sleep apnea, Sleep-scoring, Snoring.

1. INTRODUCTION

The obstructive sleep apnea (OSA) is a respiratory illness, characterized by the recurrent episodes of apnea as well as hypopnea, leading to cessation or reduction of the airflow [1]. As per the findings of some studies, obesity was described as the most important risk factors for obstructive sleep apnea (OSA) [2, 3]. Obstructive sleep apnea is a progressive chronic disease which directly influences the quality of life (QOL), given that sleep is a brain function which is essential in relieving human stress [4, 5]. In a study it was reported that, 70% of all patients diagnosed OSA patients are obese [1]. The incidence of obstructive sleep apnea among patients with class III obesity (BMI greater than 40), is 12 to 30 times greater than in the general population [5]. In some other studies it was describes that, the incidence of obstructive sleep apnea (OSA) is 42-48% in obese males, as well as 8-38% in obese females [6, 7]. Generally, women population has obstructive sleep apnea (OSA) when they go through

menopause, are obese as well as aged 60 to 69 years [8, 9]. But we have not enough research-based information regarding the co-relation between BMI and severity of obstructive sleep apnea.

2. METHODOLOGY

This was an observational study which was conducted in the Department of Otolaryngology &, Head Neck Surgery, Bashundara Ad-Din Medical College and Hospital, Bangladesh during the period from January 2121 to December 2021. A total of 57 patients with obstructive sleep apnea (OSA) were included as the subjects. The ethical committee of the mentioned hospital approved this study. As per the inclusion criteria of this study, people from both sexes (male and female), having neck circumference >17 inches for men and >16 inches for women were included. On the other hand, as per the exclusion criteria, patients with hypothyroidism and other metabolic disorders, BMI>40 and patients with associated craniofacial abnormalities were excluded. Diagnosis and titration reports were taken based on two nights of study, AASM. Patient diagnosis with obstructive sleep apnea (OSA) on baseline polysomnography with indication for CPAP therapy and without previous use of any device was sequentially included. The mild obstructive sleep apnea was defined as an AHI between 5 and 14.9, moderate obstructive sleep apnea as an AHI between 15 and 29.9, and severe obstructive sleep apnea as an AHI equal to or greater than 30 [10]. All data regarding BMI and severity of obstructive sleep apnea of the participants were recorded and analyzed. A predesigned questioner was used in data collection. Data were processed and analyzed by using MS Office and SPSS version 23 programs as per need.

3. RESULT

In this study, among total 57 participants, 71.9% were male and the rest 28.1% were female. So male participants were dominating in number. The mean (±SD) age in year, height (cm), weight (ibs) and BMI (kg/m2) were found as 46.33±11.14, 163.29±7.78 and 168.27±46.20 and 30.11±4.93 respectively. In analyzing the sleep scoring of the participant, we found the mean (±SD) TRT (Hours), TRT (Minutes), total sleep time (Hours) and total sleep time (Minutes) values were found as 8.97±1.77, 550.46±92.14, 8.03±1.75 and 492.48±111.24 respectively. Among all our participants, only 4% were with normal snoring habit. On the other hand, 12%, 19% and 65% participants were with mild, moderate, severe snoring status respectively. Finally, in analyzing the correlation between BMI and severity of OSA as per patient's diagnosis and titration based on two nights study, we observed that, there was not any significant correlation of BMI of the patients with mild, moderate or even severe stage OSA. In comparing the mild, moderate and severe cases of OSA with their mean BMI values 30.66±6.23, 28.47±6.78 and 30.43±4.32 (respectively) the P values were found as 0.755, 0.554 and 0.454 respectively.

Table 1: Demographic status of participants (N=57)

Variables	N (%) Mean (±SD)
Gender distribution	
Male	41(71.9)
Female	16(28.1)
Age distribution (Mean ±SD)	
Age	46.33±11.14
Height distribution (Mean ±SD)	
Height (cm)	163.29±7.78
Weight distribution (Mean ±SD)	
Weight (lbs)	168.27±46.20
BMI (kg/m2) distribution	
BMI (kg/m2)	30.11±4.93

Table 2: Sleep scoring distribution of patients (N=57)

Sleep Scoring	Mean (±SD)
TRT (Hours): Mean (SD)	8.97±1.77
TRT (Minutes): Mean (SD)	550.46±92.14
Total Sleep Time (Hours): Mean (SD)	8.03±1.75
Total Sleep Time (Minutes): Mean (SD)	492.48±111.24

Table 3: Snoring status distribution of participants (N=57)

Snoring status	Frequency (n)	Percentage (%)
Normal	2	4%
Mild	7	12%
Moderate	11	19%
Severe	37	65%

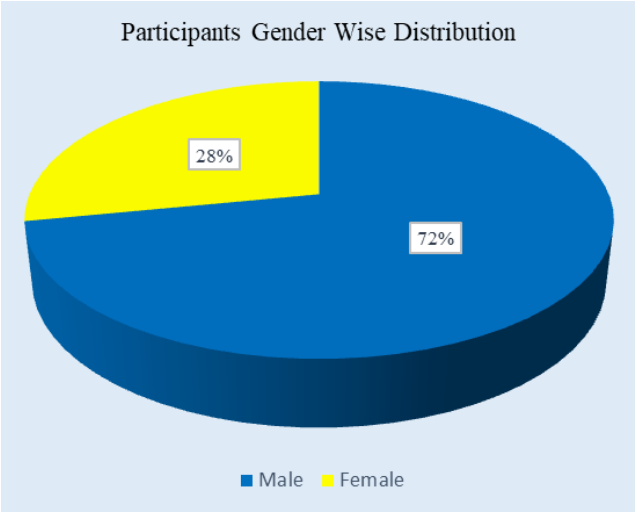

Figure I: Participants Gender Wise Distribution (N=57)

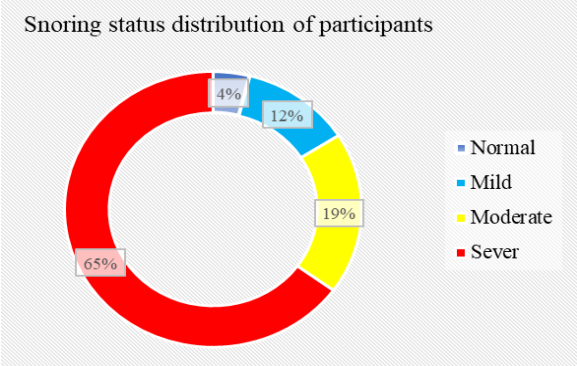

Figure II: Snoring status Distribution of the Participants (N=57)

Table 4: Correlation of mean value between BMI and OSA of patient's diagnosis on two nights' duration (N=57)

BMI	Mean ± SD	P value
Mild	30.66±6.23	0.755
Moderate	28.47±6.78	0.554
Severe	30.43±4.32	0.454

Table 5: The significance co-relation between BMI and OSA of patient's diagnosis on two nights' duration (N=57)

BMI	Mild n (%)	Moderate n (%)	Severe n (%)	P value
13-25 (kg/m2)	1 (12.5)	1 (11.1)	4 (10.0)	0.830
26-30 (kg/m2)	5 (62.5)	5 (55.6)	18 (45.0)	0.330
31-35(kg/m2)	0 (0.0)	2 (22.2)	16 (40.0)	0.020[$]
35+ (kg/m2)	2 (25.0)	1 (11.1)	2 (5.0)	0.072

*significant (<p=0.05)

4. DISCUSSION

The aim of this study was to assess the co-relation between BMI and severity of obstructive sleep apnea. In this study, among total 57 participants, 71.9% were male and the rest 28.1% were female. So male participants were dominating in number. The mean (±SD) age in year, height (cm), weight (lbs) and BMI (kg/m2) were found as 46.33±11.14, 163.29±7.78 and 168.27±46.20 and 30.11±4.93 respectively. In a study, they reported that, there is evidence in the literature that

the obesity of people is a potential risk factor for OSA, given that overweight acts directly upon the pathophysiology of narrowing of the upper portion of airways and the involvement of the oropharyngeal muscles [11]. In analyzing the sleep scoring of the participant, we found the mean (±SD) TRT (Hours), TRT (Minutes), total sleep time (Hours) and total sleep time (Minutes) values were found as 8.97±1.77, 550.46±92.14, 8.03±1.75 and 492.48±111.24 respectively. In obese population, it is not only muscles that cause respiratory obstruction, but also a layer of excess fat along with soft palate as well as the tonsillar region that involves practically all face and neck muscles, leading thus to a narrowing of the pharynx and giving it a more rounded shape, with the thickness of the fat layer being directly related to the increase in BMI [12, 13]. When snoring becomes as intense as to disturb other people, it is considered a pathological condition and thus deemed snoring [14]. Katz *et al.*, [15] Found, BMI, age and NC are significant predictors of OSA although, OSAS can affect individuals in any age group [7, 15]. Finally, in analyzing the correlation between BMI and severity of OSA as per patient's diagnosis and titration based on two nights' study, we observed that, there was not any significant correlation of BMI of the patients with mild, moderate or even severe stage OSA. In comparing the mild, moderate and severe cases of OSA with their mean BMI values 30.66±6.23, 28.47±6.78 and 30.43±4.32 (respectively) the P values were found as 0.755, 0.554 and 0.454 respectively. But some recent studies support a correlation between breathing disturbances during sleep and insulin resistant syndrome, independent of the degree of obesity [16, 17].

Limitation of the Study

Though it was a single centered study with a small sample size, so findings of this study may not reflect the exact scenario of the whole country.

5. CONCLUSION & RECOMMENDATION

In reference to the core aim of the study of significant relation between different BMI stage (kg/m2) with severity of OSA types (mild, moderate and sever) it have been found that there is a significant (<p=0.05) correlation with overweight and Obstructive sleep apnea (OSA) among the participant's two night OSA test. To more accurate result &, form a clear concept on this issue further studies are in needed to with large sample size in different part in Bangladesh.

FUNDING

No funding sources.

CONFLICT OF INTEREST

None declared.

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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