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(RESEARCH ARTICLE)

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The pattern and distribution of obstructive sleep apnea in Dhaka city population

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Abstract

Obstructive Sleep Apnea (OSA) is one of the leading causes of morbidity and it enhances mortality worldwide. The global burden due to OSA is gruesome and non-negligible. In this study, we aimed to provide data on the basic demography of OSA in a tertiary hospital to create awareness and provide a guideline for assessing OSA in Bangladesh. The demographic and clinical profile of 533 obstructive sleep apnea patients in Bangladesh was a retrospective observational study precisely to say retrospective cohort study was done in the Department of Respiratory & Sleep Medicine at Evercare Hospitals, Dhaka, Bangladesh among admitted patients for a sleep study from October 2021 to September 2023 for 2 years. In this retrospective cohort study, we included a total of 533 patients. Among them were 372 males (70%) and 161 females (30%). Risk factors of obstructive sleep apnea are increasing age, male sex, and obesity on the scale of BMI.

Keywords: Sleep; Apnea; Hypopnea; Risk factor; Cohort

1. Introduction

Obstructive sleep apnea (OSA) is a clinical condition characterized by recurrent episodes of complete obstruction (apnea) or partial obstruction (hypopnea) of the upper airway. It leads to increased negative intrathoracic pressure, and intermittent hypoxia during & sleep fragmentation [1]. Symptoms are daytime drowsiness, cognitive impairment, and loud snoring. Obstructive sleep apnea (OSA) has significant implications in decreasing quality of life, driving safety, and development of cardiovascular disease. Cohort studies have shown that in apneic untreated patients, the risk of stroke is three times higher. That risk is multiplied by three for the development of hypertension [2].

Obstructive sleep apnea was clinically recognized more than 30 years ago (3) but awareness of this condition outside the field of sleep medicine was slow to develop. The situation changed drastically when population-based studies uncovered an unexpectedly high prevalence of OSA in adults (4-5). Healthcare systems around the world were not prepared to cope with the huge number of people expected to have OSA, and attention appropriately turned to the health significance of nightly exposure to frequent episodes of apnea and hypopnea. Our study demonstrated that the prevalence of OSA is higher between the ages of 40 to 60 but no age is free from this condition. Males are more sufferer than females. OSA is common and the incidence is increasing, principally due to a worldwide rise in obesity. Current estimates for OSA in the 30–70-year age group are 27% of males and 11% of females [3]. The condition is significantly

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underdiagnosed, due to lack of awareness and an insidious presentation. A definitive diagnosis and assessment of the severity of OSA requires overnight polysomnography (PSG) [4].

The critical pathophysiological feature of OSA is the sleep-related collapse of the upper airway (UA) at the level of the pharynx, the interaction of anatomic and neural state-related factors causing pharyngeal collapse [6-7].

OSA represents the most severe manifestation of the spectrum of sleep-disordered breathing (SDB). Snoring is the mildest form of SDB; it affects 40% of adults [1] and results from narrowing, rather than occlusion of the airway; turbulent airflow causes vibration of soft tissues, principally the soft palate, and uvula.

Cessation of breathing (apnoea) secondary to upper airway collapse results in hypoxia and hypercapnia. The physiological response is increased ventilatory effort and sympathetic over activity leading to restoration of muscular tone and arousal from sleep. The airway opens, hyperventilation occurs and there is correction of the blood gases to normal. Sleep becomes fragmented as the cycle repeats. The sequelae of the physiological response to repeated apnoeas are paradoxically the principal aetiological factor leading to a 4-fold increase in all causes of mortality in patients with OSA when compared to patients without the condition [2].

OSA is one of the leading causes of morbidity and it enhances mortality worldwide. Bangladesh is now a middle-income country. Like other developed countries, our leading cause of morbidity and mortality is now non-communicable diseases. Most of the non-communicable diseases directly or indirectly increase OSA. The global burden due to OSA is gruesome and non-negligible. The study aims to provide data on the basic demography of OSA in a tertiary hospital to create awareness and to provide a guideline for assessing OSA in Bangladesh.

2. Methodology

The demographic and clinical profile of 533 obstructive sleep apnea patients in Bangladesh was a retrospective observational study precisely to say retrospective cohort study was done in the Department of Respiratory & Sleep Medicine at Evercare Hospitals, Dhaka, Bangladesh among admitted patients for a sleep study from October 2021 to September 2023 for duration of 2 years. The reasons for choosing a retrospective cohort are that it is quicker, cheaper, and easier than prospective cohort studies and it can address rare diseases and identify potential risk factors (e.g. case-control studies) [8]. Besides these, this type of study is not prone to loss of follow-up and may be used as the initial study generating hypotheses to be studied further by larger, more expensive prospective studies.

Inclusion criteria included only indoor patients and patients who did not die as per the mentioned time frame. Exclusion criteria included all outdoor patients who died and the patients who were not admitted to the respiratory medicine department as per the mentioned time frame.

At first, we tried to describe obstructive sleep apnea patients according to their gender. Then, we arranged the data age group wisely and then the age group along with gender basis wisely. Our other distribution of data was 'Classification of Obstructive Sleep Apnea' as per AHI. Then we arranged our data to describe 'Age group wise Classification of Male Female Obstructive Sleep Apnea'. Body Mass Index (BMI) is a modifiable but important risk factor for Obstructive Sleep Apnea. We also collected the BMI of all 533 patients and described data based on BMI as 'AHI CLASSIFICATION AS PER BMI'.

In this study no statistical analysis had done to present a simple description of data as the sample size was low and no clear-cut confounder was present. We used a total of three risk factors for this study. They are age, sex, and BMI. All these risk factors were described with the AHI classification scale.

3. Result

In this retrospective cohort study, we included a total of 533 patients. Among them, there were 372 males (70%) and 161 females (30%).

Gender wise Sleep Study Data		
Gender	Total Study	Percentage
Male (372)	372	70%
Female (161)	161	30%
Total Study	**533**	**100%**

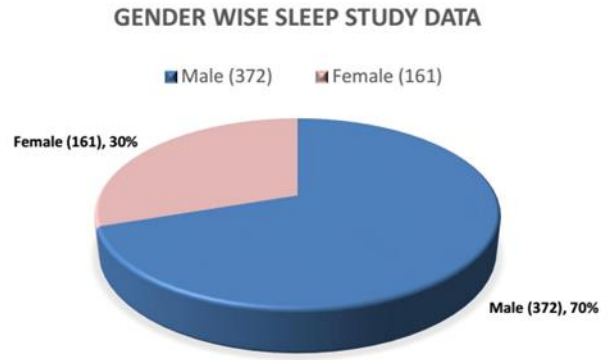
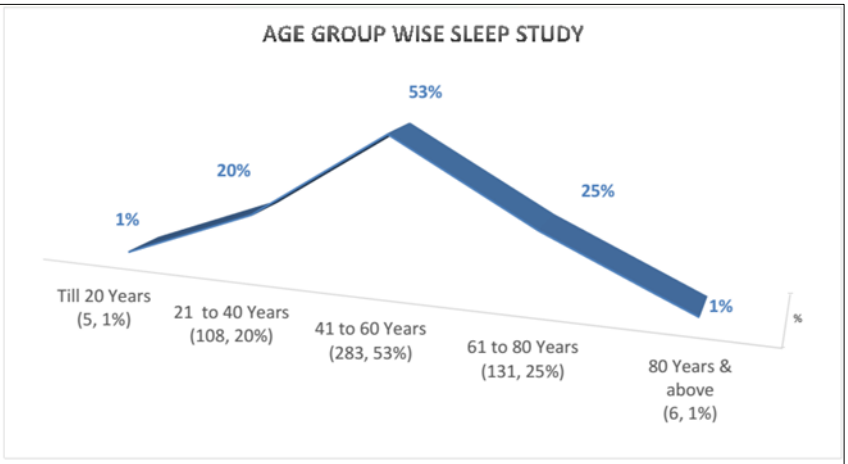


Figure 1 Sleep studies showing comparison between male female

When we arranged the data as per age group, there were 5 patients (1%) from the age group up to 20 years,108 patients (20%) from the age group of 21 years to 40 years, 283 patients (53%) from the age group of 41 years to 60 years, 131 patients (25%) of age group 61 years to 80 years and 6 patients (1%) of from age group 80 years and above. To look for gender distribution, up to 20 years of age group there were 4 males and 1 female. In the age group 21 years to 40 years, there were 84 male patients and 24 female patients suffering from OSA. Between the ages of 41 and 60 years, 188 male patients and 95 female patients have OSA. For the elderly group aged from 61 years to 80 years, there were 91 male patients and 40 female patients. At the extreme age group of 80 years and above, among 6 patients, 5 were male and 1 was female.

Age Group Wise Sleep Study				
Age group	**Male**	**Female**	**Total**	**%**
Till 20 Years (5, 1%)	4	1	5	1%
21 to 40 Years (108, 20%)	84	24	108	20%
41 to 60 Years (283, 53%)	188	95	283	53%
61 to 80 Years (131, 25%)	91	40	131	25%
80 Years & above (6, 1%)	5	1	6	1%
Grand Total	**372**	**161**	**533**	**100%**

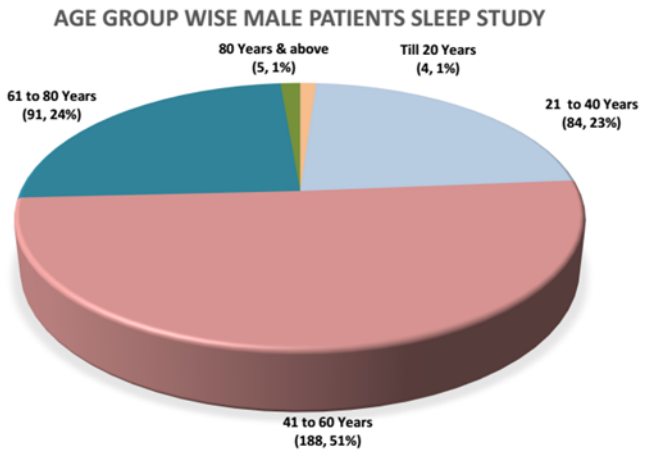


As per above 533 sleep study more sleep study done 41 to 60 Years age group (283, 53%)

Figure 2 Sleep studies in comparison of different age groups

For further evaluation of data, we look through the percentage of Age Group Wise Male Patients Sleep Study and Age Group Wise Female Patients Sleep Study. The simple arithmetic analysis provided the data that among the male patients of up to 20 years of age group with 1%, 21 years-40 years age group with 23%, 41 years to 60 years age group with 51%, 61 years to 80 years age group with 24% and 80 years and above age group with 1% suffering from OSA.

Age Group Wise Male Patients Sleep Study		
Age group	**Number**	**%**
Till 20 Years (4, 1%)	4	1%
21 to 40 Years (84, 23%)	84	23%
41 to 60 Years (188, 51%)	188	51%
61 to 80 Years (91, 24%)	91	24%
80 Years & above (5, 1%)	5	1%
Grand Total	**372**	**100%**

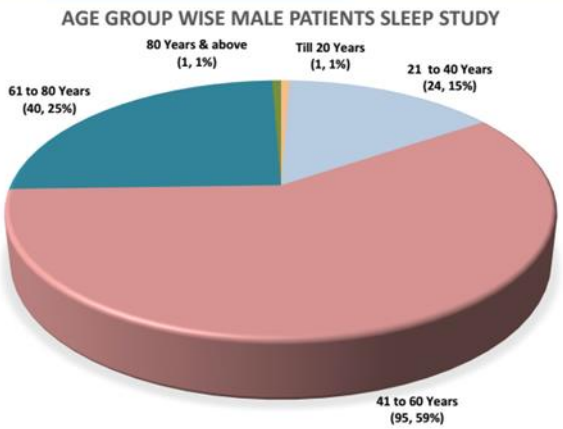


As per above 372 sleep study more sleep study done 41 to 60 Years age group (188, 51%)

Figure 3 Age group wise sleep study for males

AGE GROUP WISE female patients SLEEP STUDY pointed out that 1% of female patients from age group of up to 20 years, 15% from age group 21 years-40 years, 59% from 41 years to 60 years, 25% from 61 years to 80 years and 1% from age group 80 years and above.

Age Group Wise Female Patients Sleep Study		
Age group	**Number**	**%**
Till 20 Years (1, 1%)	1	1%
21 to 40 Years (24, 15%)	24	15%
41 to 60 Years (95, 59%)	95	59%
61 to 80 Years (40, 25%)	40	25%
80 Years & above (1, 1%)	1	1%
Grand Total	**161**	**100%**



As per above 161 sleep study more sleep study done 41 to 60 Years age group (95, 59%)

Figure 4 Age group wise sleep study for females

We classified Obstructive Sleep Apnea data as per AHI. AHI ranging from 0-5 is regarded as normal, AHI 5.1-15 is mild, AHI 15.1-30 is moderate and AHI more than 30 is a severe form of obstructive sleep apnea. Among our study population, 20% were normal, 16% had mild, 23% had moderate and 41% had severe obstructive sleep apnea as per AHI.

Classification of Obstructive Sleep Apnea			
AHI	Range	Number	%
Normal	0-5	108	20%
Mild	5.1-15	85	16%
Moderate	15.1-30	120	23%
Severe	>30	220	41%
Total		**533**	**100%**

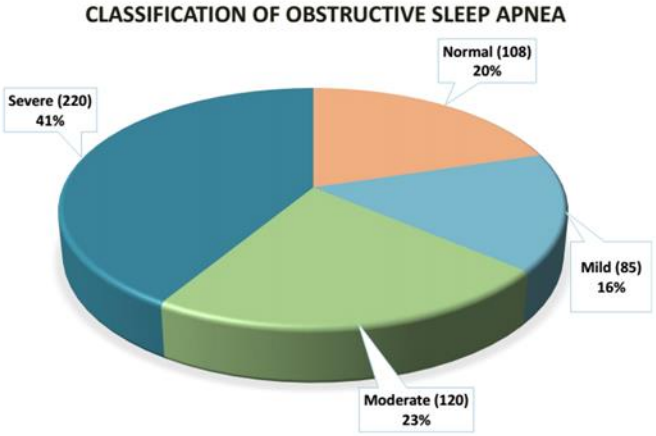


Figure 5 Classification of OSA (Obstructive Sleep Apnea)

Age group wise Classification of Male Female Obstructive Sleep Apnea										
Age group	Male					Female				
	Normal	Mild	Moderate	Severe	Total	Normal	Mild	Moderate	Severe	Total
Till 20 Years	3		1		4	1				1
21 to 40 Years	13	13	13	45	84	8	5	5	6	24
41 to 60 Years	31	30	41	86	188	21	21	21	32	95
61 to 80 Years	21	9	26	35	91	7	5	12	16	40
80 Years & above	2	2	1		5	1				1
Grand Total	**70**	**54**	**82**	**166**	**372**	**38**	**31**	**38**	**54**	**161**

1. As per above sleep study data Male & Female more sleep study done 41 to 60 Years age group
2. Male out of 372 study Severe AHI 166 patients & Female Severe AHI 54 patients

Figure 6 Age group wise classification of obstructive sleep apnea

Body Mass Index is a modifiable risk factor for obstructive sleep apnea. We arranged our data as per BMI and AHI. The findings were BMI, underweight group, AHI, Normal-1, Mild-0, Moderate-0, and Severe-2. BMI, normal weight group, AHI, Normal-15, Mild-5, Moderate-11, Severe-7. BMI, overweight group, AHI, Normal-45, Mild-35, Moderate-40, Severe-51. BMI, obese group, AHI, Normal-37, Mild-40, Moderate-54, Severe-125. BMI, morbid obese group, AHI, Normal- 10, Mild- 5, Moderate-15, Severe-35.

BMI	AHI CLASSIFICATION			
	Normal (108, 20%)	Mild (85, 16%)	Moderate (120, 23%)	Severe (220, 41%)
Under weight (3, 1%)	1			2
Normal weight (38, 7%)	15	5	11	7
Overweight (171, 32%)	45	35	40	51
Obese (256, 48%)	37	40	54	125
Morbid obese (65, 12%)	10	5	15	35
Total	**108**	**85**	**120**	**220**

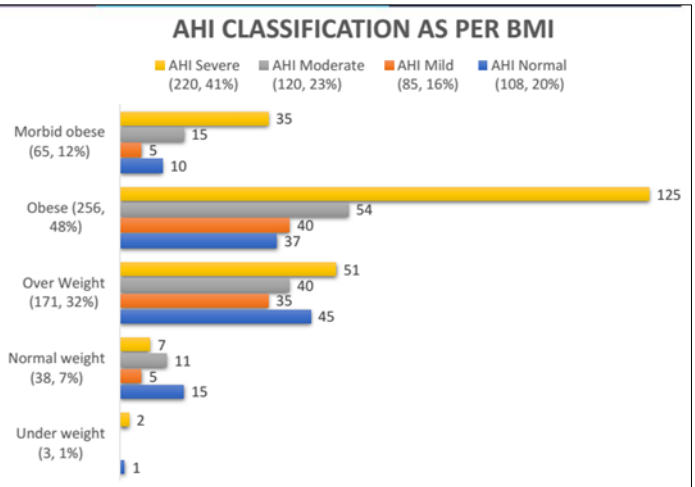


Figure 7 AHI classification as per BMI

4. Discussion

In this study, there were a total of 533 patients. Among them, there were 70% male and 30% female. Males suffer more due to obstructive sleep apnea than females. Jordan et al. and other articles regarding the epidemiology of OSA also support this finding of male dominance.

This study reveals that age is also a risk factor for OSA. After arranging the data age-wise irrespective of gender, the most prevalence was from the mid-age group i.e. 41 years to 60 years group. Among all patients with OSA, 53% were from this age group. Different studies like Punjabi, Naresh M. et al. and Patil, Susheel P., et al. have similar findings [9,10]. Due to a lack of resources, our study could not find out the underlying risk factors for middle age group consolidation of OSA patients [9]. At a young age, the prevalence of OSA was very much less. This can be easily explained by our physiological system. But why OSA is also least among extreme of age, may be a matter of great interest for further study. There may be one probability that the average life expectancy of our general population is very much below the highest age of this extreme age group.

One of the aims of a retrospective study is to find out the confounders related to a particular study. We also tried to find out the relations of Age groups with respect to gender. Among Age Group Wise Male Patients Sleep Study, 41 years to 60 years age group contributed 51% and AGE GROUP WISE female patients SLEEP STUDY pointed out that 59% of Female OSA patients were from 41 years to 60 years of age. This finding is similar to almost all globally accepted OSA studies. Sleep Apnea and 20-Year Follow-Up for All-Cause Mortality, Stroke, and Cancer Incidence and Mortality in the Busselton Health Study Cohort is one of the richest studies on OSA [4,6]. Its result on the relation of OSA for gender-based age groups is nearly synchronized with our study finding [6].

We classified Obstructive Sleep Apnea data as per AHI. AHI ranging from 0-5 is regarded as normal, AHI 5.1-15 is mild, AHI 15.1-30 is moderate and AHI more than 30 is a severe form of obstructive sleep apnea. Among our study population, 20% were normal,16% had mild, 23% had moderate and 41% had severe obstructive sleep apnea as per AHI. This result is different from Erna S. Arnardottir, Erla Bjornsdottir et. al.'s study of 'Obstructive sleep apnoea in the general population: highly prevalent but minimal symptoms' where patients with severe obstructive sleep apnea were only 2.9%. Such variation between these two results may be that in our study we included all indoor patients who had been already diagnosed with OSA and came in grave condition. On the other hand, Erna S. Arnardottir, and Erla Bjornsdottir et. al. conducted it among the general population. The authors of this article are all of the opinion that this particular point may be further researchable [10].

Whether Body Mass Index is one of the universal risk factors for obstructive sleep apnea, we tried to co-relate our data as per BMI and AHI. The findings were that AHI severity increases along with increasing BMI and participants with more BMI suffered more from obstructive sleep apnea on the AHI scale. Chi-Lu Chiang, Yung-Tai Chen et. al., Yiqi Lin, Yongxi Wu et. al. and Sophie Dodds, Linda J. Williams et. al. had similar results [17,18,13]. In the future, we hope to conduct more studies to point out underlying causes of increased BMI among patients with severe OSA on AHI parameters.

Limitations

In the hierarchy of evidence, retrospective studies have an inferior level of evidence in comparison with prospective studies [11]. As controls are often recruited by convenience sampling and are thus not representative of the general population and prone to selection bias plus retrospective cohort study is more prone to recall bias or misclassification bias [12,13]. We have a chance that subject to confounding (other risk factors may be present that were not measured) [14]. Due to the short duration of the study and lack of follow-up, temporal relationships are often difficult to assess [15]. There is a possibility of not replicating our study results in other studies or global failure of replicating the data which may raise questions of the reliability of the study also [16,17].

5. Conclusion

According to earlier research, OSA patients may also be more susceptible to mental health issues like anxiety, sadness, and psychosis due to their high levels of daytime sleepiness, severe sleep fragmentation, and low oxygen saturation levels during apneic episodes. Because it is unclear from the administrative data whether the comorbid conditions developed prior to or subsequent to the OSA diagnosis, the analysis's results are unable to establish a cause-and-effect relationship OSA and age. Growing older, having a higher body mass index, and being male all increase the likelihood of having OSA. Men are about twice as likely as women to have OSA. The prevalence of patients with older age and specifically male in gender. Our findings showed that while depressive illness is linked to OSA, its incidence is less frequent than that of sleeplessness, a prevalent ailment in mental illnesses. This research provides more evidence that age groups and gender about OSA are important risk factors for the emergence of concomitant diseases. These results call for additional investigation using case-control studies and conventional statistical methods in order to gain a deeper comprehension of the interactions between these comorbid disorders.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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