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Prevalence of obstructive sleep apnea in stable bronchial asthma patients: a hospitalbased study

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Abstract

Background- Asthma is a common chronic respiratory disease, which is associated with various factors and comorbidities. Obstructive sleep apnea is under-recognised comorbidity in asthmatic patients and its presence may be associated with outcome of the disease. This study is from tertiary care centre of India to assess the prevalence of obstructive sleep apnea in stable bronchial asthma patients, and association between severity of obstructive sleep apnea and severity of asthma.

Material and methods - This was a cross-sectional study in which 40 stable patients of bronchial asthma were enrolled. After clinical evaluation and routine investigations all patients underwent full night level 1 polysomnography. Thereafter OSA prevalence was calculated and severity of OSA correlated with severity and asthma symptom control.

Results- Among 40 stable asthma patients 14 (35%) were diagnosed as OSA. Analysis revealed asthma patient with OSA had higher mean age (<0.002), higher mean BMI (<0.001), associated with co-morbidities (<0.004) and severity of asthma and asthma symptom control had positive correlation with severity of OSA. (p = 0.017, p = 0.011 respectively)

Conclusion- A significant numbers of asthma patients had concomitant OSA; therefore OSA screening to be considered in asthma patients especially with poor symptom control despite adequate treatment. Treatment of OSA may help in better quality of life and better control of asthma.

Keywords: Obstructive sleep apnea, Asthma, prevalence, severity

INTRODUCTION Asthma is a common chronic respiratory disease affecting 1-18% of population in different geographic regions. ^[1] In a subset of patients, asthma is difficult to treat due to presence of certain risk factors and/or comorbidities. Even though it constitutes a small proportion of asthma, this 'difficult to treat' asthma significantly contributes to morbidity and economic burden associated with the disease. Obstructive sleep

morbidity that can hinder asthma control.^[2]

Obstructive sleep apnea is characterized by repetitive episodes of complete or partial collapse of the upper

apnea (OSA) is one such under-recognized co-

airway during sleep, consequent with а cessation/reduction of the airflow.^[3] It presents with loud snoring during sleep, repeated sleep interruptions and excessive day time sleepiness with or without hypoxemia.^[4] Previous studies have indicated the association of OSA with bronchial asthma and tried to elucidate their bidirectional interactions.^[5] One hypothesis suggested that asthma can predispose to OSA via direct (mechanical effect) or indirect effects (due to corticosteroids, nasal disease and obesity) and the other theory proposed that OSA can also have direct (nerve reflex, intermittent hypoxia, leptin, sleep

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fragmentation) or indirect effects (GERD, cardiac dysfunction) on asthma.^{[2],[5],[6]}

The above hypotheses regarding the bidirectional relationship highlights that the presence of OSA in asthmatic patients is likely associated with worse symptoms and poor asthma control. Treating both disorders together is likely to have a better treatment outcome. However, there is a not much data on the exact prevalence of OSA in asthma patients, particularly in Indian setting.^{[7],[8]} Getting a true picture of the prevalence will guide in formulating diagnostic algorithms for proper asthma evaluation. Hence, the present study was conducted to generate some useful data on the prevalence of OSA in asthma in our geographical region as well as to correlate the severity of the two diseases.

MATERIAL AND METHODS

This was a cross-sectional study conducted in the Department of Pulmonary Medicine of the institute. Forty stable patients of bronchial asthma presenting to outpatient department (OPD) were consecutively enrolled. Asthma was diagnosed as per the latest guidelines.^[1] Patients with acute exacerbation of asthma in the last 4 weeks, other concomitant respiratory diseases like interstitial lung diseases, pneumonia and lung cancer, recent myocardial infarction in past 6 weeks, unstable angina, left ventricular failure and neurological/psychiatric diseases were excluded. Written and informed consent was taken from all patients. The study was approved by institutional ethics committee.

All patients underwent a detailed history and physical examination including total duration of asthma symptoms, previous exacerbations and smoking history. Thereafter, they underwent routine Spirometry with reversibility and 6-minute walk test (6-MWT). Sleep behavior was also assessed using Epworth sleepiness scale.^[9]

Further all patients underwent full night level 1 polysomnography (PSG) study. The test was performed in the sleep laboratory in the department using SOMNO medics 58 channels modular polysomnography system. The patients having Apnea-Hypopnea Index (AHI) >5 was diagnosed as OSA. Severity of OSA was classified as mild, moderate and severe as per the guidelines of American Academy of Sleep Medicine.^[4] Statistical methods-

The continuous and categorical variables were summarized as mean \pm SD and proportion (%) respectively. The prevalence of OSA in Asthma was summarized as proportion (%). Pearson correlation was used to evaluate correlation between severity of OSA and severity of asthma. All statistical tests were done using SPSS (statistical package for social science). p < 0.05 was taken as significant for all statistical interpretations.

RESULTS

Out of 40 bronchial asthma patients 14 (35%) were diagnosed as OSA. Table 1 show some demographic details of asthma patients who are divided in two groups: patient with OSA and without OSA. On polysomnography study 14 patients diagnosed as OSA among them 2 as mild, 1 as moderate and 11 as severe OSA (table 2). Mean apnea hypoapnea index (AHI) of the OSA patients was 44.04 ± 21.20 events per hour. Among 40 stable asthma patients age varied from 19 year to 65 year, 6 patients (15%) were elderly (> 60 vears), among them 4 had OSA. The mean age of OSA patients in study group was 53.35 ± 8.25 years (10) OSA patients were >45 years and 4 were \leq 45 years). Study group had male: female: 1:1.1 (F = 21, M = 19). Among 14 OSA with asthma patient's female (9) outnumbered the males (5). BMI of study population ranges from 17.3 to 35.8 kg/m². Mean BMI of the study population was 23.9 ± 5.07 kg/m². Mean BMI of OSA patients was 33.41 ± 6.09 kg/m². 9 among 13 obese patients (BMI \geq 30 kg/m²) was diagnosed as OSA, 4 out of 12 pre obese $(25.0-29.9 \text{ kg/m}^2)$ had OSA and among 11 normal BMI one is diagnosed as OSA who was also hypertensive. Comorbidities had significant correlation among OSA group (Table 1). Mean duration of asthma in OSA patients was $15.00 \pm$ 8.34 years and in non OSA patients was 12.46 ± 10.21 years (p - 0.216). This leads to conclusion that age, BMI, presence of comorbidities are significantly correlated with presence of OSA in asthma patients as p value 0.002, <0.001, <0.004 respectively. Epworth sleepiness score (ESS) was ≥ 9 in 13 patients of OSA and 1 patient had ESS score of < 9 who was hypertensive also which is also significant statistically (p < 0.001). 27.5% (11) poorly controlled asthmatics had OSA and only 7.5% (3) well controlled asthmatics had OSA. 12% (6) of mild asthma patients had OSA, 7.5 % (3) of moderate asthma patients had OSA and

12.5% (5) of severe asthma patient had OSA (table 1) suggesting level of asthma symptom control (p - 0.011) (Table 3) and asthma severity (p - 0.017) (table 4) also significantly associated with OSA and its severity.

DISCUSSION

In patients with asthma, OSA can act as a mechanism that contributes to the lack of asthma control. A population based cohort study in Taiwan concluded that the risk of developing OSA increased proportionately with the number of annual emergency room visits for asthma and the risk of OSA is proportional to asthma control.^[10] The present study included 40 stable bronchial asthma patients and demonstrated a prevalence of 35% of OSA in asthma patients. The mean age of OSA group was 53.35 ± 12.7 years which was higher as compared to non OSA group. This was in concordance with the previous studies which showed that OSA was more common in older individuals.^{[11],[12]}

A cohort study done in Taiwan concluded that incidence of OSA was higher in men than in women. It also concluded that incidence of OSA was 2.51-fold greater in the asthma cohort.^[10] In another study, prevalence of OSA was 35.1% among asthma study population. 47% of OSA patients with asthma were females and 53% were males.^[13] In present study, OSA was more common in asthmatic females (22.5%) than males (12.5%). This was contrary to the findings of previous studies which showed higher OSA incidence in males.^{[10],[12],[13]} This discrepancy might be due to smaller group of study population and may require larger population-based studies for further correlation.

In the present study a higher BMI among asthma patients represented higher risk of developing OSA, mean BMI of OSA patients with asthma was 33.4 ± 6.1 kg/m². 32.5% asthma study population was obese and 30% patients were overweight. 69.2% obese population (9 among 13 obese patients) was diagnosed as OSA, 33.3% overweight had OSA and 9% patients of normal weight (1 out of 11 normal BMI) had OSA, which is in concordance with the previous studies.^{[12],[14],[15]} Studies showed that patients who gain 10% of their body weight tend to show an increase of approximately 32% in the AHI and 10% reduction in weight resulted in a 26% reduction in the AHI.^[15] With this we can contemplate that asthma

patients with higher BMI are at higher risk of developing OSA as compared to asthma patients with lower BMI.

OSA has been found to be associated with various comorbidities like hypertension, cardiovascular and cerebrovascular disease ^[3]. It has also been associated with hypothyroidism, insulin resistance and anatomical abnormalities.^[16] The present study also showed that asthma patients with comorbidities had more prevalence of OSA (p value <0.004). Some of the patients had overlap of these comorbidities and it is possible that an untreated OSA may be the cause or has led to worsening of these diseases.

A previous study also found that asthma OSA association was significantly dependent on the duration of asthma, however the finding was not seen in the present study.^[17] A large sample sized study with a prospective design might help to validate the finding. In the present study, ESS score \geq 9 were associated with high risk for OSA which is also supported by the previous literature.^[18] Considering a high prevalence of OSA in asthma patients seen in the study, ESS can be used as a screening tool for assessing risk of OSA in asthma individuals and those with high values can be planned for polysomnography.

Different studies have linked OSA with the level of asthma symptom control and showed that OSA is associated with poor asthma control.^[19] In our study. 25% of poorly controlled asthmatics had OSA whereas only 10% of well controlled asthmatics had OSA (p -0.011). Similar conclusion was drawn by an Egyptian study where 5.6% well controlled asthmatics had OSA, 61% partly controlled asthmatics had OSA, and 33.3% uncontrolled asthmatics had OSA.^[20] It is hypothesized that repeated snoring could cause damage to the soft tissue surrounding the upper airway and nasal passage due to its vibrating frequencies resulting in airway inflammation which may be responsible for poor asthma control.^{[3],[14]} This suggests that asthma symptoms can be controlled well if we treat OSA along with asthma. Similar to its association with asthma control, OSA was more commonly seen in patients with moderate (60%) and severe asthma (62.5%) as compared to mild disease (22.2%). Moreover, it was also seen that severity of OSA increases as the severity of asthma increases (Table 4). Halkanche GV et al studied 36 bronchial asthma patients, among them 12 had OSA and

Volume 4, Issue 4; July-August 2021; Page No 368-374 © 2021 IJMSCR. All Rights Reserved concluded that 58.33% had severe asthma, 25% had moderate asthma and 16.67% had mild asthma ^[20] and thus it was concluded that severity of asthma can be one of factors for predicting severity of OSA.

The present study enrolled randomly selected stable asthma patients who gave consent for enrollment for the study irrespective of their sleep behavior. They all underwent level 1 polysomnography in the hospital. We did not include patients with neurological / psychiatric disorders and anatomical abnormalities which may be the confounding factors for detection of OSA in asthma patients. Larger sample sized studies in Indian setting would allow a greater power and thus help in consolidating the findings of the study.

The present study highlights a high prevalence of OSA in stable Indian asthmatic patients. The coexistence of OSA in bronchial asthma patients predicts severe symptoms as well as poor prognosis of the dual pathology. High index of suspicion coupled by screening of OSA in asthma patients particularly those with poor symptom control/severe asthma, comorbidities, higher age and higher BMI might help in timely detection and treatment of OSA. Treating both diseases together can decrease the severity of both and better patient management.

	Study group	OSA	NO OSA	p VALUE
Mean Age (in years) (mean ± SD)	45.3±12.7	53.35 ± 8.25	41.00 ± 12.64	0.002
Gender F M	21 19	9 5	12 14	0.273
Mean Duration of Asthma (in years) (mean ± SD)	13.35 ± 9.56	15.00 ± 8.34	12.46 ± 10.21	0.216
Mean BMI (kg/m ²) (mean \pm SD) < 18.5 \geq 18.5 - 24.9 25.0 - 29.9	23.9 ± 5.07 4 11 12 7	33.41 ± 6.09 0 1 4	24.87 ± 5.84 4 10 8	<0.001
30.0 - 34.9 35.0 - 39.9 > 40	4 2	5 2 2	2 2 0	

TABLE 1: SUMMARY OF RESULTS

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Comorbidities				
Hypertension	12	10	2	
Diabetes mellitus	9	8	1	< 0.004
Hypothyroid	5	5	0	
PAH	1	1	0	
ESS <9	27	1	26	< 0.001
≥9	13	13	0	
Asthma control, n (%)				
Well controlled	24 (60)	4 (10)	21 (52.5)	
Partially controlled	12 (30)	8 (20)	4 (10)	0.011
Uncontrolled	4 (10)	2 (5)	1 (2.5)	
Severity of asthma, n (%)				
Mild	27 (67.5)	6 (15)	21 (52.5)	
Moderate	5 (12.5)	3 (7.5)	2 (5)	0.051
Severe	8 (20)	5 (12.5)	3 (7.5)	

TABLE 2: SEVERITY OF OSA IN THE STUDY POPULATION

Severity (AHI)	Asthma patients with OSA, n(%)
Mild (≥5 to <15events/hour)	2 (5)
Moderate (≥15-30events/hour)	1 (2.5)
Severe (>30events/hour)	11 (27.5)

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TABLE 3: CORRELATION OF OSA SEVERITY WITH ASTHMA SYMPTOM CONTROL

			OSA SEVERITY				
			MILD	MODERATE	SEVERE	NO OSA	p value
ASTHMA SYMPTOM CONTROL	OL	Well controlled	2	0	2	21	
	CONTR	Partially controlled	0	1	7	4	0.011
		Uncontrolled	0	0	2	1	

TABLE 4: CORRELATION BETWEEN SEVERITY OF OSA AND SEVRTIY OF ASTHMA

			SEVERITY	OF OSA		n voluo
		MILD	MODERATE	SEVERE	NO OSA	p value
SEVERITY OF ASTHMA	MILD	2	0	4	21	0.017
	MODERATE	0	1	2	2	
	SEVERE	0	0	5	3	

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