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Prevalence of asymptomatic airflow obstruction among patients visiting a tertiary health-care center

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ABSTRACT

Background: Chronic obstructive lung disease is a major health problem worldwide, with a huge impact on health and economics, both at the individual and community levels. In clinical practice, only symptomatic patients seem to undergo spirometry screening, whereas persons with no symptoms or those with early or negligible symptoms are ignored until they present with acute exacerbations and complications. Fair evidence indicates that most individuals with airflow obstruction do not recognize or report symptoms. **Aims and Objectives:** The present study was conducted to identify the prevalence of undiagnosed airflow obstruction in asymptomatic adults, without known obstructive lung disease or any other pulmonary condition. **Materials and Methods:** A total of 500 subjects between 18 and 65 years of age, coming to the outpatient department for a routine/preventive health checkup who were asymptomatic and never diagnosed for airflow obstruction, with no evidence of any physical disease on examination were selected by random sampling method after taking informed written consent. A detailed history, complete general physical and clinical examination, and spirometry (as per the ATS guidelines) for individuals were done. **Results:** Overall prevalence of AO was 16% of patients (80 patients out of 500). About 4.20% of patients had mild obstruction (GOLD – Stage 1), 4.60% had moderate obstruction (GOLD – Stage 2), 5.40% had severe obstruction (GOLD – Stage 3), and 1.80% had very severe obstruction (GOLD – Stage 4). Subjects with asymptomatic airflow obstruction had a higher prevalence of ever smoking (72.5%, 58 out of 80 patients) than never smokers (27.5%, 22 out of 80 patients) and this difference was highly significant statistically. **Conclusion:** There is a high prevalence of asymptomatic airflow obstruction, detected by spirometry, in asymptomatic patients of different severities. Smoking is a strong risk factor and AO is directly associated with age, both among smokers and never smokers. The use of spirometry should be implemented in all routine health checkup plans, as an important diagnostic tool.

Key words: Asymptomatic airflow obstruction; Chronic obstructive lung disease; Spirometry; Smoking

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD), which has a typically gradual progressive course, is a major health problem worldwide, with a huge impact and burden on health and economics, both at the individual and community levels because of repeated hospital admissions.[1] The true burden of COPD is a sum of disease burden in diagnosed and undiagnosed patients. Obstructive airway disease (OAD) encompasses several diseases such as asthma, COPD, bronchiolitis, bronchitis, and bronchiectasis. Data suggest that all are becoming prominent; despite this, they remain grossly underdiagnosed. For instance, it has been estimated that approximately two-thirds of individuals

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with COPD remain undiagnosed.[2] In clinical practice, only symptomatic patients seem to undergo spirometry tests, whereas persons with no symptoms or those with early or negligible symptoms are ignored until they are sent to emergency with acute exacerbations or complications when the disease is already in an advanced stage. Fair evidence indicates that most individuals with airflow obstruction do not recognize or report symptoms.[3] The evidence indicates that fewer than 10% of those identified by spirometry screening have severe or very severe OAD; however, this is in absolute terms, is still a substantial number.[4]

Not much is known about the clinical relevance of asymptomatic airflow obstruction, and until, this is defined along with the demonstration of therapeutic effectiveness of early therapeutic interventions, the role of detecting undiagnosed airflow obstruction with screening programs will remain controversial.[5] Early tobacco cessation interventions are more successful in persons when airflow obstruction is demonstrated, especially when coupled with the estimation of spirometric estimation of lung age.[6]

Aims and objectives

Although the prevalence of airflow obstruction and its relation with respiratory symptoms has been well documented,[7] studies of asymptomatic airflow obstruction in a large sample of adults are few, particularly from Asia. Therefore, the present study was conducted to identify the prevalence of undiagnosed airflow obstruction in asymptomatic adults, without known obstructive lung disease or any other pulmonary condition.

MATERIALS AND METHODS

The present descriptive study was conducted at Narayana Hrudayalaya Hospital, Bengaluru. A total of 500 subjects were studied between November 2011 and April 2013. Ethical clearance was sought from hospital ethical committee. Individuals between 18 and 65 years of age, coming to the outpatient department for a routine/preventive health checkup were selected by random sampling method after taking informed written consent. Of these, patients never diagnosed with obstructive airway disease previously and also with no evidence of any physical disease on examination were included in the study. Patients who were previously diagnosed with obstructive airway disease or presenting with symptoms of obstructive airflow obstruction or unable to perform spirometry were excluded from the study. A detailed history was taken and complete general physical and clinical examination was done.

Spirometry

Patients were subjected to both pre- and post-bronchodilator spirometry following the procedures recommended by the American Thoracic Society (ATS). Proper instructions on how to perform the forced expiratory maneuvers were given to the patients, and the highest values of three recordings were taken. The volume of air forcibly exhaled from the point of maximal inspiration (forced vital capacity [FVC]), the volume of air exhaled during the first second of this maneuver (forced expiratory volume in 1 s [FEV_1]), the ratio of these two measurements (FEV_1/FVC), and peak expiratory flow were measured. Data were expressed as percentage of predicted value calculated by comparing with the reference values based on age, height, sex, and race.

Airflow obstruction was defined and quantified according to the criteria established by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines.

Based on post-bronchodilator FEV_1, AO was defined as post-bronchodilator FEV_1/FVC ratio of <70%. Reversibility in FEV_1 was defined as an increase of 12% and 200 mL in FEV_1 or FVC over the baseline value measured 20 min after inhalation of 200 μg of salbutamol, a rapid acting bronchodilator.[9]

Statistical analysis

Data collected were entered into an Excel spreadsheet on Microsoft Excel 2010. The statistical analysis was done using the Statistical software package SPSS v22 and Epi Info v7. $p < 0.05$ with 95% confidence intervals was considered statistically significant.

RESULTS

Among a total of 500 patients, 23.40% were female and 76.60% were male. The mean age was 48.98 years for males and 44.83 years for females. Maximum number of patients (39.4%) was in between the age groups of 56 and 65 years. Overall prevalence of AO was 16% of patients (80 patients out of 500) (Table 1).

Of all the subjects with asymptomatic airflow obstruction, 4.20% of patients had mild obstruction (GOLD – Stage 1), 4.60% had moderate obstruction (GOLD – Stage 2), 5.40% had severe obstruction (GOLD – Stage 3), and 1.80% had very severe obstruction (GOLD – Stage 4) (Table 2).

Table 1: Frequency distribution of patients on the basis of their pulmonary functions

Pulmonary function test	Total no. of patients (n=500)	Percentage
Normal PFT	340	68
Obstructive PFT	80	16
Restrictive PFT	80	16

Ever smokers had a higher prevalence of asymptomatic airflow obstruction (72.5%, 58 out of 80 patients) than never smokers (27.5%, 22 out of 80 patients) and this difference was highly statistically significant (P<0.05) (Table 3).

About 18.53% of the total male population and 7.69% of the total female population were diagnosed to have OAD with a statistically significant gender difference. Among asymptomatic individuals, AO was not found to be significantly influenced by body mass index (BMI). Older individuals were more likely to have asymptomatic AO (mean age cutoff of 51.5 years) (Table 4).

Among 80 patients with asymptomatic airflow obstruction (16% of the total population), 15 (18.75%) showed significant bronchodilator reversibility (Figure 1).

DISCUSSION

In the present study, we found the overall prevalence of asymptomatic airflow obstruction to be 16% which was 18.53% and 7.69%, respectively, for men and women. These findings were consistent with other studies on the prevalence of asymptomatic airflow obstruction. In a study by Coultas et al., in NHANES 3, previously undiagnosed airflow obstruction was found in 12% of subjects and was more common among males (14.2%) than among females (9.9%).[8] In a report from Spain, 14.3% of men and 3.9% of women aged 40–79 years had some form of obstructed airflow.[9] In a general population-based sample in Britain, 9.9% were observed to have airflow obstruction, with 52% of the cases being undiagnosed.[10] In another study from Korea by Shin et al., asymptomatic airflow obstruction was observed in 12.4% of the men and in 3.5% of the women.[11] In our study, of all the subjects with asymptomatic airflow obstruction, 4.20% of patients had mild (GOLD – Stage 1), 4.60% had moderate (GOLD – Stage 2), 5.40% had severe (GOLD – Stage 3), and 1.80% had very severe obstruction (GOLD – Stage 4). This was similar to another study by Geijer et al., in which out of 702 subjects, undetected airflow obstruction was found in 210 subjects (29.9%) among whom mild airflow obstruction (GOLD – Stage 1) was found in 25.9% and moderate airflow obstruction (GOLD – Stage 2) was seen in 4.0%.[12]

Table 2: Frequency distribution of male and female patients on the basis of different degrees of airway obstruction

Obstructive airway disease	Males	Females	Total (percentage)
Mild	19	2	4.2
Moderate	22	1	4.5
Severe	21	6	5.4
Very severe	9	0	1.8

In our study, the prevalence of asymptomatic airflow obstruction increased significantly with age. AO was seen more in the elderly population (65%), that is, above 51.5 years according to the median age as compared to the younger age group (35%) which was <51.5 years (P=0.013). This was similar to a study done in Korea by Shin et al., who found that in male smokers, the association between asymptomatic airflow obstruction and age was particularly strong, with prevalence increasing from 4.6% in those aged 40–49 years to >40% in those aged 60–69 years.[11] In another study done by Geijer et al., undetected airflow obstruction was found to be 45% in the older age group (>55 years) versus 21% in the younger age group (40–44 years).[12] Our study found a significant relationship between AO and current or former cigarette smoking (P=0.006) with a higher prevalence of asymptomatic airflow obstruction in these smokers (59.18%) than in never smokers (40.82%). At the same time, there were a large percentage of those with AO, especially women, who had never smoked. The poorly reversible airflow obstruction in non-smokers can be attributed to passive smoking or biomass exposure, if any. Our findings were in concordance with the findings of Coultas et al., where ever smokers had a higher prevalence of asymptomatic airflow obstruction (82.3%) than subjects with no airflow obstruction (54.2%).[8] Fu et al., (2016) found in a cross-sectional survey at Hong Kong that one-seventh of smokers have asymptomatic airflow obstruction.

In our study, there was no significant relation found between AO and the BMI. The prevalence of AO was found to be approximately equal among patients with lower or normal BMI and with higher BMI values. This was consistent with the findings of Coultas et al., using data from NHANES III, who showed that there was no significant relation between AO and BMI.[8] A study by Celli et al., (also from

Table 3: Distribution of patients with different degrees of obstructive airway disease according to their smoking status

Smoking status	Mild obstruction	Moderate obstruction	Severe obstruction	Very Severe obstruction	Total	P value
Never smoker	12	2	7	1	22	0.006
Current smoker	9	17	17	8	51	
Ex-smoker	0	4	3	0	7	

Table 4: Distribution of patients of airway obstruction according to their gender, BMI, and age

Variables	Total no. of patients	Patients with AO (%)	P value
Gender			
Males	383	71 (18.53)	0.014
Females	117	9 (7.69)	
BMI (Kg/m^2)			
Lower or normal BMI	220	115 (52.3)	0.539
Higher BMI	280	133 (47.5)	
Age (years)			
<51.5	250	28 (35)	0.013
>51.5	250	52 (65)	

BMI: Body mass index

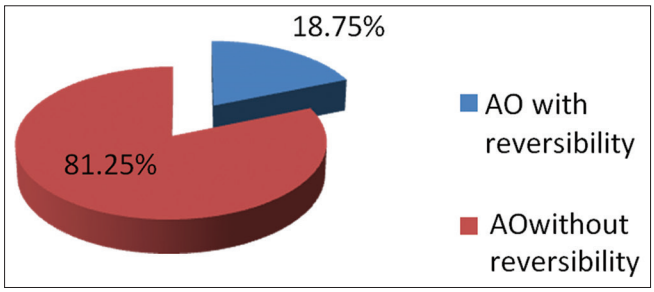

Figure 1: Distribution of patients of airflow obstruction with and without reversibility

NHANES data) of airflow obstruction in never smokers showed that higher rates of obstruction were significantly associated with increasing age, male sex, lower BMI, and a history of allergies.[13] The depletion of body weight, fat-free mass, and muscle mass in patients with moderate and severe COPD during early course may be a probable cause of the inverse relationship between AO and BMI. However, another similar study by Manzar et al., showed that increasing age at presentation and BMI correlated significantly with AO in the target group (P=0.001 and P=0.005, respectively).[14] In summary, these three studies of the association of AO and BMI showed no relationship, an inverse relationship, and a positive correlation, respectively. Further studies with detailed nutritional assessment can add to the knowledge of association of BMI with asymptomatic airflow obstruction.

Out of a total number of patients with asymptomatic airflow obstruction in our study, significant reversibility was found in 15 patients (18.75%), while 81.25% had non-reversible AO. A study by Geijer et al., on a population of 702 subjects reported undetected AO in 210 subjects, among whom 4.76% of subjects met the criteria for reversibility.[12] However, that study looked at a population of smokers, which may explain the low degree of reversible airflow obstruction compared to our study which included more never smokers.

An important feature of the present study is the high prevalence of asymptomatic airflow obstruction in the absence of a recognized pulmonary disorder or obstructive lung disease, that is, in asymptomatic, apparently healthy individuals. As a result, findings may be especially relevant for the typical man or woman in a general clinical setting.

Limitations of the study

The study population included in this study is small and not truly representative of the general population, having been recruited from persons self referring to an executive/preventive health centre. Moreover, there were more persons in the older age group due to higher self referral.

CONCLUSION

Our study concluded that there is high prevalence of different severities of undiagnosed airflow obstruction among asymptomatic patients. Smoking is a strong risk factor for asymptomatic airflow obstruction as it is for symptomatic AO, and it is directly associated with age. Spirometry screening should be implemented in all routine health checkup plans, as an important diagnostic tool. Early diagnosis of airflow obstruction could help in early institution of treatment including lifestyle changes with an emphasis on smoking cessation.

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PC- Concept, design, and data collection of the study along with interpretation of results, review of manuscript. **RG-** Review of literature and manuscript preparation, correspondence with journal. **PD-** Statistical analysis and interpretation of results, review of manuscript.

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