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A study of changing trends in obstructive airway diseases & associated co-morbidities

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ABSTRACT

Obstructive airway diseases (OAD), includes diseases characterized by increased resistance to airflow as a result of airway obstruction or airway narrowing. Types of obstructive lung diseases are asthma, COPD, bronchiectasis, obliterative bronchiolitis (OB). AIM: To study the prevalence of various obstructive airway diseases and its associated co morbidities, especially in general medical OPD.A cross sectional study was conducted at the medicine OPD ofa tertiary care centre on 100 consecutive patients of OAD. Detailed clinical history& examination of patients presenting with lower respiratory symptoms for longer duration was done along with relevant investigations. The final diagnosis was made as per history, clinical examination and investigation findings. Analysis was done by SPSS software ver.17. Out of the 100 patients of chronic airflow diseases, 43% had Bronchial asthma, while 15% and 36% had OB and COPD. COPD and bronchiectasis patients were associated with low BMI while patients with Asthma had relatively higher BMI. Most of the BA patients had mild functional impairment on spirometry while OB and COPD patients had moderate to severe obstruction. Majority of COPD and OB patients had moderate PHT on 2 D echo. Hypertension was the most common associated co-morbidity followed by DM. Most common disease presenting asOAD was Bronchial Asthma but it had least functional impairment, followed by OB, having moderate to severe obstruction and moderate Pulmonary HT. Post-TB OB has emerged as an important contributor of OAD, and it should be strongly considered in obstructive diseases patient with history of TB.

Keywords: Bronchial Asthma, COPD, Chronic Airflow Limitation, Obstructive airway diseases, Obliterative Bronchiolitis, Spirometry

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INTRODUCTION

Obstructive airway diseases, or obstructive lung diseases, includes diseases characterized by increased resistance to airflow as a result of airway obstruction or airway narrowing. Types of obstructive lung diseases are asthma, COPD, bronchiectasis, obliterative bronchiolitis (OB)[1].

Bronchial Asthma (BA) is a chronic inflammatory lung disease that results in variable episodes of airflow obstruction, but it is usually reversible. Chronic Obstructive Pulmonary Disease (COPD) is an obstructive pulmonary disease with progressive limitation in airflow that is not fully reversible[1]. The patient with asthma has variations in airflow over time, usually with normal lung function between exacerbations, whereas the limitation in expiratory airflow in the patient with COPD is generally more constant. The pathology of asthma and response to therapy differ from COPD. However, the patient with a diagnosis of obstructive pulmonary disease may have features of both asthma and COPD. Patients with asthma who have less responsive reversible airflow obstruction are difficult to distinguish from COPD patients.

Bronchiectasis is an obstructive disease characterized by dilated bronchioles most frequently resulting from untreated or poorly treated pulmonary infections that cause an increase in sputum production[1]. Obliterative

bronchiolitis a rare life threatening form of non-reversible obstructive lung disease in which the bronchioles (small airways) are compressed and narrowed by fibrosis and inflammation. This is another airway disease rarer than COPD and even more difficult to diagnose that should be considered in the diagnosis of anyone with severe airflow limitation especially someone who happens to be young and a non-smoker[1]. While in the west the most common cause of obliterative bronchiolitis is post-transplant (lung, heart lung or bone marrow transplant)[1], the most common causes in India would be post infectious and secondary to collagen vascular disease[3].

Occupational asthma (OA) is a lung disorder caused by a specific workplace sensitizer, defined as an agent that induces asthma through a mechanism that is associated with a specific immunologic response. This leads to attacks of wheezing, shortness of breath, chest tightness, and coughing especially at workplace[1].

Chronic obstructive airways disease as a complication of pulmonary tuberculosis has been re-studied recently in many regions of the globe. In the executive summary of the 2006 update of the Global initiative for chronic obstructive lung disease (GOLD) guidelines[4], the role of tuberculosis in the development of chronic airways obstruction has been recognized. According to the GOLD Workshop summary, chronic bronchitis or bronchiolitis and emphysema can occur as complications of pulmonary tuberculosis [5].

The present research was carried out to study the prevalence of various obstructive airway diseases and its associated co morbidities like cardiovascular disorders, diabetes mellitus, hypertension, osteoporosis and thyroid dysfunction.

MATERIALS AND METHODS

A cross sectional study was conducted at medical outpatient department and asthma clinic run by department of Medicine of a tertiary care centre for the duration of 1.5 years. A total of 100 consecutive patients above 18 years of age and diagnosed with asthma, chronic obstructive pulmonary disease, bronchiectasis, obliterative bronchiolitis or occupational asthma were included in the study. Patients with active tuberculosis, known retroviral disease, upper respiratory tract infection in last 4 weeks, and lower respiratory tract infection in last 3 months or respiratory failure on oxygen were excluded from the study.

Written informed consent was taken from each patient & study was explained to each. Routine investigations like HB, CBC, LFT, RFT'S, serum electrolytes, ESR, Ca2+ / PO42-, lipid profile were done from the hospital laboratory. Detailed clinical history with special emphasis on occupation both past &present was taken into account, including ongoing treatment were evaluated, followed by clinical examination for each patient. Ultrasound thorax & abdomen (only when needed), HRCT thorax (only when needed especially for diagnosis of OB patients), 2D echo, chest X-Ray and ECG were done as per the requirement as a part of standard of care. According to ATS/ERS statement, Spirometry was performed using Jaeger's spirometer, either in sitting or standing position in each patient[6]. The final diagnosis was made as per history, clinical examination and investigation findings. Standard tools for diagnosis were used as follows:

1. Bronchial Asthma was diagnosed on the basis of Global Initiative for Asthma (GINA) guidelines i.e. history of paroxysmal dyspnea and spirometry showing forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) ratio less than 70% and FEV1 less than 80% predicted with good bronchodilator reversibility i.e. an improvement in FEV1 by 12% and 200 ml[7].
2. COPD was diagnosed one basis of Global initiative for Obstructive Lung Disease guidelines (GOLD guidelines) i.e. cough, sputum production, or dyspnea with history of exposure to risk factors (e.g. tobacco smoking, biomass exposure) and spirometry showing FEV1/ FVC less than 70% and FEV1 less than 80% predicted with poor bronchodilator reversibility[8].
3. Bronchiectasis was diagnosed on the basis of history of chronic cough with sputum; confirmed by high resolution computed tomography (HRCT) thorax, and spirometry showing obstructive abnormality i.e. FEV1/ FVC less than 70% and FEV1% less than 80% predicted[9].
4. Obliterative bronchiolitis was diagnosed by Turton's clinical criteria, i.e. a) irreversible airway obstructionb) reduced FEV1, c) exclusion of emphysema, asthma, bronchiectasis or any other known causes of airway obstruction and; d) characteristic HRCT findings of mosaic attenuation worsening on expiration[10].

Obstructive abnormality was graded depending on FEV1 % predicted of 60- 80%, 40- 60% and less than 40% into mild, moderate and severe, respectively. Two-dimensional echocardiography with continuous and pulsed wave Doppler studies was performed. Pulmonary HTN was diagnosed if[11]:

a) Tricuspid incompetence (TI) gradient measured by continuous wave Doppler derived pulmonary artery pressure calculation was greater than 30 mm of Hg.

b) Clinical (loud second heart sound in pulmonary area),
c) Radiographic (dilated descending pulmonary artery)
d) Electrocardiograph evidence of pulmonary hypertension (P- Pulmonale).

Statistical analysis was done using SPSS ver. 17. Continuous data was presented as mean and std. deviation while for categorical data, frequencies and percentages were used. Appropriate statistical tests were used based on type and presentation of data. p-value of less than 0.05 was taken as level of significance.

RESULTS

Out of the 100 patients of Chronic airflow disease, 43(43%) were Bronchial asthma, 15(15%) were COPD, 36(36%) were obliterative bronchiolitis, 1(1%) was bronchiectasis and 5(5%) were occupational asthma (Table 1).Out of the 36 patients of OB 9(25%) were post infectious and the majority of patients 26(72.2%) were post tuberculosis (TB), 1 patient (2.7%) was post chemical fumes inhalational OB. Most of the asthmatics were found to be above 40 years of age (mean - 44.91years) while most patients with COPD patients were above 60 years i.e. in the elderly people (mean - 59.73).Patients of obliterative bronchiolitis and occupational asthma had a mean age of 55.67 and 56.40 years respectively. COPD and bronchiectasis patients were associated with low BMI while mean BMI of patients with Asthma was relatively higher (Table 2). On observing pulmonary functions among different disease categories, we observed that most BA patients had mild functional impairment on spirometry while most OB and COPD patients had moderate to severe obstruction (Table 3). Most BA patients had normal 2-D echo while majority of COPD and OB patients had moderate PHT on 2 D echo (Table 4). Hypertension was the most common associated co-morbidity in the study group followed by DM. The Prevalence of co-morbidities in respective pathologies was shown in Table 5.

DISCUSSION

Chronic airflow disease with or without airflow limitation is a major cause for morbidity. In the present study, most common disease presenting with was BA (43%). In a similar study in Mumbai[12], out of the 268 patients, 63% had BA with mean age of 38.0 years and it was more common in men (60%) then women (40%).Similar results were also observed in other studies in the literature[13-15]. The mean BMI for BA was 26.48 Kg/m^2which is in concordance with the studies done earlier where asthmatics were found to have normal to high BMI[13,14]. Several mechanisms have been proposed for a potential causal relationship between obesity and asthma. Obesity can directly affect the airway calibre through the chest wall restriction. Narrowing of airways and a reduction of lung volumes has been associated with bronchial hyper-reactivity[16].

The prevalence of OB in present study was found to be 36%, with majority of them being post TB (72.2%). Prevalence of tuberculosis is very high in India, the sequelae of healed TB also plays very important role. There are very few studies from India in the past which link tuberculosis as a cause for chronic airflow limitation. In a study in Chicago in 1960, out of 1403 patients of TB admitted 23% had chronic airflow limitation[17].In another study 48 out of 71 patients (68%) who had been previously treated for TB with an average duration of 16 years were found to have CAL[18].In another study by JM Joshi et al., 12 patients who were misdiagnosed as asthma, COPD, bronchiectasis were found to have OB with the age range of 6-55 yrs. All the patients had past history of serious childhood infection (post infectious)[19].In another study in Mumbai[12],out of the 268 patients of CAL 36 patients(13%) had OB with the mean age of 45 years out of which 33 patients (9%) were classified as post infectious within which 28 had past history of TB.

COPD was the third most common finding among patients with CAL, with a prevalence of 15%. The prevalence of COPD varies from 3-8% among Indian males and approx. 2.5-4.5% among Indian females[20]. The prevalence among South East-Asia Region is 12.5% (7.1%-17.9%)[21]. Mean BMI of COPD patients in the current study was 21.71 Kg/m^2which is consistent with the study done by Stefano Guerra et al. where patients of COPD were found to have low BMI. Emphysema patients can progressively lose weight due to several mechanisms. For instance, it has been hypothesized that the oxygen cost of breathing is increased in these patients [22,23]and the caloric intake is reduced since large meals can induce shortness of breath.

Majority of the BA patients had mild obstruction on spirometry (74.4%) and had normal 2 D echo (46.5%), which is consistent with the previous study[12] as bronchial asthma is a reversible disease with variable obstruction. Majority of the patients of OB (86.1%) had mild obstruction while 13.9% had moderate to severe obstruction on PFT. Mild PHT was observed in 38.9% while 55.6% and 5.6% had moderate to severe PHT. In the study done in the Indian literature[12], 53% patients of OB had severe obstruction on PFT and 19% had already developed pulmonary HTN at the time of presentation. In COPD, 40% and 13.3% patients had moderate to severe obstruction on spirometry

while 33.3%, 40%and 20% had mild, moderate and severe PHT respectively. According to a study by NK Gupta et al. [24],among 40 Patients of COPD 45% (18/40) had mild obstruction on PFT,27.5%(11/40) had moderate obstruction,12.5%(5/40) had severe obstruction and 15%(6/40) had very severe obstruction on PFT. In the same study 20 patient (50%) had normal 2 D echo,25% had mild PHT,10% had moderate PHT, and 5% had severe PHT on 2 D echo.

Occupational asthma was seen in 5% (n-5) of patients in this study, of which 2 were sweepers exposed to phenol/Lysol, 1 sweeper was exposed to roadside dusts, 1 was a school teacher exposed to chalk dust while1 patient was a hotelier exposed to cooking fumes and smoke.Work-related asthma, which includes occupational asthma and work-aggravated asthma, has become one of the most prevalent occupational lung diseases[1].These patients were advised to avoid further exposure completely and early in the course of their disease to offer the best chance of recovery.

A total of 5 patients of BA had Hypertension, 3 had Diabetes and 2 had hypothyroidism. There are some studies indicating association of asthma and hypothyroidism may be through autoimmune mechanisms and usually there is poor control of asthma in hypothyroid disorder. Four patients of COPD were associated with hypertension and 1 each with DM and IHD. COPD is found to be associated with comorbidities like HTN, IHD, lipid metabolism disorders, DM, obesity in the previous studies[25-27] as COPD is an inflammatory process which causes systemic inflammation. Smoking which could be common etiological factor or risk factor causing increased atherosclerosis and inflammation of the blood vessels.

COPD is the third leading cause of death worldwide and in India, approximately15 million people suffer from COPD. Knowledge level of the healthcare providers is low, especially amongst physicians. The awareness of COPD among primary care physicians has to increase and smokers above the age of 40, with and without respiratory symptoms, have to undergo spirometry if it is regarded important to establish the COPD diagnosis at an early stage[28].

Table 1. Distribution of patients according to Type of Obstructive Airway Diseases

Diagnosis	N	%
BA	43	43.0%
Bronchiectasis	1	1.0%
COPD	15	15.0%
OB	36	36.0%
Occupational Asthma	5	5.0%
Total	100	100%

Table 2. Mean Age and BMI in various Obstructive Airway Diseases

DISEASE	Mean age (years)	BMI (Kg/ m^2)
BA	44.91	26.48
COPD	59.73	21.71
OB	55.67	24.14
Bronchiectasis	83	19.02
Occupational asthma	56.4	27.14
Total	51.96	24.88

Table 3. Pulmonary Function Tests (PFT) in various Obstructive Airway Diseases

PFT	BA		Bronchiectasis		COPD		OB		Occupational asthma		Total
Mild	32	74.4%	0	0.0%	7	46.7%	2	5.6%	3	60.0%	44
Moderate	11	25.6%	1	100.0%	6	40.0%	31	86.1%	2	40.0%	51
Severe	0	0.0%	0	0.0%	2	13.3%	3	8.3%	0	0.0%	5
Total	43	100%	1	100%	15	100%	36	100%	5	100%	100

Table 4. 2-D Echo findings in various Obstructive Airway Diseases

2-D Echo	BA		Bronchiectasis		COPD		OB		Occupational asthma		Total
Normal	20	46.5%	0	0.0%	1	6.7%	0	0.0%	2	40.0%	23
Mild PHT	17	39.5%	1	100%	5	33.3%	14	38.9%	2	40.0%	39
Mod. PHT	5	11.6%	0	0.0%	6	40.0%	20	55.6%	1	20.0%	32
Severe PHT	1	2.3%	0	0.0%	3	20.0%	2	5.6%	0	0.0%	6
Total	43	100%	1	100%	15	100%	36	100%	5	100%	100

Table 5. Co-morbidities in various Obstructive Airway Diseases

Co-morbidities	BA		Bronchiectasis		COPD		OB		Occupational asthma		Total
HTN	5	11.6%	1	100%	4	26.7%	9	25.0%	1	20.0%	20
DM	3	7.0%	0	0.0%	1	6.7%	3	8.3%	1	20.0%	8
IHD	0	0.0%	0	0.0%	1	6.7%	1	2.8%	0	0.0%	2
Hypothyroidism	2	4.7%	0	0.0%	0	0.0%	0	0.0%	1	20.0%	3
Absent	33	76.7%	0	0.0%	9	60.0%	23	63.9%	2	40.0%	67
Total	43	100%	1	100%	15	100%	36	100%	5	100%	100

CONCLUSION

Most common disease presenting as CAL was BA but it had least functional impairment, followed by OB having moderate to severe obstruction on Spirometry and moderate PHT on 2 D echo. Post-TB OB has emerged as an important contributor of CAL, as India is a country where TB is still very prevalent, it should be strongly considered in CAL patients with history of TB. Also, Occupational history is very important to rule out OB as well as occupational asthma.As the use of Spirometry is still less in physician's practise of general medicine, it should be encouraged for more diagnosis of obstructive airway diseases. This will eventually diagnose correctly different OAD, which will help to reduce the exacerbations in patients and their hospitalizations with optimized treatment leading to decreased economic burden on the patients.

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