



AN EPIDEMIOLOGICAL STUDY OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND ASSOCIATED COMPLICATIONS: A PROSPECTIVE, SINGLE CENTRE, OBSERVATIONAL STUDY

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ABSTRACT

INTRODUCTION: Chronic Obstructive Pulmonary Disease (COPD), a common preventable and treatable disease. It is responsible for considerable morbidity and mortality in the community especially among the older people. As this disorder has a protracted course spanning over several years to decades, place a major burden to the resources of health care system. COPD is of considerable public health importance as these diseases are to a great extent preventable.

AIM: The present study was planned to evaluate the prevalence, presentation, severity, associated risk factors and complications associated with COPD at medicine department of a tertiary care teaching hospital of western India.

MATERIAL AND METHODS: In this study, 84 patients who were diagnosed as having COPD as per GOLD guidelines with FEV1/ FVC <70% were enrolled. A Detailed History, Clinical Examination, Signs of right heart failure like raised JVP, congestive hepatomegaly and pedal edema, ECG changes of COPD and Right Heart failure, Chest X-ray, 2D Echo and Spirometry was performed. By using spirometry results, severity of clinical symptoms and history of smoking, patients were classified based on GOLD staging of COPD. By using spirometry results patients were classified based on GOLD staging of COPD. Pack Years of smoking was compared with severity of COPD. All p-values were calculated using one-way ANOVA test.

RESULTS: The findings presented study included involvement of age group of 50 – 80 years with male predominance as evidenced by 9:1 ratio of Male to Female ratio for COPD epidemiology. Smoking was the major risk factor. Dyspnoea and Cough / Cough with expectoration of sputum were the major clinical symptoms. Acting accessory muscles of respiration with pursed lip breathing was the major clinical sign observed. Most number of cases had severe airway obstruction which was not reversible on spirometry. High flattened diaphragm and hyper lucent lungs were the most common chest x-ray finding observed in this study. FEV1 was significantly decreased with increased severity of COPD. Signs of cor pulmonale are present in most of the very severe group of patients.

CONCLUSION: COPD is a preventable disease as smoking is the major risk factor for this disease. Spirometry is mandatory to diagnose and assess the severity of COPD. Clinical signs of right heart failure in COPD were effective in screening the patients for cor pulmonale.

KEYWORDS : COPD, GOLD, Spirometry, Epidemiology.

INTRODUCTION:

From the time of Laennec., et al through the first half of 20th century, mechanical explanations of Chronic Obstructive Pulmonary Diseases dominate. The importance of cigarette smoking was not appreciated at that time. But the observation "Chronic lung disease may cause heart failure even on otherwise normal heart" was made at that time.

Chronic Obstructive Pulmonary Disease (COPD), a common preventable and treatable disease, is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients.

Chronic Obstructive Pulmonary Diseases is responsible for considerable morbidity and mortality in the community especially among the older people. As this disorder has a protracted course spanning over several years to decades, place a major burden to the resources of health care system. COPD is of considerable public health importance as these diseases are to a great extent preventable. Exacerbation of the COPD occurs more during winter season.

Chronic Obstructive Pulmonary Diseases is the second most common lung disorder after pulmonary tuberculosis. Incidences are Higher in males due to higher prevalence of smoking. It is a disease of middle aged and elderly people, less common below the age of 35 years.¹ Studies from North India reported that the prevalence of chronic bronchitis was as high as 16% in people above 40 years from rural areas. Prevalence is more in North India than South India due to seasonal variability, particularly extremes of climate in North India. A study by Bhattacharya et al showed prevalence of chronic bronchitis in rural population aged more than 30 years was 57 / 1000 there was a male preponderance which was higher with increasing age and pack years of smoking.²

The global prevalence of physiologically defined chronic obstructive pulmonary disease (COPD) in adults aged 40 years is approximately 9-10 %. It is a major cause of morbidity and mortality worldwide. Besides the lung abnormalities, COPD is now recognized to be a condition that has an impact on other organs, the so-called systemic

effects and comorbidities of COPD.³

The present study was planned to evaluate the prevalence, presentation, severity, associated risk factors and complications associated with COPD at medicine department of a tertiary care teaching hospital of western India.

Material And Methods:

This Cross-sectional study was carried out on adult patients admitted in a tertiary Care Teaching Hospital of Western India under department of Internal Medicine and fulfilling predefined inclusion and exclusion criteria. It was decided to include the patients with age >40 years admitted with symptoms suggestive of airway obstruction of more than 2 years duration and in whom clinical diagnosis of COPD is made. Also, the criteria of FEV1/ FVC $\leq$ 0.7 and FEV1 < 80% of the predicted, which does not change significantly (<200ml) after bronchodilator therapy with 0.3 mg of salbutamol nebulisation were taken into consideration. The patients with Bronchial asthma (isolated), Tuberculosis, clinically symptomatic patients of Ischemic Heart Disease, Rheumatic Heart Disease and Clinically symptomatic patients of Thyrotoxicosis were excluded from the study.

A total of 84 patients who were diagnosed as having chronic obstructive pulmonary disease as per GOLD guidelines with FEV1/ FVC <70% were further divided into 3 groups. In Group I, Patients who fulfil the inclusion criteria and belong to moderate COPD (GOLD stage- 2 based on predicted FEV1 50-80%), in Group II, Patients who fulfil the inclusion criteria and belong to severe COPD (GOLD Stage 3 based on predicted FEV1 30-50%) and in Group III, patients who fulfil the above criteria and belong to very severe COPD (GOLD stage 4 based on predicted FEV1 <30%) were selected.

We prepared a detailed proforma to collect all the relevant information to meet the objectives of the study. All the patients were subjected as for 1) Detailed History, 2) General examination and examination of Respiratory system and other systems, 3) Examination specifically for signs of right heart failure like raised JVP, congestive hepatomegaly and pedal edema, 4) Conventional 12 lead Electro cardiography was taken for ECG changes of COPD and Right Heart failure, 5) X-ray

chest PA view and left lateral view, 6) Spirometry.

Spirometry was performed when the patient was clinically stable. Tests were performed with the patient comfortably seated, with clothes loosened. The patients were instructed to take a deep inspiration then close the lips around the mouth piece and blow out as hard and fast as possible, following deep inspiration. Volume was obtained on the vertical axis of recording paper and time on the horizontal axis. The curve which was obtained is referred to as forced vital capacity curve.

By using spirometry results patients were classified based on GOLD staging of COPD. Severity of clinical symptoms were correlated with GOLD staging of COPD. Pack Years of smoking was compared with severity of COPD. Patients who showed clinical sign of right heart failure were subjected to Echo cardiography for confirmation. P values were calculated using one-way ANOVA test.

Results:

The results collected from this study was tabulated into different variants and incidence of each variant was calculated in percentage. COPD is the disease of aged as evidenced by majority of patients in the present study were belong to the age group of 50 – 80 years. COPD has male predominance as evidenced by 9:1 ratio of Male to Female due to high prevalence of smoking habits observed in males. Cigarette smoking was the major risk factor for COPD in this study. Dyspnoea and Cough / Cough with expectoration of sputum were the major clinical symptoms observed in this study. Acting accessory muscles of respiration with pursed lip breathing was the major clinical sign observed in this study.

Most number of cases had severe airway obstruction which was not reversible on spirometry. High flattened diaphragm and hyper lucent lungs were the most common chest x-ray finding observed in this study. CXR-PA view was obtained to detect right heart enlargement and / or pulmonary artery dilatation. Major percentage (60.71) of the study group had duration of illness between 5-10yrs most of which is contributed by severe and very severe COPD groups. 26.19% had duration of illness less than 5yrs of which 16.66% is constituted by moderate COPD group. 11.9% had duration of illness for 11-20yrs and majority of them belonged to very severe COPD.

Table 1: Duration Of Illness In Various Stages Of Copd

Duration Of Illness(years)	Moderate (Stage 2) (n=21)	Severe (stage 3) (n=39)	Very Severe (stage 4) (n=24)	Total (n=84)
<5	14(16.66%)	16(19.04%)	2(2.38%)	22(26.19%)
5-10	5(5.95%)	28(33.33%)	18(21.42%)	51(60.71%)
10-20	1(0.84%)	5(5.95%)	4(4.76%)	10(11.9%)

Out of the 84 COPD patients studied, 16.8% (21/84) had moderate airflow obstruction. 41.16% (39/84) had severe obstruction and 20.16% (24/84) had very severe obstruction as per GOLD COPD guidelines. FEV1 (Liters): FEV1 in patients with very severe COPD had a mean of 0.66(+/-0.19)0.53+/-0.19 as compared to moderate and severe COPD groups who had a mean of 1.79(+/-0.37) and 1.07(+/-0.2) respectively. Thus, the FEV1 has a significant decrease with increased severity of COPD.

Table 2: Spirometry

Spirometry Values	Moderate (stage 2)(n=21) 25.0%	Severe (Stage 3) (n=39) 46.42%	Very severe (stage4) (n=24) 28.57%	P value
FEV1(liter/sec) (range)	1.03-3.04	0.69-1.62	0.34-1.22	
FEV1(mean +/-SD)	1.79(+/-0.37)	1.07(+/-0.2)	0.66(+/-0.19)	<0.001
FVC (liters) (range)	1.44-4.03	1.49-2.66	1.01-2.94	
FVC (mean)+/-SD	2.81(+/-0.69)	2.14(+/-1.62)	1.60(+/-0.15)	<0.001

The signs of cor-pulmonale like Pedal edema, Loud second heart sound, Raised JVP and Palpable P2 were found in 47.61% (40/84) patients in the present study. Signs of cor-pulmonale are present in most of the very severe group of patients. Pedal edema was the most common sign of failure observed in 47.61% of COPD patients, 30.41% had loud second heart sound, 42.85% had raised JVP, and 23.8 % had

palpable P2.

Table 3: Prevalence Of Physical Signs Of Cor-pulmonale

Signs Of Cor Pulmonale	Moderate (stage2) (n=21)	Severe (stage 3) (n=39)	Very severe (stage 4) (n=24)	Total(n=84)
Pedal edema	4	20	16	40 (47.61%)
Loud P2	5	12	8	25 (30.41%)
Palpable P2	0	13	7	20 (23.8 %)
Raised JVP	1	20	15	36 (42.85%)

In the present study 47/84 (55.95%) had pulmonary artery hypertension (PAH) of which 26 had mild PAH, 14 had moderate PAH and 7 had severe PAH.

Table 4: Distribution Of PAH In Various Stages Of COPD

GOLD staging	Mild PAH (<30mmHg)	Moderate PAH (30-35mmHg)	Severe PAH (>50mmHg)
Stage 2(n=21)	5	0	0
Stage 3(n=39)	10	9	0
Stage 4(n=24)	11	5	7
Total	26	14	7
percentage	55.31%	29.78	14.89%

DISCUSSION:

In the present study maximum number of cases were in the age group of 61-70 years. This coincides well with the various study like, Wig K.L Guleira K. S et al 1964 study showed maximum number of cases in 55-65 years.⁴ Higham MA Dawson et al at 2001 showed maximum number cases in 61-70years.⁵ and Suzzane Hurd et al showed maximum number of cases in 60-70 years.⁶

In this study, it was noted the incidence of COPD was higher in males than females with male to female ratio of 9:1. Male cases accounted for 90% of the total cases in this study. This finding also coincides with the studies like, Trivedi H.S. et al study showed 80% of cases were male.⁷ and Mieguere et al showed 93% of cases were male.⁸

In this study it is observed that 70% of patients were from rural areas and 30% were from urban areas. The study by Bhattacharya S.N. et al, 1975, also made similar observation.⁹ Anderson et al, 1963, made similar observation in his study.¹⁰ In spite of heavy Air pollution, the urban areas contributed only 30% of the cases in this study.

Among the various risk factors Smoking is the major risk factor accounted for 87% of the causative risk factor in this present study. Ashley F, Kannel WB et al, 1975, made similar observation.¹⁰ Burrows et al, 1979, made similar observation.¹¹ Intensity of smoking was expressed in pack-years in this study. As the number of pack-years more than 20, increased predisposition to COPD was observed in many studies. In this study, most of the patients were 20-30 pack-years of smoking constituting 96% of the total. Higgins ITT et al, 1959, observed in his study 86% patients were more than 30 pack-years of smoking.¹²

Chronic respiratory infection which constituted 28.3% was the second major risk factor observed in this study, followed by Air Pollution and Allergy. Burrows B et al, 1977, also made similar observation. In his study Chronic respiratory infection constituted 35%.¹¹ Air pollution constituted 13.3% of risk factor and Allergy 8.3% of risk factors.¹³

In this present study of most of the cases between 5-10 years of duration of the disease. Barnes BJ et al, 1999, in his study observed 55% had more than 15 years.¹⁴

In this study cough and cough with expectoration of sputum was observed in 86.28% and 76.19% of cases respectively Burrows et al, 1979, made in his study 96% of patients had cough with exportation of sputum.¹¹ Dyspnoea was observed in 100% cases. Altose MD et al, 1985, observed 90% of cases had dyspnoea.¹⁵

This study observed acting accessory muscles of respiration was the major physical sign observed in 52.49% of cases. Polycythemia (Secondary to hypoxia) was observed in only 5.3% of cases. Pedal oedema raised JVP, and congestive hepatomegaly observed in 47.61% and 42.85% of cases respectively.

In this present study most common radiological finding in chest X-ray PA view was hyper inflated lungs with low flattened diaphragm which constituted 75% of cases. Thurlbeck WM et al, 1970, observed in his study 78% of the patients showed radiological evidence of emphysema with chronic bronchitis.¹⁶ Normal X-ray chest was observed in 15% of cases.

In the study the greatest number of patients were in GOLD Stage III COPD which constituted 46.29% of cases. The study by Higham et al⁵ showed that majority of patients were in Stage III (BTS Scheme for COPD) constituted 57 – 58% of cases. Renzetti AD et al, 1966 observed 76% of his cases belong to moderate to severe stages of COPD.¹⁷

In this study it is observed that 42.8% of cases showed clinical evidence of right heart failure. All the patients who showed the clinical evidence of right heart failure were subjected to echocardiography and confirmed the presence of right heart failure. Mattay R et al, 1981, observed that 12.5% of his cases were showed evidence of cor pulmonale.¹⁸

CONCLUSION:

COPD is a preventable disease as smoking is the major risk factor for this disease. Spirometry is mandatory to diagnose and assess the severity of COPD and FEV1 was the single most important parameter in spirometry to diagnose COPD along with the less than 15% of reversibility of airflow obstruction to bronchodilators. Clinical signs of right heart failure in COPD were effective in screening the patients for cor pulmonale and we concluded that Right heart failure denotes severity and duration of COPD.

Limitations:

Detailed investigations to know the aetiology of cor-pulmonale were not carried out. further investigation in form of CT scan, tissue diagnosis would have been more helpful in knowing the exact aetiology of cor pulmonale. These were not done because of lack of facility and economic status. Also, more advanced tests like right sided heart catheterization and radionucleotide ventriculography which gives information about pulmonary artery pressure, pulmonary artery wedge pressure, cardiac output in former and right ventricular function in later, were not carried out because lack of facility. Pathogenesis explained for the development of pulmonary arterial hypertension in patients of cor-pulmonale and subsequent development of right heart enlargement includes chronic hypoxemia, acidosis and certain mediators, which were not studied in this study. A regular and detailed follow up was not carried out in all patients. So, we could not know the subsequent progression of the disease nor the response to the treatment given.

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