Evaluation of Pulmonary Hypertension in Chronic Obstructive Pulmonary Disease"

Medical Science

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ABSTRACT

METHODOLOGY: The present study was designed to assess clinical features in patients with COPD and to evaluate PH in them using noninvasive methods. The study was conducted on 100 COPD patients at K R Hospital. In addition to the routine laboratory tests, pulmonary function tests, ECG, 2D Echocardiography were done.

RESULTS: Mean age of the studied patients was: 65.07±7.52 years, majority of patients were in the age group 61-70 years. Out of 100 patients studied, 76 were male and 24 females.

Cough was the commonest presenting symptom (96%), followed by sputum production (84%), breathlessness(84%). Duration of illness in majority of patients (37%) was 6-10 years, in 34% of patents 1-5 years and in 29% of patients 11-20 years.

Majority of patients(75%) were smokers and the severity of PH was related to the smoking duration and number of cigarettes smoked per day. PH was moderate in 23% and severe in 77% patients.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of health care burden worldwide and the only leading cause of death that is increasing in prevalence. It is the fourth leading cause of death, and by 2020, is expected to rise to the 3rd position as a cause of death.[1] Pulmonary hypertension (PH) is a serious complication of COPD and is associated with poor prognosis. COPD is characterized by airflow limitation that is not fully reversible with bronchodilators unlike bronchial asthma. The term COPD includes both chronic bronchitis and emphysema. The disease is common in smokers and more commonly seen in males. The prevalence in India is as high as 10% in patients aged above 40 years.

PH is defined as an increase in mean pulmonary arterial pressure (mPAP) ≥25 mmHg at rest, pulmonary artery wedge pressure (PAWP), or left ventricular end-diastolic pressure ≤15 mmHg and increased pulmonary vascular resistance (PVR). It was first identified by Romberg in 1891. PH may occur at any stage of COPD. Exact determination of prevalence of pulmonary hypertension (PH) in COPD has been hampered by difficulties in obtaining valid data from population based studies. Main reason being right heart catheterization cannot be performed on large scales for ethical reasons. Estimation of PH by 2D Echo alone is subjected to some errors.

Pressure is known to increase during REM sleep, exercise, acute exacerbations which, eventually leads to right heart failure. Thus, early detection and treatment of PH becomes important to prevent right heart failure.

This study is an attempt to study the clinical profile of COPD patients and development of PH in them.

OBJECTIVES

1. To study the clinical profile of COPD patients.
2. To evaluate PH in COPD patients by non-invasive methods.

MATERIALS AND METHODS

Patients attending the outpatient department or admitted to General Medicine wards of K R Hospital, Mysore in the period between December 2010 and June 2012 were evaluated by history, physical examination and relevant baseline investigations.

Those patients with Bronchial asthma, Pulmonary tuberculosis, interstitial lung disease, valvular heart disease, acute left ventricular failure were excluded from the study. Those patients found

clinically eligible and subsequent confirmation by spirometry (FEV1/FVC<0.7) were enrolled into the study. The study sample size was 100. The purpose of the study was explained to the patient and informed consent obtained.

Pulmonary function testing was done using Spirobank II S/N V00056 spirometer. Three satisfactory efforts were recorded and best effort was considered. Bronchodilatation was done using 200 µg of inhaled salbutamol using a metered dose inhaler and test was repeated after 15 min.

These patients were subjected to ECG, Chest Xray, 2D Echocardiography in addition to routine lab tests.

The analysis of the data was done using appropriate statistical methods. Ethical committee clearance was taken.

RESULTS

Mean age of the studied patients was 65.07±7.52 years, minimum age being 50 years and maximum age 85 years. Majority of patients were in the age group 61-70 years. Out of 100 patients studied, 76 were male and 24 females.

Occupational exposure study of patients showed that 81% had exposure to dust, dust and husk, textile mills dust.

Among 100 patients, 84 were living in rural area and 16 in urban area.

Table.1 shows clinical symptoms with which COPD patients present clinically.

Table 1: Clinical symptoms

Clinical Symptoms	Number of patients (n=100)	%
Cough	96	96.0
Breathlessness	84	84.0
Sputum	88	88.0
Fever	49	49.0
Weight loss	39	39.0
Swelling of lower limbs	55	55.0
Weakness and fatigue	77	77.0
Chest pain	34	34.0

Cough was the commonest presenting symptom(96%), followed by sputum production (84%), breathlessness(84%), weakness and fatigue(77%) and swelling of lower limbs(55%). Duration of illness in majority of patients (37%) was 6-10 years, in 34% of

patents 1-5 years and in 29% of patients 11-20 years.

Among 100 patients studied, 75 were smokers and 25 nonsmokers.

Graph.1 showing duration of smoking in patients
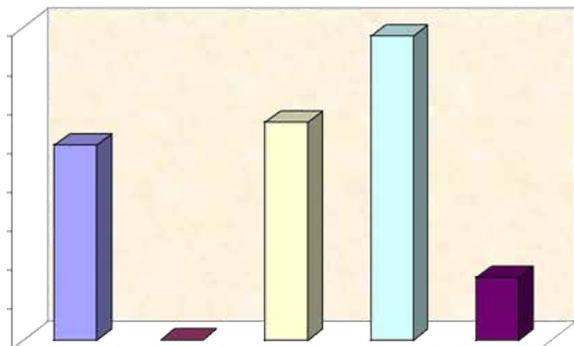
Out of 100 patients, majority of patients i.e. 39% had smoked for 21-30 years, 28% for 11-20 years and 8% for >30 years.Among smokers, 62% had smoked 11-20 cigarettes/beedis per day, 32% 1-10 per day and 5% smoked >20 cigarretes/beedis per day.

Among 100 patients studied, JVP was raised in 67% patients, pedal oedema was present in 60% patients and cyanosis was present in 64% patients.

In 54% patients BMI was normal i.e. 18.5-25 kg/m^2, in 43% patients it was 25-30 and in 1% BMI was >30 kg/m^2. Mean BMI was found to be 23.8kg/m^2.

Table 2: Examination of respiratory system

Examination of	Number of patients	%
respiratory system	(n=100)	
Use of accessory muscles	80	80.0
Barrel shaped chest	53	53.0
Chest movements		
• Normal	35	35.0
• Minimal	65	65.0
Rhonchi	61	61.0
Crepitations	99	99.0
CVS-PH	38	38.0

The most common clinical finding on examination was crepitations (99%), followed by use of accessory muscles of respiration(80%), reduced chest movements(65%), rhonchi (61%), barrel shaped chest(53%). Clinical signs of pulmonary hypertension were present only in 38% patients.

Chest X-ray was abnormal in 98% patients with evidence of emphysema and chronic bronchitis.

Table 3: Distribution of FEV$_1$/FVC in pre and post assessment using bronchodilators

Distribution of	Pre (n=100)		Post (n=100)	

FEV$_1$/FVC	No	%	No.	%
<50	1	1.0	1	1.0
50-70	99	99.0	98	98.0
>70	0	0.0	1	1.0
Mean ± SD		58.10±4.38		60.86±4.04

Mean FEV$_1$/FVC is significantly more in post-assessment with t=5.786; p<0.001.

Table 4: FEV$_1$ distribution of pre and post assessment

Distribution	Pre (n=100)		Post (n=100)	
of FEV$_1$	No.	%	No.	%
<2.0	82	82.0	69	69.0
>2.0	18	18.0	31	31.0
Mean ± SD		1.64±0.33		1.86±0.27

Mean FEV$_1$ is significantly more in post-assessment with t=12.537; p<0.001.

The following ECG findings were noted in 100 patients – P. pulmonale in 90% , rightward shift of QRS axis in 90% , R wave length in v6<5 mm in 83%, R/S ratio in v5<1 in 69%, RBBB in 49% and low voltage complexes in 38%.

Table 5: Severity of PH

PASP	Number of patients	%
	(n=100)	
Mild PH 20-30 mmHg	0	0.0
Moderate PH 30-50 mmHg	23	23.0
Severe PH >50 mmHg	77	77.0
Total	100	100.0

77% patients were found to have severe PH, 23% had moderate PH and mild PH was present in 0% patients.

Graph showing severity of pulmonary hypertension
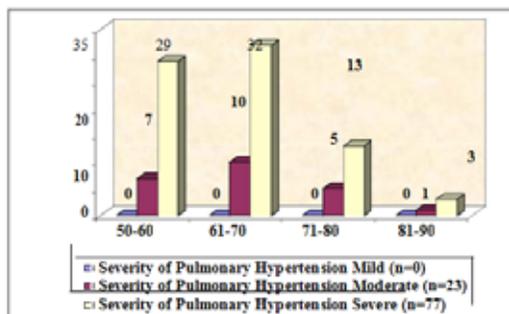
Both moderate (43%) and severe (41%) PH was seen in age groups 61-70 years. p-value was not statistically significant Both

moderate and severe PH was seen in smokers with long standing smoking duration history.

DISCUSSION

As per study by Michel Migueres et al in patients of COPD, the mean age of presentation was 60 years and 93.3% were males. Results were comparable to our study where mean age of presentation was 65 years, and 76% were males. Higher prevalence in males may be attributed to smoking and exposure to various dusts and allergens at workplace which are major risk factors in causation of COPD.

In the study, 84% subjects were from rural background, comparable to Goel.S et al. study (72.7%).[5]

Major presenting symptoms were cough (96%), expectoration in 88%, and breathlessness in 84%. Symptom profile is comparable with Mahesh et al. study where cough was in 100% patients, expectoration in 100% and breathlessness in 90.9%.[6]

75% of patients in the study group were smokers, and had smoking history of more than 20 years, comparable to Prasanta R Mohapatra et al. study.[4]

Table 6: Pre and post-bronchodilator FEV$_1$/FVC

Studies	Mean FEV1	Mean FEV$_1$/FVC
Prasanta Mohapatra et al.[4]	42.5±14	54.86±4.04
Higham MA et al.	39.4%	40.3%
Present study	58.1±4.38	60.86±4.04

In the present study, pre and post bronchodilator FEV1/FVC was comparable to Prasnata R Mohapatra et al.study Mean BMI of patients in the present study was 23.8, comparable to those in Prasanta R Mohapatra et al study (23).[4]

Table 7: Severity of pulmonary hypertension

Severity	Higham MA et al.	Gupta et al.[7]	Present study
Mild	25%	58.8%	0%
Moderate	43%	23.5%	23%
Severe	68%	17.6%	77%

In our study, 77% of the patients had severe PH, and 23% had moderate PH. PH developed in COPD patients with symptoms of more than 5 years duration indicating chronic hypoxia as a risk factor. Hypoxic pulmonary vasoconstriction is a frequent explanation for acute rise in pulmonary vascular resistance during exposure to hypoxia in patients with COPD. Estimation of PH has a prognostic value in COPD patients. 5-year survival rates were 50% in patients with mild PH, 30% in moderate PH, and 0% in severe PH.

CONCLUSION

Earlier studies reported PH as a rare manifestation in COPD, but over the years, with use of sensitive diagnostic techniques, such as Doppler echocardiography, the percentage of PH in COPD has been recognized to be higher than previously estimated.

It becomes necessary to diagnose PH in COPD as

1. These patients have a poor prognosis.
2. These patients need treatment with pulmonary vasodilators and supplemental oxygen.
3. Presence of mild PH often prompts consideration of lung transplantation.
4. Severe PH is a contraindication for lung transplantation.

LIMITATIONS OF THE STUDY

1. Sample size was small, only 100.
2. Poor echocardiographic window in patients with COPD interfers with accurate estimation of pulmonary pressures.
3. Right heart catheterization which is the gold standard to assess PH was not done due to hospital limitations. Compared to this, echocardiography has sensitivity of 60% and specificity of 74%.

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