

Prevalence of Pulmonary Hypertension in COPD Patients: A Retrospective Observational Study

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is the fourth leading cause of death, and by 2020, it is expected to rise to the 3rd position as a cause of death. Pulmonary hypertension is a serious complication of COPD and is associated with poor prognosis. Thus, early detection and treatment of pulmonary hypertension becomes important to prevent right heart failure.

Aim: The present study was undertaken to study the prevalence of pulmonary hypertension in COPD patients and to highlight the importance of early diagnosis of pulmonary hypertension to prevent further complications.

Materials and Methods: 130 patients, who presented with history of cough, sputum, breathlessness or wheezing of more than 3 months duration to the department of Pulmonology, Chalmeda Anand Rao Hospital were subjected to pre and post-bronchodilator pulmonary function testing. During 01st November 2012 to 30th June 2014. Those patients whose post-bronchodilator FEV1/FVC was less than 0.7 were included in this study. These patients were evaluated for presence of pulmonary hypertension using chest X-ray, electrocardiogram, 2D echocardiography.

Results: Out of 130 cases diagnosed with COPD, 122 patients were included in the study and 8 cases were excluded of which 2 cases were excluded due to coexisting cardiac disease and 6 cases were excluded due to poor window at 2D-Echocardiography. Our study showed that PFT parameters R/S ratio in V6 in ECG showed inverse correlation to severity of COPD, cardiomegaly in chest x-ray was more prominent in severe COPD.

Conclusion: This study focuses on non invasive methods like ECG, X-ray, 2D Echo and PFT in screening for pulmonary hypertension and subsequent development of cor pulmonale in COPD patients.

KEY WORDS: COPD, Pulmonary hypertension, 2D Echo, ECG, Chest x-ray.

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Online Access and Article Informtaion

Quick Response code



DOI: 10.16965/ijims.2016.119

International Journal of Integrative Medical Sciences

www.imedsciences.com

Received: 13-05-2016

Accepted: 23-05-2016

Reviewed: 13-05-2016

Published: 31-05-2016

Source of Funding: Self

Conflicts of interest: None

BACKGROUND

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 is a serious complica-

tion of COPD and is associated with poor prognosis. In general pulmonary hypertension is said to be present when Mean pulmonary artery pressure (PPA) is more than 25 mmHg, in COPD when pressure is above 20 mmHg. Pulmonary hypertension associated with COPD is usually mild to moderate, and in <5% patients it is severe. Pressure is known to increase to a great extent during REM sleep, exercise, acute exacerbations which, eventually leads to right heart failure. Thus, early detection and treatment of pulmonary hypertension becomes important to prevent right heart failure [2]. The aim of our study was to study the prevalence of pulmonary hypertension in COPD patients and to highlight the importance of early diagnosis of pulmonary hypertension to prevent further complications.

MATERIALS AND METHODS

This was a retrospective observational hospital based study conducted at Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar, Telangana, during 1st November 2012 to 30th June 2014. A total of 130 patients were evaluated for presence of pulmonary hypertension using chest X-ray, electrocardiogram, 2D echocardiography. Out of 130 cases diagnosed with COPD, 122 patients were included in the study and 8 cases were excluded of which 2 cases were excluded due to coexisting cardiac disease and 6 cases were excluded due to poor window at 2D-Echocardiography.

Inclusion Criteria: Clinically diagnosed as COPD (mainly emphysema and chronic bronchitis) with subsequent confirmation by spirometry i.e., FEV1/FVC < 0.7.

Exclusion Criteria: patients diagnosed as having Bronchial asthma, Pulmonary Tuberculosis (present or past), Interstitial lung diseases, Valvular, Acute Left Ventricular Failure and Pulmonary edema secondary to other causes hypertension, ischemic heart disease, cardiomyopathies), Primary pulmonary hypertension, Bronchiectasis were excluded.

Sampling Method Simple random sampling Data was collected using a pretested proforma meeting the objectives of the study. Detailed

history, physical examination and necessary investigations were undertaken.

Pulmonary Function Test: Pulmonary function testing was done using HELIOS 401 spirometer. COPD was diagnosed and classified according to BTS guidelines (BTS post bronchodilator FEV1/FVC < 70% and FEV1 < 80% predicted), mild (FEV1 60- 80% of predicted), moderate (FEV1 40- 59% predicted) and severe (FEV1 < 40% predicted) respectively. Using non-invasive methods like ECG, Chest X-Ray, 2-D Echocardiography pulmonary hypertension was evaluated in diagnosed COPD patients.

Other investigations

Patients were subjected to are as follows

- Hb, TC, DC, ESR
- Blood urea, serum creatinine
- FBS/PPBS/RBS
- Absolute eosinophil count
- Sputum for gram stain and AFB
- Urine Albumin /Sugar/Microscopy

Institutional ethical committee clearance This study was reviewed and approved by in Institutional ethical committee at Chalmeda Anand Rao Institute of Medical Sciences, Karimnagar on 05th October 2012.

Statistical Analysis: The data were analyzed by using SPASS software. Mean \pm SD was calculated and unpaired student's t-test was applied. P-value of $d < 0.05$ was considered as statistically significant, a value of $d < 0.01$ as very significant and a value of $d < 0.001$ as highly significant.

RESULTS

Out of 130 cases diagnosed with COPD, 122 patients were included in the study and 8 cases were excluded of which 2 cases were excluded due to coexisting cardiac disease and 6 cases were excluded due to poor window at 2D-Echocardiography.

Age of the study group: The age of the patients being studied ranged between 39 years to 84 years. The mild COPD group ranged from 39 years to 80 years with a mean age of 66 ± 11.29 years. The ages in moderate COPD group were 50 years to 84 years and mean 65.60 ± 9.90 years and in severe COPD group was 40

years to 78 years and mean 57.80 ± 9.08 years.

Sex distribution of the study group: In the present study, out of 122 patients, 104(85.25%) were males and 18 (14.25%) were females

Table 1: Showing the Sex distribution.

Sex	Mild COPD (n=42)		Moderate COPD (n=40)		Severe COPD (n=40)		Total (n=122)	
	No.	%	No.	%	No.	%	No.	%
Male	38	90.48	32	80	34	85	104	85.25
Female	4	9.52	8	20	6	15	18	14.75

Chest radiography findings

The following parameters were studied in the chest radiography.

1. Presence or absence of emphysema
2. Cardiomegaly
3. Prominent pulmonary conus (PPC)

Table 2: Chest x-ray findings.

Chest x-ray findings	Mild COPD		Moderate COPD		Severe COPD		Total COPD	
	No	%	No	%	No	%	No	%
Emphysema	12	28.57	18	45	18	45	48	39.34
Cardiomegaly	-	-	4	10	18	45	22	18.03
PPC	2	4.76	4	10	12	30	18	9.89

Electrocardiographic findings

Table 3: Showing the ECG findings.

ECG findings	Mild COPD		Moderate COPD (n=40)		Severe COPD (n=40)		Total COPD (n=40)	
	No	%	No	%	No	%	No	%
'P' Pulmonale	12	28.57	16	40	18	45	46	37.7
R/S in V6 <1	4	9.52	10	25	16	40	30	24.59
RAD	2	4.76	8	20	14	35	24	19.67
RBBB	2	4.76	4	10	6	15	12	9.84

Echocardiographic findings: Echocardiographic study was carried out in 2-D Echocardiography mode. In 2D- chocardiography. right atrium (RA) dilation was seen in 6 (14.28%) of mild COPD patients , 16 (40.00%) of moderate COPD and 31 (77.5%) of severe COPD and 53(43.44%) of total COPD patients. Right ventricle (RV) dilatation is seen in 6 (14.28%) of mild COPD patients, 16 (40.00%) of moderate COPD and 31 (77.5%) of severe COPD and 53(43.44%) of total COPD patients. Pulmonary hypertension is present in 10 (23.80%) of mild COPD patients , 18 (45.00%) of moderate COPD and 33 (82.5%) of severe COPD and 61(50.00%) of total COPD

patients.

DISCUSSION

The study consisted of 130 subjects, out of which 8 cases were excluded according to the exclusion criteria and 122 cases who had post bronchodilator FEV1/FVC <0.7, were included which were further divided into mild, moderate, severe. Group I has 42 subjects with mild COPD, Group II has 40 subjects with moderate COPD while Group III has 40 subjects with severe COPD. All the individuals in different groups were subjected to detailed history and physical examination and pulmonary function Testing. All patients underwent electrocardiography, conventional radiography and 2D-Echocardiography along with other investigations mentioned.

The PFT parameters namely FEV1, FVC and FEV1% were significantly altered , FEV1, FVC and FEV1% are inversly and significantly related to severity of COPD (P<0.05).

Cardiomegaly was significantly more common in patients with severe COPD group.

The most common abnormality observed was P pulmonale. This was seen more commonly in patients with severe obstruction although not statistically significant. The R/S ratio in V6 < 1 correlated significantly well with the severity of COPD.

Success rate of Echocardiographic examination:

In our study 130 patients had to be screened to get the desired 122 subjects in the study, success rate of 96.16% was observed which is fairly well when compared to the success rate shown by other study lesser et al (1983), Oswald Mammoser et al [2] (success rate of approx 83%) and Himelman et al (success rate of approx 91%) Bertoli et al (success rate of approx 86%) and Tsuda et al (80%). The success rate of 2D-Echocardiography in the present study is around 96.16%, which is comparable to other studies. The reasons for the failure rate observed are thick barrier of air in emphysematous chest preventing adequate penetration by ultrasonic waves and the altered anatomy and position of the heart in the chest making correct direction and angulation of the echo probe extremely uncertain.

Prevalence of pulmonary hypertension in COPD patients: Pulmonary hypertension is present in 10 (23.80%) of mild COPD patients, 18 (45.00%) of moderate COPD and 33 (82.5%) of severe COPD and 61(50.00%) of total COPD patients.

In the present study, it was observed that even some of the patients with mild COPD tend to have features of pulmonary hypertension as evidenced by ECG and Echocardiographic parameters. The prevalence of pulmonary hypertension in mild, moderate and severe COPD patients is 23.80% , 45.00% and 82.5% respectively. The overall prevalence among total COPD patients is 50.00%.

The present study finding reveals 50.00% patients of various severity of COPD have findings of pulmonary hypertension, that is similar in prevalence of previous studies. Although the true prevalence of PH in COPD is unknown, an elevation of pulmonary arterial pressure is reported to occur in 20 percent – 90 percent of patients when measured by right heart catheterization with some evidence that pulmonary hemodynamic worsening airflow obstruction [4-9]. Two studies have shown an abnormal increase in mean pulmonary arterial pressure in COPD of 0.4-0.6 mm Hg per year. These studies illustrate that PH in COPD progresses slowly and occurs in mild as well as severe forms of disease [10,11]. In a study by Gupta NK et al [12], the frequencies of PH in mild, moderate, severe, and very severe COPD were 16.67%, 54.55%, 60.00%, and 83.33%, respectively. In one study it was found to be 25%, 43%, and 68% in mild, moderate, and severe COPD, respectively [13]. Approximately 25 percent patients with COPD eventually develop cor pulmonale [14]. Cor pulmonale was found in 40 percent patients with COPD in one autopsy study [15,16]. It is estimated that every year between 10 percent and 30 percent of all hospital admissions for heart failure in united states are due to cor pulmonale [17] and approximately 85 percent patients with cor pulmonale have COPD [13].

Limitations of the study: The limitations of the present study were small sample size, study was only hospital based, and right heart catheterization and measurement of pulmonary

artery pressure which is the gold standard to assess pulmonary hypertension was not done due to hospital limitations.

CONCLUSION

Our study concluded with the following observations; On Electrocardiography, the most common abnormality observed was P pulmonale but R/S ratio in V6 < 1 correlated significantly well with the severity of COPD. In the Echocardiographic study, the right heart parameters were significantly increased when severe COPD group were compared to mild and moderate COPD subjects. The prevalence of right heart dilatation in severe COPD subjects is quite higher and significant. The prevalence of Pulmonary hypertension is 23.80% in mild COPD patients, 45.00% in moderate COPD patients and 82.5% in severe COPD patients and 50.00% in total COPD patients. The present study emphasizes the importance of screening for pulmonary hypertension and subsequent development of cor pulmonale through thorough clinical assessment and non-invasive investigations like chest radiography electrocardiography and 2 D-Echocardiography.

Conflicts of interests: None

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How to cite this article:

Shruthi Reddy, Rajender, Nithin Reddy. Prevalence of Pulmonary Hypertension in COPD Patients: A Retrospective Observational Study. *Int J Intg Med Sci* 2016;3(5):285-289. DOI: 10.16965/ijims.2016.119