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Original Research Article

Prevalence of pulmonary hypertension in COPD

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ABSTRACT

Background: Chronic obstructive pulmonary disease is a leading cause of morbidity and mortality in adults all over the world. Pulmonary hypertension (PH) is a severe disorder defined by a mean pulmonary artery pressure of ≥25 mmHg at rest. Pulmonary hypertension can occur as an isolated disease or as a consequence of a number of underlying diseases and conditions, such as heart failure and chronic obstructive pulmonary disease (COPD). 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.
Methods: This was a retrospective observational hospital based study conducted at Integral Institute of Medical Sciences and Research Lucknow U P, during 1st January to 31st December 2017. A total of 210 patients were evaluated for presence of pulmonary hypertension using chest X-ray, electrocardiogram, 2D echocardiography.
Results: The present study finding reveals 38.02 % patients of various severity of COPD have findings of pulmonary hypertension, that is similar in prevalence of previous studies.
Conclusions: The prevalence of PH in patients with COPD was 38.02%. As PH has an important role in the prognosis of COPD patients, it should be evaluated in as many COPD patients as possible.

Keywords: 2D echocardiography, COPD, Pulmonary hypertension

INTRODUCTION

Chronic obstructive pulmonary disease is a leading cause of morbidity and mortality in adults all over the world. While other major causes of non-cancer mortality such as coronary artery disease and stroke have shown a consistent downward trend, COPD is the only one that continues to increase.[1] The epidemiological scenario is expected to worsen and the World Health Organization predicts that COPD will become the third leading cause of death (currently fourth) and the fifth leading cause of disability (currently twelfth) worldwide by the year 2020.[2,3] Pulmonary hypertension (PH) is a severe disorder defined by a mean pulmonary artery pressure of ≥25 mmHg at rest.[4-7] Pulmonary hypertension can occur as an isolated disease or as a consequence of a number of underlying diseases and conditions, such as heart failure and chronic obstructive pulmonary disease (COPD).[7-14] The diagnostic method of choice for PH is right-heart catheterization.[4] However, its invasive nature renders it unsuitable in population-based studies. Transthoracic Doppler echocardiography is a non-invasive tool used in clinical practice for screening and monitoring of PH progression. Although some studies describe under- or overestimation of pulmonary arterial pressures by echocardiography, a meta-analysis has shown it to have good sensitivity (83%), reasonable specificity (72%) and a correlation 0.7 with invasively acquired measurements.[15,16] Most deviations from measurements by right heart catheterization seem to occur in patients with very high pressure estimates.[17] In echocardiograms, the pulmonary artery systolic pressure is the most frequently used parameter. 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 25mmHg, in COPD when pressure is above 20mmHg. Pulmonary hypertension associated with COPD is usually mild to moderate, and in <5% patientsit 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.[18]

The aim of present 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.

METHODS

This was a retrospective observational hospital-based study conducted at Integral Institute of Medical Sciences and Research Lucknow U P, during 1st January to 31st December 2017. A total of 210 patients were evaluated for presence of pulmonary hypertension using chest X-ray, electrocardiogram, 2D echocardiography. Out of 210 cases diagnosed with COPD, 192 patients were included in the study and 18 cases were excluded of which 5 cases were excluded due to coexisting cardiac disease and 13 cases were excluded due to poor window at 2DEchocardiography.

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.

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 (FEV 1 <40% predicted) respectively. Using non-invasive methods like ECG, Chest X-Ray, 2-DEchocardiography pulmonary hypertension was evaluated in diagnosed COPD patients.

Echocardiography

All the participants were subjected to trasthorasic echocardiography. The standardized protocol included 2-dimensional scanning in the parasternal long and short axis views, apical and subcostal views. In addition, left ventricular dimensions were measured using 2-dimension guided M-mode. Tricuspid regurgitation peak velocity (TRV) was measured using Continuous Wave Doppler. Tissue Doppler imaging was done in the apical 4-chamber view. Echocardiograms were made using a commercially available ultrasonography system (Vivid I, GE Healthcare, Little Chalfont, UK), with a 2.5 MHz transducer.

Pulmonary artery systolic pressure

Pulmonary artery systolic pressure was calculated as the sum of the estimated right atrial pressure (RAP) and the pressure gradient over the tricuspid valve as: ePASP = 4*TRV2 + RAP. The pressure gradient was computed from the highest Doppler tricuspid regurgitation velocity gathered from several windows using the simplified Bernoulli equation (4*TRV2).

RAP was estimated according to the guidelines of the American Society of Echocardiography: if the inferior vena cava diameter was ≤21 mm and its forced inspiratory collapse (“sniff test”) was >50%, RAP was estimated to be 3mmHg; if the diameter was >21mm and the collapse <50%, RAP was estimated as 15 mmHg; in intermediate cases, a value of 8 mmHg was assigned.

Participants were deemed to have ePH if they had ePASP >40mmHg. If data on RAP was missing, a tricuspid pressure gradient >36mmHg (TRV >3.0 m/s) criterion was used instead. Participants in whom TRV was too small to measure or absent were included in the prevalence analyses as non-cases, as we they were most likely to have normal pulmonary pressures.

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 Institutional ethical committee at Integral Institute of Medical Sciences and Research Lucknow, UP, India.

Statistical analysis

The data were analyzed by using SPASS software. Mean±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

Age and sex of the study group

The study consisted of 210 subjects, out of which 18 cases were excluded according to the exclusion criteria and 192 cases who had post bronchodilator FEV1/FVC <0.7, were included which were further divided into three groups. Group I have 53 subjects with mild COPD, Group II has 62 subjects with moderate COPD while Group III has 77 subjects with severe COPD.

The age of the patients being studied ranged between 40years to 86years. The mild COPD group ranged from 40years to 82years with a mean age of 66±11.29 years.

The ages in moderate COPD group were 48 years to 86 years and mean 65.60±9.90 years and in severe COPD group was 43 years to 79 years and mean 57.80±9.08 years. Sex distribution of the study group: In the present study, out of 192 patients, 167 (86.97%) were males and25 (13.02%) were females.

Table 1: Gender wise distribution of study patients.

	Mild COPD (n=53)		Moderate COPD (n=62)		Severe COPD (n=77)		Total (n=192)	
Sex	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Male	44	83.01	51	82.25	73	94.80	167	86.97
Female	9	16.98	11	17.74	4	05.191	25	13.02

Echocardiographic findings

Echocardiographic study was carried out in 2-D Echocardiography mode. In 2D-chocardiography. right atrium (RA) dilation was seen in 19 (35.84%) of mild COPD patients, 26 (41.93%) of moderate COPD and 29 (37.66%) of severe COPD and 74 (38.54%) of total COPD patients.

Right ventricle (RV) dilatation is seen in 20 (37.73%) of mild COPD patients, 27 (43.54%) of moderate COPD and 31 (40.25%) of severe COPD and 78 (40.62%) of total COPD patients. Pulmonary hypertension is present in 21 (39.62%) of mild COPD patients, 25 (40.32%) of moderate COPD and 27 (35.06%) of severe COPD and 73 (38.02%) of total COPD

Prevalence of pulmonary hypertension in COPD patients

Pulmonary hypertension is present in 21 (39.62%) of mild COPD patients, 25 (40.32%) of moderate COPD and 27 (35.06%) of severe COPD and 73(38.02%) of total COPD. 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 39.62%, 40.32% and 35.62% respectively. The overall prevalence among total COPD patients is 38.02%.

DISCUSSION

The present study finding reveals 38.02% 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 20-90% of patients when measured by right heart catheterization with some evidence that pulmonary hemodynamic worsening airflow obstruction.[18-21] 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.[22,23] In a study by Gupta NK et al, 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.[24,25] Approximately 25% patients with COPD eventually develop cor pulmonale.[26] Cor pulmonale was found in 40 percent patients with COPD in one autopsy study.[27,28] 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.[29]

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

The prevalence of PH in patients with COPD was 38.02%. There were no significant correlations between the presence of PH and GOLD stage, severity of the bronchial obstruction and presence of polycythemia. As PH has an important role in the prognosis of COPD patients, it should be evaluated in as many COPD patients as possible.

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Ethical approval: The study was approved by the institutional ethics committee

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