Original Article

An observational study of correlation of cardiac manifestations with severity of COPD

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Abstract:

Introduction: Various systemic manifestations and complications have been observed throughout the course of Chronic Obstructive Pulmonary Disease. Out of those manifestations one of the important manifestations is cardiac involvement. The major and well-known cardiac complications of COPD are pulmonary vascular disease and its impact on right ventricular function, higher incidence of myocardial infarction and arrhythmias. These complications correlate inversely with survival. **Aim:** To study cardiac manifestations in COPD patients and its correlation with severity of the disease. **Methodology:** This observational study was conducted in the department of medicine at a tertiary care hospital in Solapur, Maharashtra. Data of 80 patients diagnosed and their cardiac status assessed on the basis of clinical findings, radiological changes and spirometry, electrocardiography and echocardiography. All patients were analyzed for cardiac involvement based on symptomatology, ECG and 2D-ECHO results. **Results:** Out of 80 COPD patients 6 patients were GOLD class 1 (mild), 28 in class 2 (moderate), 36 in class 3 (severe) and 10 patients belonged to GOLD class 4 (very severe). Cardiovascular complications were found in 40 patients out of 80. Of these, pulmonary hypertension was found in 45%, IHD in 30%, cor-pulmonale in 20% and arrhythmias were found in 10% of which supraventricular arrhythmias were seen in 75% and ventricular arrhythmia in25%. **Conclusion:** Our study concluded that patients with mild to moderate COPD may also have cardiac complications. Due to common symptomatology, they are difficult to diagnose. Hence, it is necessary at the time of initial diagnosis to carry out ECG and 2DECHO for early detection and for better management of these patients.

Keywords: Chronic Obstructive Pulmonary Disease (COPD), Pulmonary vascular disease, Cardiac manifestations

Introduction:

Chronic Obstructive Pulmonary Disease (COPD) is likely to be among the top three major causes of mortality by 2030, according to a World Health Organization (WHO) report released on May 20, 2008. COPD is the world's third biggest cause of mortality, according to the Global Burden of Disease 2018.[1] COPD might overtake cancer as the top cause of death in the globe in a decade or less.[2] The disease's prevalence is estimated to be between 6.5 percent and 7.7 percent.[3] In 1990, India had 28.1 million instances of COPD, but by 2016, there had been a considerable increase, with the overall number of cases rising to 55.3 million.[4] Throughout the course of Chronic Obstructive Pulmonary Disease, a variety of systemic symptoms and consequences are typical. One of the most prominent indications is cardiac involvement, which is the most prevalent cause of death.[5,6] Pulmonary artery hypertension and its influence on right ventricular function,

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as well as a greater incidence of myocardial infarction and cardiac arrhythmias, are all well-known cardiac consequences of COPD. These problems are negatively associated to survival.[7]

Because COPD and cardiac difficulties have many of the same risk factors, including as age, cigarette smoking, inactivity, and persistent low-grade pulmonary and systemic inflammation, cardiac involvement is frequently encountered in COPD.[8]

As a result, COPD has a greater total morbidity and death rate. Cardiac disease has a significant influence on the severity of COPD and has been linked to frequent hospitalisation and mortality. Breathlessness, chest discomfort, cough, and easy fatigability are just a few of the prevalent symptoms that make diagnosing co-existing cardiac indications challenging. Atrial fibrillation is a common associated cardiac arrhythmia that is linked to a decrease in FEV1. A triggering factor or a result of an acute COPD exacerbation is atrial fibrillation.[9]

Though there are several cardiac symptoms, pulmonary arterial hypertension (PAH) and chronic cor-pulmonale (COR-P) are two of the most well-known. Because they are usually linked with right ventricular dysfunction, they have a direct link to an increase in the severity and frequency of hospitalization. They've also been linked to increased dyspnea, decreased exercise tolerance, and a decline in functional status. Ischemic heart disease, myocardial infarction, congestive heart failure, and cardiac arrhythmias are some of the other cardiac symptoms seen in COPD patients.

Methodology:

Aim:

To study cardiac manifestations in cases of COPD.

To determine and analyse the relationship between cardiac symptoms and COPD severity.

Observational research was carried out at the medicine department of a tertiary care hospital in Solapur, Maharashtra.

Duration of Study: June 2021 through September 2021.

With the use of symptoms, ECG, and 2 D-ECHO, data from 80 patients who satisfied the diagnostic criteria for COPD based on clinical, radiological, and spirometry were evaluated for cardiac manifestation.

Inclusion criteria:

Patients who, based on clinical history, chest radiography, and spirometry, satisfy the diagnostic criteria for COPD.

Exclusion criteria:

Patients having a history of chronic lung disease other than COPD, hypertension, prior cardiac disease, or inability to conduct spirometry are excluded.

Sampling: All patients who satisfied the study's inclusion and exclusion criteria were enrolled, and their FEV1 values on spirometry were used to classify them into the GOLD class. Clinical information, as well as ECG and 2-D ECHO, were gathered. Patients with pulmonary hypertension were divided into three groups: mild (30-50mmHg), moderate (50-70mmHg), and severe (>70mmHg).[10] IHD was diagnosed using the ACC/AHA 2011 criteria.[11] The mean, median, average, SD, P value, and Chi square test were used to analyse the data.

Results:

The age range in our study was 50 to 80 years old, with a mean age of 64.26 16.52 years. We discovered a male preponderance in our research. There were 72 men and 8 women in the group, giving a male to female ratio of 9 to 1. Fifty (69%) of the 72 male patients were smokers. Six patients had mild COPD, 28 had moderate COPD, 36 had severe COPD, and ten had very severe COPD.(Table 1)

Table 1: Classification of COPD Patients based on GOLD Class

Sr. No.	GOLD Class	Severity	No. of Patients
1	FEV1 (>80%)	Mild	6 (7.5%)
2	FEV1 (50-80%)	Moderate	28 (35%)
3	FEV1 (30-50%)	Severe	36 (45%)
4	FEV1 (<30%)	Very Severe	10 (12.5%)

Table 2: Frequency of cardiac manifestations and their association with severity of COPD

GOLD Class	Pulmonary Hypertension	COR-P	IHD	Arrhythmia
1 (Mild)	1 (16.66%)	-	1 (16.66%)	-
2 (Moderate)	7 (25%)	3 (10.71%)	4 (14.28%)	1 (3.5%)
3 (Severe)	20 (55.55%)	7 (19.44%)	12 (33.33%)	3 (8.33%)
4 (Very Severe)	8 (80%)	6 (60%)	7 (70%)	4 (40%)
Total	36	16	24	8

X2 = 3.83, P = 0.92, Not Significant

There were cardiac manifestations in 40 of the 80 individuals investigated. Thirty-six individuals (45%) were found to have pulmonary hypertension. On the basis of ECG abnormalities, 24 individuals (30%) were diagnosed with IHD. Sixteen patients (20%) had cor-pulmonale, while eight patients (10%) had arrhythmias, with six patients (75%) having supraventricular arrhythmias (atrial fibrillation and multifocal atrial tachycardia), and two patients (25%) having ventricular premature beats.

Table 3: Incidence of Pulmonary Hypertension and its association with severity of COPD

GOLD Class	Mild PH (30-50mmHg)	Moderate PH (50-70mmHg)	Severe PH (>70mmHg)	Total
Mild	1 (100%)	-	-	1
Moderate	2 (28.57%)	4 (57.14%)	1 (14.28%)	7
Severe	3 (15%)	7 (35%)	10 (50%)	20
Very Severe	1 (12.5%)	4 (50%)	3 (37%)	8
Total	7	15	14	36

X2 = 7.32, P = 0.29, Not Significant

The total number and percentage of patients with pulmonary hypertension (PAH) was 1 (16.66%) in mild, 7 (25%) in moderate, 20 (55.55%) in severe and 8 (80%) in very severe cases of COPD.

Table 4: Frequency of Arrhythmia In COPD patients

Type of Arrhythmia	No. of Patients	Percentage (%)
Supraventricular	**6**	**75%**
• Atrial Fibrillation	5	83.33%
• Multifocal Atrial Tachycardia	1	16.67%
Ventricular	**2**	**25%**
• Premature Ventricular Beats	2	100%

Arrhythmias were seen in eight individuals (10%), with six (75%) having supraventricular arrhythmias (atrial fibrillation and multifocal atrial tachycardia) and two (25%) having ventricular premature beats.

Discussion:

COPD was prevalent in the majority of the individuals investigated. There were 40 cardiac symptoms in the 80 subjects investigated. PAH was shown to be more common in study groups as COPD severity rose. Sruti Reddy et al[12], NK Gupta et al[13], and Vivek Katiyar et al[14] did similar research in India and found similar findings. COR-P was found in 20% of COPD patients as a reflection of pulmonary hypertension, with higher rates in severe and very severe illness. COR-P was observed in 17.5 percent of patients in research by N. K. Gupta et colleagues [13]. Lokendra Dave et al[15] and Kaushal et al[16] found a higher prevalence of COR-Pulmonale 39.5% and 32% cases respectively, probably because the majority of the patients in these studies were from severe and very severe COPD GOLD class. In our study, 24 individuals (30%) were diagnosed with ischemic heart disease, with the majority of them falling into the severe and very severe COPD categories. Similar findings were obtained in research by Amit S Gupta et al, who discovered that 21% of patients had IHD and COPD.[17] Arrhythmias affected 10% of the individuals in the study group, with 75% having supraventricular arrhythmias and 25% having premature ventricular complexes. Atrial fibrillation is detected in 83.33 percent of supraventricular arrhythmias; other individuals exhibited multifocal atrial tachycardia. Sushil Anturlikar et al[18] and Dabadghao VS et al[19] conducted investigations in India on the incidence of atrial fibrillation.

Conclusion:

In severe COPD, cardiac consequences are prevalent. They can also be seen in mild to moderate diseases, according to our research. Because smoking is a frequent risk factor, smokers had a greater probability of having cardiac complications. Due to the limited sample size, the p-value for both the correlation of COPD with cardiac symptoms and the incidence of pulmonary hypertension was not significant. A larger sample size might lead to a higher correlation. The cardiac manifestations of COPD are difficult to detect due to the common symptomatology. Routine electrocardiographic and echocardiographic investigations should be performed in all COPD patients at the time of first diagnosis and on a regular basis thereafter to allow for early detection, monitoring, and improved treatment of cardiac comorbidities.

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