



Pattern of cardiovascular morbidities in patients of chronic obstructive pulmonary disease

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ABSTRACT

Background: Various comorbidities are associated with COPD. **Aim:** To study the pattern of cardiovascular comorbidities in patients of COPD. **Material and Methods:** The study included 300 patients presented with signs and symptoms suggestive of COPD. The diagnosis of cardiovascular comorbidities was made on the basis of clinical examination of the cardiovascular system, electrocardiographic changes and echocardiography. **Results and conclusions:** On electrocardiography, around 159 (53%) cases showed changes on ECG suggestive of presence of cardiovascular morbidity. ECG showed changes suggestive of atrial hypertrophy in 105 (35%) patients and ventricular hypertrophy in 72 (24%) cases. 78 (26%) cases had sinus tachycardia on ECG and 55 (18.3%) had changes of coronary artery disease, 6 (2%) cases had arrhythmia and 3 (1%) had acute myocardial infarction changes on ECG.

Key words: COPD (Chronic obstructive pulmonary disease); Cor pulmonale

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INTRODUCTION

COPD is an important risk factor for atherosclerosis leading to 2 to 3-fold increase in the risk of cardiovascular disease. Even modest decrease in FEV1 cause 2 to 3-fold increased risk of IHD, strokes and sudden cardiac death. Mechanism suggested for increased coronary risk is the fact that persistent low-grade inflammation causes atherosclerosis, IHD, Strokes and coronary deaths¹. Mild to moderate pulmonary hypertension may develop late in the course of COPD and is due to hypoxic vasoconstriction of small pulmonary arteries, eventually resulting in structural changes that include intimal hyperplasia and later smooth muscle hypertrophy/hyperplasia. There is an inflammatory response in vessels similar to that seen in the airways and evidence for endothelial cell dysfunction. The loss of the pulmonary capillary bed in emphysema may also contribute to increased pressure in the pulmonary circulation. Progressive pulmonary hypertension may lead to right ventricular hypertrophy and eventually to right-side cardiac failure (cor pulmonale)¹.

The expert committee of WHO (1961) defined cor pulmonale as hypertrophy of the right ventricle resulting from diseases affecting the function and / or structure of the lungs. Chronic obstructive pulmonary disease is by far the main cause of cor pulmonale. The true incidence of cor pulmonale in COPD has been difficult to establish. Earlier studies of prognostic indicators in patients with COPD reported cor pulmonale in about 25% of all subjects². Elevation of the jugular venous pressure and the presence of pitting ankle edema are often the most useful findings suggestive of cor pulmonale in clinical practice. However, the jugular venous pressure is often difficult to assess in patients with COPD, due to large swings in intrathoracic pressure. Firm diagnosis of cor pulmonale can be made through a number of investigations, including radiography, electrocardiography, echocardiography, radionuclide scintigraphy, and magnetic resonance imaging³. The chest radiograph may show enlargement of the central pulmonary arteries

with oligemic peripheral lung fields. Pulmonary hypertension should be suspected when the right descending pulmonary artery is larger than 16 mm in diameter and the left pulmonary artery is larger than 18 mm in diameter. Right ventricular enlargement leads to an increase of the transverse diameter of the heart shadow to the right on the posterior anterior view and filling of the retrosternal air space on the lateral view¹.

Electrocardiographic (ECG) abnormalities in cor pulmonale reflect the presence of right ventricular hypertrophy (RVH), RV strain, or underlying pulmonary disease¹. Doppler echocardiography is used to estimate pulmonary arterial pressure, taking advantage of the functional tricuspid insufficiency that is usually present in pulmonary hypertension².

MATERIAL AND METHODS

The study was conducted in the Department of TB and Chest Diseases, Government Medical College, Patiala, Punjab (India). The study included 300 patients presented with signs and symptoms suggestive of COPD, both male and female, in outdoor as well as indoor. The main purpose of the study was to study the pattern of co-existing cardiovascular morbidities such as hypertension, pulmonary artery hypertension, coronary artery disease and right ventricular failure in patients of chronic obstructive pulmonary disease.

The diagnosis of COPD and cardiovascular comorbidities was made on the basis of:

1. History suggestive of COPD and cardiovascular comorbidities.
2. Clinical presentation
3. Radiological findings on X-ray chest and HRCT (whenever indicated)
4. Other investigations (Post bronchodilator spirometry, ECG, Echocardiography, PCV, CRP).

The patient data was recorded on a self-structured Performa. The collected data analyzed using Epi Info6 package. The consent of the patient was taken for his/her enrollment in the study. The identity of patients was kept as secret.

OBSERVATIONS AND RESULTS

TABLE-1: RELEVANT CLINICAL EXAMINATION OF CARDIOVASCULAR SYSTEM

Finding	No. of cases	%ge
Normal	289	96.3%
Any S ₁ , S ₂ , abnormality	2	0.7%
Any Murmur	7	2.3%
Shift of apex	2	0.7%
Total	300	100%

TABLE-2: CORRELATION OF VARIOUS LABORATORY FINDINGS WITH THE PRESENCE OF ABNORMAL ECG

Lab. Finding	Patients with Abnormal ECG findings	
	No. of Cases	%age
Hb decreased	47	29.6%
TLC Increased	133	83.6%
RBS increased	2	1.3%
CRP +ve	107	67.3%
PCV	36	22.6%
HIV +ve	0	0%

FIG. 1: BAR DIAGRAM SHOWING ELECTROCARDIOGRAPHIC FINDINGS OF THE PATIENTS

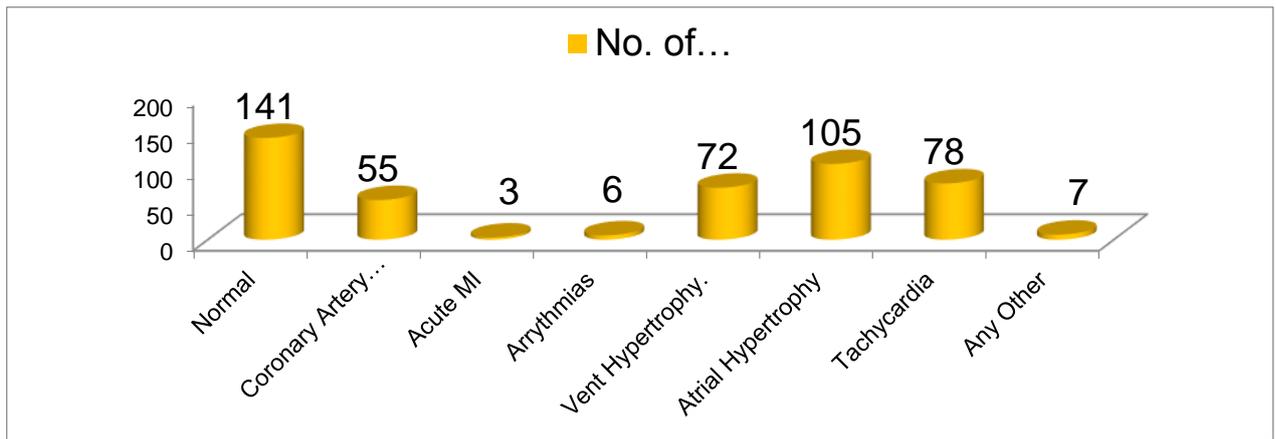


FIG. 2: BAR DIAGRAM SHOWING ECHOCARDIOGRAPHIC FINDINGS

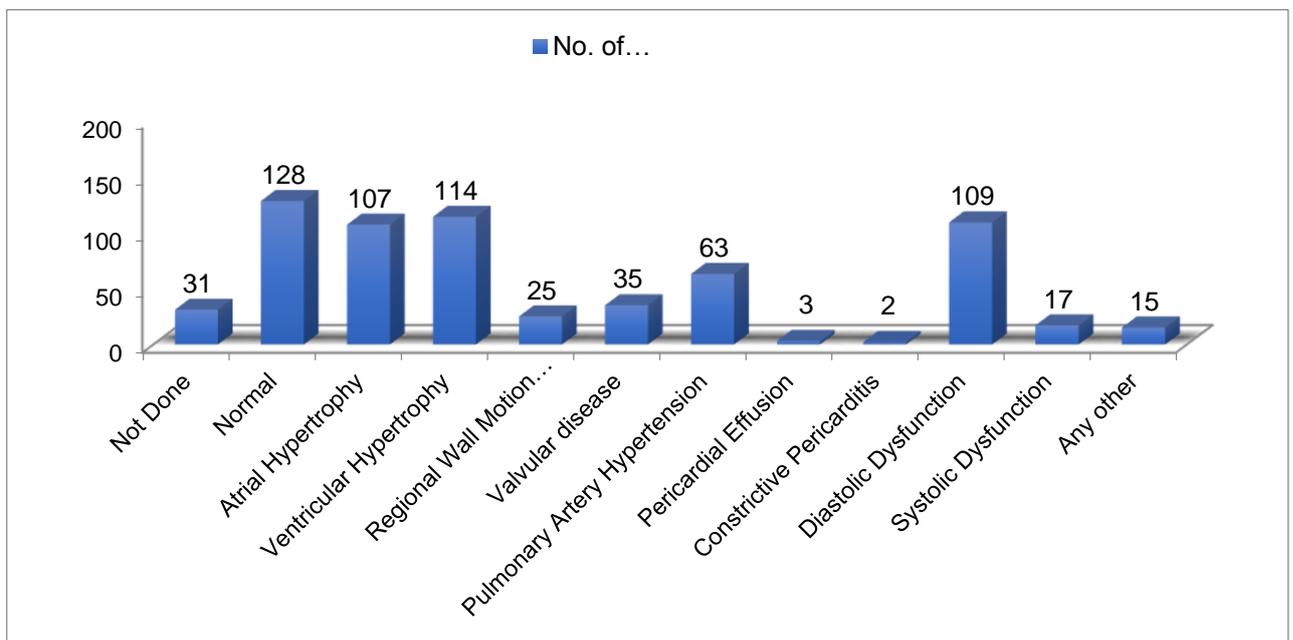
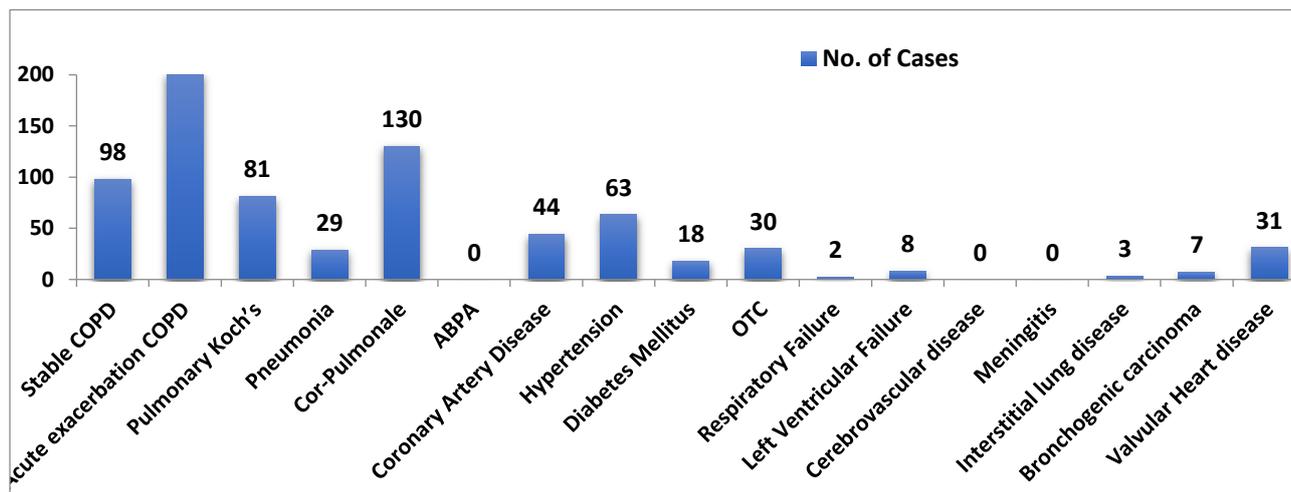


FIG. 3: BAR DIAGRAM SHOWING FINAL DIAGNOSIS

DISCUSSION AND CONCLUSIONS

The patients were investigated to confirm the diagnosis of COPD and to identify any cardiovascular morbidity associated with COPD in individual patients.

Diagnosis of cardiovascular comorbidity: The diagnosis of cardiovascular comorbidities was made on the basis of clinical examination of the cardiovascular system, electrocardiographic changes and echocardiography.

In the present study, in 289 (96.3%) cases, the cardiovascular system on examination was found out to be normal. In 7 (2.3%) cases murmur was heard and in only 2 (0.7%) cases S1 & S2 abnormality was detected. Also, the shift of apex was found in only 2 (0.7%) cases. As per GOLD guidelines, though an important part of patient care, but physical examination is rarely diagnostic in COPD¹.

Normally the apex impulse is located at or medial to the left midclavicular line in the fourth or fifth intercostal space. But in case of the ventricular hypertrophy the position of the apex beat shifts down, as in case of right ventricular hypertrophy or down and out, as in case of left ventricular hypertrophy. As per GOLD guidelines, detection of cardiac apex beat is often difficult because of pulmonary hyperinflation¹, so as in present study, only 2 patients were found to have shift of apex beat. Auscultation of the heart: may show signs of cor pulmonale, such as split of second sound (pulmonic), murmur of pulmonary or tricuspid insufficiency².

On electrocardiography, around 159 (53%) cases showed changes on ECG suggestive of presence of cardiovascular morbidity and in 141 (47%) cases ECG was found to be within normal limits. ECG showed changes suggestive of atrial hypertrophy (such as p-pulmonale or peaked p wave suggestive of right atrial hypertrophy) in 105 (35%) patients and ventricular hypertrophy (such as right axis deviation and R/S ratio in V5 or V6 ≤ 1) in 72 (24%) cases. 78 (26%) cases had sinus tachycardia on ECG and 55 (18.3%) had changes of coronary artery disease (such as poor progression of r-wave). 6 (2%) cases had arrhythmia and 3 (1%) had acute myocardial infarction changes on ECG. The results of this study were comparable to the study conducted by R L Aggarwal (2008), in which 50% cases showed ECG changes with 28.6% cases had sinus tachycardia, 35.7% had p-pulmonale indicative of right atrial hypertrophy and 35.7% cases had right axis deviation indicative of right ventricular hypertrophy⁴. In present study, only 6 (2%) cases showed features suggestive of arrhythmia on ECG while sinus tachycardia was present in around 26% of the cases. As per Scott R C et al, arrhythmias other than sinus tachycardia are uncommon in COPD⁵.

In addition, around 55 (18.3%) cases in present study showed features suggestive of coronary artery disease. Some of the cases had past history of CAD in the study and some were freshly diagnosed to have CAD. The high prevalence of CAD in our study subjects can be explained by the fact that some of the cases included in this study had multiple coexisting diseases such as pulmonary Koch's, diabetes mellitus, hypertension which serve as the risk factors for development of CAD; either in the past or currently diagnosed³.

On echocardiographic evaluation, 128 (42.6%) cases had normal echocardiographic parameters. 114 (38%) patients in this study had echocardiographic evidence of ventricular hypertrophy. 109 (36.3%) had echocardiographic evidence of left ventricular diastolic dysfunction. 107 (35.6%) patients had atrial hypertrophy and 35 (11.6%) patients had evidence of valvular heart disease. 25 (8.3%) patients had regional wall motion abnormality (RWMA) on echocardiography. 17 (5.6%) had evidence of left ventricular systolic dysfunction. 6 (2%) cases had evidence of pulmonary artery hypertension. Echocardiography showed pericardial effusion in 3 (1%) and constrictive Pericarditis in 2 (0.6 %) of the cases. Echocardiography was interpreted as normal in 128(42.6%) cases. In around 31 (10.3%)

cases echocardiography could not be done either because of unaffordability of the patients or in some cases with normal ECG. The features of atrial and ventricular hypertrophy are indicative of cor pulmonale. The results of present study were comparable to the study done by N K Gupta et al (2011), in which cor pulmonale was observed in 7/17 (41.17%) cases; 7.50% cases had left ventricle (LV) systolic dysfunction and 47.5% cases had evidence of LV diastolic dysfunction⁶. As per the above results, with the increase in the disease severity, incidence of cardiac involvement increased and more patients needed referral to the cardiac centre for further management. Also, the mortality rate increased with increase in the disease severity. So, there is significant correlation among the stage and outcome of the disease.

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