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Research Article

## CARDIAC MANIFESTATIONS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD)

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**Abstract:**

**OBJECTIVE:** To determine the cardiac manifestations in patients with chronic obstructive pulmonary disease (COPD) at tertiary care hospital Hyderabad.

**PATIENTS AND METHODS:** This six month cross sectional descriptive study was conducted from 01-July-2015 to 31 December 2015 in the department of cardiology at tertiary care hospital Hyderabad. All the patients with known COPD ( $\geq 2$  years duration), of  $\geq 40$  years of age, either gender were recruited and entered in the study. The inclusion criteria were patients with history of cough and expectoration of at least three months duration in two consecutive years, have history of shortness of breath for long time with or without cough. The COPD patients were studied through history, clinical examinations, imaging (chest X-ray), electrocardiographically and echocardiographically (for cardiac manifestations), relevant laboratory investigations and also by pulmonary function test (spirometry). The frequency and percentages was calculated while the mean  $\pm$ SD was computed for numerical variables.

**RESULTS:** During six months study period total fifty (50) patients with COPD were evaluated for cardiac events by X-ray, ECG and echocardiography. The mean age  $\pm$ SD of age (years) and duration of disease (years) for whole population was  $62.76 \pm 5.87$  and  $7.87 \pm 3.85$  while the majority of patients were belonged to rural population 32 (64%) and males 35 (70%) whereas the disease was considered as mild, moderate and severe in 14%, 50% and 36%. The common ECG findings observed were RAD 54%, P-pulmonale 52% and RVH 50% while the common echocardiographic findings observed were pulmonary hypertension 64%, cor-pulmonale 60% and right ventricular dilatation 54%.

**CONCLUSION:** ECG and echocardiography are better tools than clinical methods for detecting right ventricular dysfunction in COPD while the echocardiography is better than ECG in detecting the RV dysfunction in subjects with COPD.

**Keywords:** COPD, Cor-pulmonae, pulmonary hypertension and Right ventricular dysfunction.

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**INTRODUCTION:**

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of morbidity and mortality worldwide and majority of the patients suffer for years and die prematurely due to its complications. [1,2] The disease is currently 4<sup>th</sup> leading cause of mortality in the world and accounts for substantial number of visits to general health care provider, emergency wards, hospitalizations and absence from work due to sick leave.[3,4] COPD is characterized by slowly progressive air flow obstruction, shortness of breath and exercise intolerance and ultimately leads to pulmonary arterial hypertension and other cardiovascular events. [5,6] Right ventricular (RV) abnormalities are common in subjects with COPD especially those with low oxygen saturation and occurred in approximately 50% of the patients having moderate to severe COPD and portends a higher mortality rate while its detection and management may lead to good survival and improved quality of life.[7-9] Thus, this study was designed to study the electrocardiographic and echocardiographic alterations in patients with COPD in terms of risk factor and severity assessed clinically and through pulmonary function testing so that the patients can be detected at an earlier stage of the disease because early recognition and treatment of right ventricular dysfunction leads to improved quality of life with prolonged survival.

**PATIENTS AND METHODS:**

This six month cross sectional descriptive study was conducted from 01-July-2015 to 31 December 2015 in the department of cardiology at tertiary care hospital Hyderabad. All the patients with known COPD ( $\geq 2$  years duration), of  $\geq 40$  years of age, either gender were recruited and entered in the study. The inclusion criteria were patients with history of cough and expectoration of at least three months duration in two consecutive years, have history of shortness of

breath for long time with or without cough while the exclusion criteria were the patients with existing other lung pathologies like asthma, bronchiectasis, tuberculosis and restrictive lung, patients with ischemic heart disease and hypertension, malignancy, connective tissue disorders and pregnant ladies. The COPD patients were studied through history, clinical examinations, imaging (chest X-ray), electrocardiographically and echocardiographically (for cardiac manifestations or complications), laboratory investigations and also by pulmonary function test (spirometry). Patients were recruited for the study after obtaining their informed consent. The patients had cough with expectoration for greater than three months duration for two consecutive years with or without shortness of breath were considered as predominant chronic bronchitis while the patients with exertional dyspnea for long duration had minimal productive cough with small quantity of mucoid sputum were considered as predominant emphysema whereas combination of mentioned symptoms were considered as mixed pattern, or emphysema-bronchitis complex. The severity of COPD was assessed according to British Thoracic Society guidelines mild: FEV1 60-79% of predicted, moderate: FEV1, 40-59% of predicted and severe: FEV1 < 40% of predicted. The data was saved on pre-designed proforma and analyzed in SPSS 16. The frequency and percentages was calculated while the mean  $\pm$ SD was computed for numerical variables.

**RESULTS:**

During six months study period total fifty (50) patients with COPD were evaluated for cardiac events by X-ray, ECG and echocardiography. The mean age  $\pm$ SD of age (years) and duration of disease (years) for whole population was  $62.76 \pm 5.87$  and  $7.87 \pm 3.85$  while the majority of patients were belonged to rural population 32 (64%). The results are presented in Table 01 and 02.

TABLE 01: THE DEMOGRAPHICAL AND CLINICAL PARAMETERS OF STUDY POPULATION

PARAMETER	N =50	PERCENTAGE (%)
<b>Age (years)</b>		
40-49	05	10
50-59	10	20
60-69	22	44
70 +	13	26
<b>GENDER</b>		
Male	35	70
Female	15	30
<b>DURATION OF DISEASE (years)</b>		
2-3	12	24
4-5	18	36
>5	20	40
<b>SEVERITY OF DISEASE</b>		
Mild	07	14
Moderate	25	50
Severe	18	36
<b>SMOKING</b>		
Yes	40	80
No	10	20
<b>SYMPTOMS</b>		
Cough with sputum	21	42
Shortness of breath	28	56
Edema	12	24
Fever and weight loss	10	20
<b>SIGNS</b>		
Cyanosis	20	40
Flapping tremor	18	36
Tachypnoea	25	50
Parasternal heave	10	20
Loud P2	12	24

TABLE 02: THE IMAGING STUDY OF THE POPULATION

INVESTIGATIONS	N=50	PERCENTAGE (%)
<b>ELECTROCARDIOGRAPH FINDINGS</b>		
P-pulmonale	26	52
Low voltage complex	16	32
Right axis deviation	27	54
Poor R wave progression	18	36
Incomplete RBBB	07	14
Right ventricular hypertrophy (RVH)	25	50
<b>ECHOCARDIOGRAPHIC FINDINGS</b>		
Right atrial dilatation	22	44
Right ventricular dilatation	27	54
Right ventricular wall hypertrophy	17	34
Right ventricular failure	10	20
Abnormal septal motion	12	24
Cor-pulmonale	30	60
Pulmonary hypertension	32	64
<b>CHEST RADIOGRAPH (X-RAY)</b>		
Emphysema	42	84
Increased broncho-vascular markings	37	74
Prominent right descending pulmonary artery	18	36

**DISCUSSION:**

Chronic obstructive pulmonary disease is one of leading cause of chronic morbidity and mortality world wide. In this study males occupied 35 (70%) of the study population. This higher incidence attributed because of smoking. In current series six (12%) females were smokers and all of them also had history of cooking with dried wood fuel or dried cow dung. The majority of COPD patients were in the age group of 60-69 years (22 patients) while the overall mean age  $\pm$ SD was 63.85 $\pm$ 12.53 years, the findings regarding age and gender are consistent with former studies.[10-14]. The old age patients admitted because of the longer duration of tobacco exposure and repeated respiratory tract infections that impair their quality of life. The mean duration for shortness of breath and cough in present study was 5.22 years while in the study by Gupta, et al and Banergera JC, et al the mean duration of symptoms was 9.8 $\pm$ 5.2 and 5.42 $\pm$ 3.97 years respectively. [15, 16] Breathlessness is the symptom that commonly causes the patient to get medical health services and is usually the most disabling symptoms. Close questioning usually regarding smoking with scanty mucoid sputum usually in the morning for many years. [17, 18] In

current study, most of the patients had tachypnea on presentation, had signs of hyperinflation, and also decrease breath sounds with prolonged phase of expiration. The clinical signs of cor-pulmonale and pulmonary hypertension are usually found in the advanced cases due to the lungs hyperinflation while most of the patient had X-ray evidence of emphysema i.e. signs of hyperinflation like low flat diaphragm, hypertranslucency, the observations are consistent with the former studies. [19-21] The RVH on ECG was found in 25 (50%) patients and the similar finding was reported by Kolb TM, et al and Gupta, NK et al. [22, 23] The p-pulmonale has been used as an indirect evidence of RVH by various studies. [24, 25] Its occurrence largely due to positional and partly hemodynamic alterations but it cannot be designated an unequivocal criterion for RVH. [26] In the present study, seven (14%) patients had incomplete RBBB, the presence of RBBB is usually due to coronary disease but RVH is also found in persons without cardiac disorders. The arrhythmias (usually transient and supraventricular) are occasionally detected during acute exacerbations of the COPD and are relieved once hypoxia monitored and corrected. [27] In the present study, 30

(60%) patients had echocardiographic evidence of cor pulmonale, comprising of right ventricular dilatation and hypertrophy, right atrial dilatation or evidence of right ventricular failure, or abnormal septal motion abnormality. The findings of present study correlate well with most of the findings of the study by Himelmann RB, et al. [28] In present study 12 (24%) patients had echocardiographic evidence of interventricular motion abnormality in the shape of systolic bowing or paradoxical movement into the left ventricle, the sign of systolic over load of right ventricle. In a study by Danchin N, et al three patients (8%) had paradoxical motion of the interventricular septum. [29]

### CONCLUSION:

The COPD is a disease more common in males during the 5th and 6th decade. Majority of the subjects have advanced disease at presentation. ECG and echocardiography are better tools than clinical methods for detecting right ventricular dysfunction in COPD while the echocardiography is better than ECG in detecting the RV dysfunction in subjects with COPD.

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