

ORIGINAL RESEARCH

Assessment of association between echocardiographic findings in COPD patients & its severity

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ABSTRACT

Background: Cardiovascular disease accounts for significant morbidity and mortality in chronic obstructive pulmonary disease. The present study was conducted to assess association between echocardiographic findings in COPD patients and its severity. **Materials & Methods:** 86 COPD patients of both genders were diagnosed clinically as having COPD with confirmation by spirometry. Pulmonary function tests were done in all patients and they were graded according to the severity of COPD with guidelines given by Global initiative for Obstructive Lung Disease (GOLD). Chest x-ray, twelve lead electrocardiogram, and 2-D Echo were done to evaluate the severity of RV dysfunction. **Results:** Out of 86 patients, males were 56 and females were 30. Symptoms were breathlessness in 70, cough with sputum in 54, fever in 48, swelling of feet in 32 and decreased urinary output in 15. Signs were raised JVP in 62, tachypnea in 56, Loud P2 in 43, ascites in 17, pedal edema in 21 and cyanosis in 30 cases. The difference was significant ($P < 0.05$). ECG findings were Cor pulmonale (42), LVDD (30), RVH (21), PAH (18), RA/RV dilatation (15), RVSD (12) and LVH (10). There was significant association between echocardiographic findings with severity of COPD ($P < 0.05$). **Conclusion:** High occurrence of cardiac co morbidities such as PAH, RV dysfunction and LV dysfunction accompanied COPD patients.

Key words: Cardiovascular disease, chronic obstructive pulmonary disease, ascites

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INTRODUCTION

The COPD, defined by GOLD as a preventable and treatable disease with significant extrapulmonary effects, is a common clinical entity in clinical practice.¹ The COPD is one of the leading causes of death and disability worldwide.² According to World Bank data, it has moved from its status in 2000 as the 4th and 12th most frequent cause of mortality and morbidity, respectively, to the 3rd and 5th leading cause of mortality and morbidity, respectively.³

Cardiovascular disease accounts for significant morbidity and mortality in chronic obstructive pulmonary disease (COPD). Its prevalence and mechanisms of association have not been elucidated.^{4,5} Chronic obstructive pulmonary disease (COPD) includes emphysema, an anatomically defined condition characterized by destruction and enlargement of the lung alveoli; chronic bronchitis, a clinically defined condition with chronic cough and phlegm; and small airway disease, a condition in which small bronchioles are narrowed.⁶ COPD is a

powerful and independent risk factor for cardiovascular morbidity and mortality which includes right ventricular (RV) dysfunction and cor pulmonale secondary to pulmonary arterial hypertension (PAH), left ventricular dysfunction. Echocardiography provides a rapid, non-invasive, portable, and accurate method to evaluate cardiac functions.⁷ The present study was conducted to assess association between echocardiographic findings in COPD patients and its severity.

MATERIALS & METHODS

The present study consisted of 86 COPD patients of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were diagnosed clinically as having COPD with confirmation by spirometry. A detailed clinical examination was carried out. Symptoms such as breathlessness, cough, nature and diurnal variation of expectoration and severity of breathlessness was

recorded. Pulmonary function tests were done in all patients and they were graded according to the severity of COPD with guidelines given by Global initiative for Obstructive Lung Disease (GOLD). Chest x-ray, twelve lead electrocardiogram, and 2-D

Echo were done to evaluate the severity of RV dysfunction. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I: Distribution of patients

Total- 86		
Gender	Males	Females
Number	56	30

Table I shows that out of 86 patients, males were 56 and females were 30.

Table II: Clinical presentation

Parameters	Variables	Number	P value
Symptoms	Breathlessness	70	0.05
	Cough with sputum	54	
	Fever	48	
	Swelling of feet	32	
	Decreased urinary output	15	
Signs	Raised JVP	62	0.91
	Tachypnea	56	
	Loud P2	43	
	Ascites	17	
	Pedal edema	21	
	Cyanosis	30	

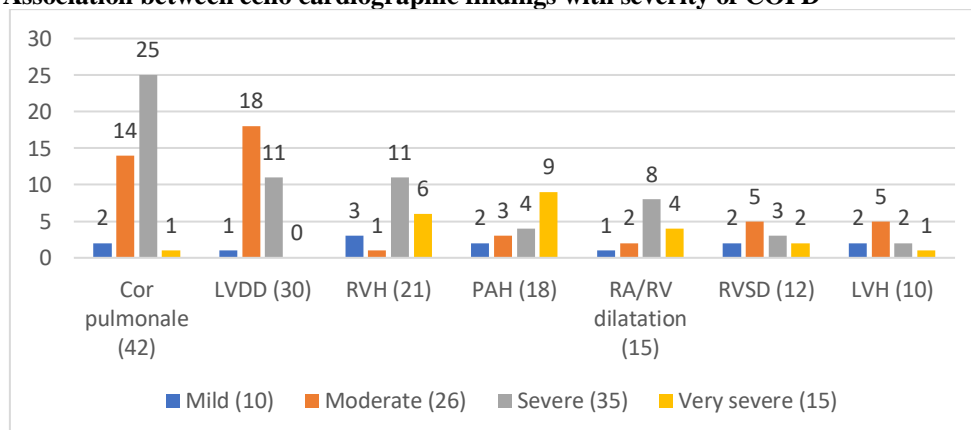
Table II shows that symptoms were breathlessness in 70, cough with sputum in 54, fever in 48, swelling of feet in 32 and decreased urinary output in 15. Signs were raised JVP in 62, tachypnea in 56, Loud P2 in 43, ascites in 17, pedal edema in 21 and cyanosis in 30 cases. The difference was significant (P< 0.05).

Table III: Association between echocardiographic findings with severity of COPD

ECG findings	Mild (10)	Moderate (26)	Severe (35)	Very severe (15)	P value
Cor pulmonale (42)	2	14	25	1	0.05
LVDD (30)	1	18	11	0	0.02
RVH (21)	3	1	11	6	0.04
PAH (18)	2	3	4	9	0.03
RA/RV dilatation (15)	1	2	8	4	0.05
RVSD (12)	2	5	3	2	0.94
LVH (10)	2	5	2	1	0.85

Table III, graph I shows that ECG findings were Cor pulmonale (42), LVDD (30), RVH (21), PAH (18), RA/RV dilatation (15), RVSD (12) and LVH (10). There was significant association between echocardiographic findings with severity of COPD (P< 0.05).

Graph I: Association between echo cardiographic findings with severity of COPD



DISCUSSION

The COPD is associated with significant extrapulmonary (systemic) effects among which cardiac manifestations are the most common.⁸ Cardiovascular disease accounts for approximately 50% of all hospitalisation and nearly one third of all deaths, if predicted FEV1 (Forced expiratory volume in 1st second) is less than 50%.⁹ In more advanced cases, cardiovascular disease accounts for 20-25% of all deaths in COPD. The COPD affects pulmonary blood vessels, right ventricle, as well as left ventricle leading to development of pulmonary hypertension, cor pulmonale, right ventricular dysfunction and left ventricular dysfunction too.¹⁰ Echocardiography provides a rapid, non-invasive portable and correct method to evaluate the right ventricle function, right ventricular filling pressure, tricuspid regurgitation, left ventricular function and valvular function.¹¹ The present study was conducted to assess association between echocardiographic findings in COPD patients and its severity.

We found that out of 86 patients, males were 56 and females were 30. Kabir et al¹² found out the echocardiography changes in COPD patients and to assess right ventricular (RV) dysfunction by echocardiography and correlate with the disease severity. Regarding symptoms, majority 65 (92.9%) patients had breathlessness, 58 (82.9%) had cough with sputum, 25 (35.7%) had swelling of feet. Regarding signs, 68 (97.1%) patients had tachypnea, 24 (34.3%) had raised JVP, 23 (32.9%) had loud P2 suggestive of pulmonary arterial hypertension. Regarding echocardiographic findings, 42 (60.0%) patients had Cor pulmonale, 32 (45.7%) had LVDD, 31 (44.3%) had RVH, 30 (42.9%) had PAH, 29 (41.4%) patients had RA/RV dilation, 11 (15.7%) had RVSD and 9 (12.9%) had LVH. Table 08 shows RA/RV dilation, RVH, Cor pulmonale, PAH and LVDD.

We found that symptoms were breathlessness in 70, cough with sputum in 54, fever in 48, swelling of feet in 32 and decreased urinary output in 15. Signs were raised JVP in 62, tachypnea in 56, Loud P2 in 43, ascites in 17, pedal edema in 21 and cyanosis in 30 cases. Das et al¹³ in their study a total of 86 (male-65, female-21) consecutive stable and ambulatory IHD patients were selected. Associated COPD was found in 51.2% (n = 44) patients of the study group (males-36, females-8) according to GOLD criteria; 90.9% of cases of COPD had moderate to severe disease. This was much higher than the prevalence of COPD among general population. A positive correlation was found between severity of COPD and impaired left ventricular ejection fraction (EF). This study also shows that general perception about COPD is poor among patients and their physicians. Most of the COPD cases (81.8%) of IHD were newly detected in this study by spirometric evaluation. Use of inhaled bronchodilator among the previously diagnosed cases is also very low (15.9%). Awareness regarding

coexistence of the two diseases may be helpful in management and reduction of mortality and morbidity of COPD in IHD.

We found that ECG findings were Cor pulmonale (42), LVDD (30), RVH (21), PAH (18), RA/RV dilatation (15), RVSD (12) and LVH (10). There was significant association between echocardiographic findings with severity of COPD (P< 0.05). Kulkarni¹⁴ assessed the cardiac, right and left ventricular changes in subjects with increasing COPD severity. All the patients diagnosed with COPD (using GOLD criteria) were included in study and assessed for right and left ventricular changes. Out of 60 patients, 58 were males and two were females, with mean age being 64.71±28.28 years. Among the study population, 45 (75%) patients had one or the other cardiac condition. Cardiac changes included left ventricular diastolic dysfunction (58.3%), right ventricular dilatation (33.3%), right ventricular hypertrophy, right atrial dilation, tricuspid regurgitation and pulmonary hypertension and left heart changes included left ventricular hypertrophy.

The limitation the study is small sample size.

CONCLUSION

Authors found that high occurrence of cardiac comorbidities such as PAH, RV dysfunction and LV dysfunction accompanied COPD patients.

REFERENCES

1. Kaushal M, Shah PS, Shah AD, Francis SA, Patel NV, Kothari KK. Chronic obstructive pulmonary disease and cardiac comorbidities: A cross-sectional study. *Lung India*. 2016;33:404-09.
2. Gupta NK, Agrawal RK, Srivastav AB, Ved ML. Echocardiographic evaluation of heart in chronic obstructive pulmonary disease patient and its correlation with the severity of disease. *Lung India*. 2011;28:105-09.
3. Murphy ML, Adamson J, Hutcheson F. Left ventricular hypertrophy in patients with chronic bronchitis and emphysema. *Ann Intern Med*. 1974;81:307-13.
4. Fluck DC, Chandrasekar RG, Gardner FV. Left ventricular hypertrophy in chronic bronchitis. *Br Heart J*. 1966;28:92-97.
5. Holtzman D, Aronow WS, Mellana WM, Sharma M, Mehta N, Lim J, et al. Electrocardiographic abnormalities in patients with severe versus mild or moderate chronic obstructive pulmonary disease followed in an academic outpatient pulmonary clinic: ECG in COPD. *Ann Non-invasive Electrocardiol*. 2011;16(1):30-32.
6. Dave L, Dwivedi P, Srivastava N, Yadav BS, Dohre R. A study of cardiovascular manifestations of COPD. *Int J Res Health Sci*. 2014;2(3):812-17.
7. Jatav VS, Meena SR, Jelia S, Jain P, Ajmera D, Agarwal V, et al. Echocardiographic findings in chronic obstructive pulmonary disease and correlation of right ventricular dysfunction with disease severity. *Int J Adv Med*. 2017;4:476-80.
8. Kabir MA, Haque SD, Baker A, Alam MK, Rahman SA. Study on association between echocardiographic findings in COPD patients with severity of COPD. *Mediscope*. 2020;7(1):44-50.

9. Pothal SS, Dani P, Manjhi R, Dutta P, Behera BS, Behera A. Correlation between chronic obstructive pulmonary disease and cardiovascular abnormality: A cross-sectional study. *J Clin Diag Res.* 2018;12(8):17-21.
10. Premananth P, Deiveegan C, Nagarajan N, Gnanasekaran R. COPD severity and right heart status among patients attending a tertiary care hospital in Madurai, Tamilnadu. *Indian J Immunol Respir Med.* 2019;4(4):239-44.
11. Kumar H, Verma A, Pandey A, Srivastava U, Pandey M, Chaudhary R, et al. Echocardiographic evaluation of stable J Clin Diag Res (COPD) patients. *J Assoc Chest Physicians.* 2020;8:88-91.
12. Kabir MA, Haque SD, Baker A, Alam MK, Rahman SA. Study on association between echocardiographic findings in COPD patients with severity of COPD. *Mediscope.* 2020 May 17;7(1):44-50.
13. Das S, Mukherjee S, Kundu S, Mukherjee D, Ghoshal AG, Paul D. Presence and severity of COPD among patients attending cardiology OPD of a tertiary healthcare centre. *Journal of the Indian Medical Association.* 2010 Jul 1;108(7):406-9.
14. Kulkarni KD, MaheSh P. Left Ventricular and Right Ventricular Functional Changes in Cases of COPD and its Correlation with Severity-A Cross-sectional Study. *Journal of Clinical & Diagnostic Research.* 2022 Jan 1;16(1).