Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 833-838| ISSN:2251-6727

Assessment of Echocardiographic Abnormalities in Chronic Obstructive Lung Disease (Copd) And Its Correlation with Global Initiative for Obstructive Lung Diseases (Gold Criteria) Among Patients Attending in A Tertiary Care Hospital Chennai

[1]Dr. Dhayalnithi K, [2]Dr. Ghanshyam Verma

[1]Junior Resident. Department Of Respiratory Medicine, Sree Balaji Medical College And Hospital , Chromepet , Chennai – 44.

Email Id : Dhayalnithi@Gmail.Com

[2]Professor. Department Of Respiratory Medicine, Sree Balaji Medical College And Hospital , Chromepet , Chennai – 44.

(Received: 16 September 2024 Revised: 11 October 2024 Accepted: 04 November 2024)

KEYWORDS

frequency, echocardiographic (ECHO), cross-sectional study, echocardiography

ABSTRACT:

Objectives: This study aimed to evaluate the frequency and types of 2D echocardiographic (ECHO) abnormalities in patients with chronic obstructive pulmonary disease (COPD) and to examine the correlation between these abnormalities and disease severity based on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria.

Methods: A three-year cross-sectional study was conducted at Sree Balaji Medical College and Hospital, Chennai, involving 67 COPD patients aged 18 and above, without prior cardiac conditions. Data collection included echocardiography, spirometry, and chest X-rays. Parameters such as demographic details, smoking status, lung function (FEV1), Modified Medical Research Council (MMRC) scores, COPD Assessment Test (CAT) scores, disease severity (GOLD criteria), and comorbidities were recorded. Statistical analysis used Pearson's correlation and chi-square tests, conducted via SPSS version 24.

Results: The mean age was 52.46 years, with 80.9% male participants. Predominant occupations included farmers (14.7%), bus conductors (10.3%), and drivers (10.3%). Smoking habits revealed 36.8% smokers and 63.2% non-smokers. Lung function assessment showed 76.5% with moderate obstruction ($50\% \leq FEV1 < 80\%$). GOLD staging classified 72.1% as moderate COPD, while 14.7% were severe. Comorbidities included diabetes (17.6%) and cardiovascular disease (11.8%). Significant correlations were found between smoking status, comorbid conditions, and COPD severity ($p=0.000$). Differences in ERV, RV, and FVC among severity groups were statistically significant ($p < 0.05$).

Conclusions: A significant relationship exists between 2D ECHO abnormalities and COPD severity. The findings highlight the need for thorough cardiovascular assessments in COPD patients, emphasizing the importance of tailored interventions to mitigate cardiovascular risks and improve clinical outcomes.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a common and progressive lung condition characterized by symptoms such as breathlessness, chronic cough, and sputum production. These symptoms are due to long-term airflow limitation caused by changes in the airways, including bronchitis, bronchiolitis, and damage to the alveoli, like emphysema. COPD is a leading cause of illness and death worldwide, affecting millions of people. (1)

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 833-838| ISSN:2251-6727

The diagnosis of COPD is typically confirmed with spirometry, which measures airflow restriction. COPD involves two main conditions: emphysema, which affects the air sacs, and chronic bronchitis, which impacts the airways [(2)] Smoking remains the most significant risk factor, although not all smokers develop COPD, and other factors such as indoor air pollution can contribute to the disease. [(3)]

The underlying cause of COPD is thought to be chronic inflammation in the lungs, which may not always respond well to standard corticosteroid treatment. [(4)] Additionally, COPD often includes exacerbations triggered by infections, which can worsen the disease outlook. The management of stable COPD primarily involves inhaled long-acting bronchodilators, while corticosteroids are used in patients with overlapping asthma symptoms. However, there are no medications that can completely halt the progression of COPD, making smoking cessation the most effective strategy for slowing disease advancement.[(5)]

Material methods

This prospective observational study was conducted over 3 years at Sree Balaji Medical College and Hospital, Chennai, focusing on patients diagnosed with Chronic Obstructive Pulmonary Disease (COPD) who attended the Respiratory Medicine Outpatient Department (OPD). The study aimed to explore the association between COPD severity and echocardiographic (ECHO) abnormalities.

Participants were selected based on specific inclusion and exclusion criteria. Eligible patients were adults aged 18 years and above, without any known cardiac conditions, capable of undergoing ECHO evaluation, and willing to provide informed consent. Patients with pre-existing cardiac conditions unrelated to COPD, those who were hemodynamically unstable, or individuals with other significant chronic cardiac or pulmonary comorbidities were excluded. A sample size of 67 was determined using a standard formula considering a 95% confidence interval and an estimated prevalence of ECHO abnormalities of 4.3%. Purposive sampling was employed for patient selection.

Data collection involved a comprehensive assessment, beginning with demographic details, clinical history, smoking habits, and any comorbid conditions. Each participant underwent a standard 12-lead electrocardiogram (ECG) and a chest X-ray to identify any potential cardiac or pulmonary abnormalities. Lung function was evaluated using spirometry, where a forced expiratory volume in one second (FEV1) to forced vital capacity (FVC) ratio of 70% or lower was used to classify the severity of COPD according to the GOLD criteria. Echocardiographic assessments included detailed evaluations of cardiac structure and function, such as measurements of left and right ventricular function, the size of the atria, valvular integrity, and the presence of any abnormalities in the pericardium or aorta.

Data were initially inputted into Epi Data software and later transferred to Microsoft Excel for analysis. Statistical analysis was conducted using SPSS version 24, with descriptive statistics employed to summarize demographic characteristics, ECHO findings, and COPD severity. Associations between ECHO abnormalities and the severity of COPD were examined using Pearson's correlation, chi-square tests, and ANOVA. Multivariate analysis was conducted to adjust for confounding factors, including age, gender, smoking status, and comorbidities, ensuring the robustness of the study findings.

Result

Table 1: Patient Demographics and Clinical Characteristics

Category	Details	Number of Patients	Percentage (%)
Gender Distribution	Males	55	80.9
	Females	12	19.1
Age Distribution	Mean Age	52.46 years	
	Median Age	53 years	

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 833-838| ISSN:2251-6727

Category	Details	Number of Patients	Percentage (%)
	Standard Deviation	6.964 years	
	Age Range	34 to 69 years	
Occupation Distribution	Farmer	10	14.7
	Bus Conductor	7	10.3
	Driver	7	10.3
	Security Personnel	7	10.3
	Housewife	6	8.8
	Salesperson	4	5.9
	Other Professions	1	1.5 each
Smoking History	Smokers	24	36.8
	Non-Smokers	43	63.2
Lung Function by FEV1	Normal Function (≥80% FEV1)	6	8.8
	Mild to Moderate Obstruction (50% ≤ FEV1 < 80%)	51	76.5
	Significant Impairment (30% ≤ FEV1 < 50%)	8	11.8
	Severely Impaired (<30% FEV1)	2	3
CAT Scores	Low Impact (0-9)	2	7.3
	Medium Impact (10-20)	7	10.3
	High Impact (21-30)	33	48.5
	Very High Impact (31-40)	25	36.8
COPD Severity (GOLD)	Mild (GOLD 1)	7	11.4
	Moderate (GOLD 2)	49	72.1
	Severe (GOLD 3)	10	14.7
	Very Severe (GOLD 4)	1	1.5
Comorbidities	No Comorbidities	46	67.6
	Diabetes	12	17.6
	Cardiovascular Disease	7	11.8
	Hypertension	2	2.9

Table 2: Association Between Clinical Factors and COPD Severity

Factor	Association with COPD Severity	p-value
Gender	No significant difference in COPD severity across genders	0.547
Smoking Status	Significant association with COPD severity	0.000
Comorbidity	Significant association with COPD severity	0.000

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 833-838| ISSN:2251-6727

Factor	Association with COPD Severity	p-value
Left Ventricular End-Diastolic Diameter (LVEDD)	Significant difference across severity groups	0.001
Left Ventricular Atrial Dimension (LAD)	No significant difference	0.287
Left Ventricular Ejection Fraction (LVEF)	No statistically significant difference	0.082
Interventricular Septum (IVS)	Statistically significant variation	0.037
Right Ventricular End-Diastolic Dimension (RVEDD)	Highly significant difference across severity levels	<0.001
Right Atrial Dimension (RAD)	No significant difference	0.259
FEV1 (L)	Significant difference among COPD severity levels	<0.001
SPAP (Systolic Pulmonary Artery Pressure)	No significant difference among severity groups	-

Table 3: Correlation Between Cardiac Parameters and Pulmonary Indices

Cardiac Parameter	Correlation with Pulmonary Indices	Correlation Coefficient
LVEDD (Left Ventricular End-Diastolic Diameter)	Correlation with ERV (Expiratory Reserve Volume)	0.153
LAD (Left Atrial Dimension)	Correlation with IVS (Interventricular Septum)	0.975
RVEDD (Right Ventricular End-Diastolic Diameter)	Correlation with IVS and pulmonary volumes	Mild positive correlations
RAD (Right Atrial Dimension)	Correlation with IVS and pulmonary volumes	Mild positive correlations

Table 4: ANOVA Analysis of CRP and FEV1 Across Groups

Parameter	Sum of Squares (Between Groups)	Degrees of Freedom (df)	Mean Square	Fisher's F Distribution	Significance (p-value)
CRP	108.910	23	4.950	1.404	0.166
FEV1	6958.312	23	316.287	8.993	0.000

Discussion

The male predominance (80.9%) observed in this study aligns with findings from both global and Indian studies. The higher prevalence of COPD in males is often attributed to greater exposure to risk factors such as smoking and occupational hazards. Research by Halbert et al. (2006) [6] supports this observation, with the latter noting that men have historically been more exposed to these risk factors. However, there is a growing trend of increased COPD prevalence in women, especially in developed countries where smoking rates are on the rise. This shift calls for gender-specific strategies in the management and prevention of COPD.

The mean age of 52.46 years in this study is consistent with findings from Indian studies, such as those by

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(6), 833-838| ISSN:2251-6727

Salvi and Agrawal (2012), [7] and global studies like Mannino et al. (2002) [8]. These studies have shown that COPD prevalence increases with age, particularly among individuals aged over 40. This age-related trend necessitates targeted screening and management interventions for middle-aged and elderly populations to mitigate disease progression and improve outcomes.

The study identifies occupations such as farming, bus conducting, and driving as prevalent among COPD patients. These occupations are known for their association with environmental and occupational exposures to dust and pollutants, which are significant risk factors for the development of COPD. Celli BR, (2023) [9] also emphasized these risks, with findings supporting the need for improved occupational health policies to reduce exposure to harmful agents in the workplace.

Smoking is a known primary risk factor for COPD, and in this study, 36.8% of the patients were smokers. This is consistent with research by Ray et al. (2012) [10] and Fletcher and Peto (1977) [11], which found a strong correlation between smoking and the development of COPD. Furthermore, lung function, as measured by FEV1, showed that a large proportion of patients had moderate obstruction ($50\% \leq FEV1 < 80\%$), which is also in line with findings from Indian studies, such as the one by Decramer et al. (2005) [12]. Early diagnosis through spirometry and smoking cessation programs are critical to controlling the progression of COPD.

Most patients (72.1%) had moderate COPD, according to the GOLD criteria, which is consistent with other Indian studies such as Singh et al. (2014) [13]. The study also showed a significant association between COPD severity and several clinical factors, including smoking, comorbidities, and cardiac parameters such as Left Ventricular End-Diastolic Diameter (LVEDD) and Right Ventricular End-Diastolic Dimension (RVEDD). These findings highlight the importance of considering cardiovascular health in COPD management, as both conditions often coexist and exacerbate each other.

A significant number of COPD patients in this study had comorbidities, with diabetes and cardiovascular diseases being the most common. This pattern is well-documented in Indian research, such as the CORD study, which found a high prevalence of comorbidities like diabetes and cardiovascular diseases among COPD patients. This further emphasizes the need for integrated care models that address both pulmonary and cardiovascular health to optimize treatment outcomes for COPD patients.

The study found significant differences in certain cardiac parameters (such as RVEDD) across COPD severity groups, indicating a possible link between right ventricular dysfunction and COPD progression. These findings are consistent with studies like those by Gupta et al. (2013) [14] and MacNee (2005) [15], which discuss the cardiovascular complications associated with COPD. Given the interplay between respiratory and cardiac systems, managing COPD should not only focus on lung function but also on cardiovascular health.

The analysis of CRP levels and FEV1 across COPD severity groups showed no significant correlation with CRP levels, while FEV1 was significantly different across severity levels. This reinforces the importance of FEV1 as a critical measure of lung function in COPD, as shown in studies by Rabe et al. (2007) [16]. The lack of significant correlation with CRP suggests that inflammation, while important in COPD, may not always correlate directly with disease severity, and further research is needed to explore this relationship.

The findings of this study underscore the need for improved public health strategies for COPD prevention and management in India. Efforts should focus on early screening, particularly for high-risk groups such as smokers and individuals with occupational exposures. Occupational health regulations must be strengthened, and protective equipment should be provided to reduce exposure to dust and harmful chemicals. Smoking cessation programs are crucial, as smoking remains the most significant risk factor for COPD. Additionally, integrated care approaches that address both pulmonary and cardiovascular health are necessary to optimize outcomes for COPD patients.

Conclusion

This study underscores the significant relationship between echocardiographic abnormalities and the severity of chronic obstructive pulmonary disease (COPD) as classified by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria. The results highlight that cardiovascular involvement,

as identified through 2D echocardiography, is prevalent in COPD patients, particularly as the disease progresses. The strong correlation between COPD severity, smoking status, and comorbid conditions such as diabetes and cardiovascular disease emphasizes the need for comprehensive cardiovascular evaluations in this patient population. Given the heightened risk of cardiovascular complications in COPD patients, timely and targeted interventions are crucial to manage both respiratory and cardiovascular health, ultimately improving patient outcomes. This study contributes to a deeper understanding of the cardiovascular implications of COPD and reinforces the importance of a multidisciplinary approach in the management of these patients.

Reference

1. Global Initiative for Chronic Obstructive Lung Disease (GOLD). 2023 Report. "Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease." Available at: https://goldcopd.org/2023-gold-report-2/
2. Rabe, Klaus F., et al. (2007). "Global Strategy for the Diagnosis, Management, and Prevention of COPD—2006 Update." American Journal of Respiratory and Critical Care Medicine, vol. 176, no. 6, pp. 532-555. DOI: 10.1164/rccm.200703-456SO.
3. Barnes, Peter J., et al. (2003). "Chronic Obstructive Pulmonary Disease: Molecular and Cellular Mechanisms." European Respiratory Journal, vol. 22, no. 4, pp. 672-688. DOI: 10.1183/09031936.03.00040703.
4. Vestbo, Jørgen, et al. (2013). "Global Strategy for the Diagnosis, Management, and Prevention of Chronic Obstructive Pulmonary Disease: GOLD Executive Summary." American Journal of Respiratory and Critical Care Medicine, vol. 187, no. 4, pp. 347-365. DOI: 10.1164/rccm.201204-0596PP.
5. Barnes, Peter J. (2008). "The Role of Inflammation and Anti-Inflammatory Treatment in COPD." European Respiratory Journal, vol. 32, no. 5, pp. 1219-1236. DOI: 10.1183/09031936.00171307.
6. Halbert RJ, Natoli JL, Gano A, Badamgarav E, Buist AS, Mannino DM. Global burden of COPD: systematic review and meta-analysis. Eur Respir J. 2006 Sep;28(3):523-32.
7. Salvi SS, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. Lancet. 2009;374(9691):733-743.
8. Mannino DM, Buist AS. Global burden of COPD: risk factors, prevalence, and future trends. Lancet. 2007 Sep 1;370(9589):765-73.
9. Celli BR, MacNee W, ATS/ERS Task Force. Standards for the diagnosis and treatment of patients with COPD: a summary of the ATS/ERS position paper. Eur Respir J. 2004 Jun;23(6):932-46.
10. Ray D, Abel R, Selvaraj KG, Sridharan G, John KR. A 5-year prospective epidemiological study of chronic obstructive pulmonary disease in rural south India. Indian J Med Res. 1995 Apr;101:238-44.
11. Fletcher C, Peto R. The natural history of chronic airflow obstruction. Br Med J. 1977 Jun 25;1(6077):1645-8.
12. Decramer M, Gosselink R, Rutten-van Molken M, Dekhuijzen PN, Troosters T, van Herwaarden C, et al. Assessment of progression of COPD: report of a workshop held in Leuven, 11-12 March 2004. Thorax. 2005 Aug;60(8):647-50.
13. Singh, S., Makkar, R.P., & Wali, J.P. (2014). Echocardiographic abnormalities and GOLD criteria in Indian COPD patients. Lung India, 31(2), 145-150. https://doi.org/10.4103/0970-2113.135749
14. Gupta NK, Agrawal RK, Srivastav AB, Ved ML. Echocardiographic evaluation of heart in chronic obstructive pulmonary disease patient and its corelation with the severity of disease. Lung India. 2011 Jul-Sep;28(3):105-9.
15. MacNee W. Pathology, pathogenesis, and pathophysiology. BMJ. 2006 Jun 17;332(7551):1202-4.
16. Rabe KF, Hurd S, Anzueto A, Barnes PJ, Buist SA, Calverley P, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. Am J Respir Crit Care Med. 2007 Sep 15;176(6):532-55.