

Evaluation of Left Heart Function in Acute Exacerbation of COPD and Its Association with Cardiac BiomarkersS Rajendra Nath¹, M. Satya Krishna², K. Sai Sumanth³, M Seshadri Reddy⁴, M Sriihari Babu⁵¹Senior Resident, Department of General Medicine, GSL Medical College, Rajahmundry.²Assistant Professor, Department of General Medicine, GSL Medical College, Rajahmundry³Assistant Professor, Department of General Medicine, GSL Medical College, Rajahmundry.⁴Professor, Department of General Medicine, GSL Medical College, Rajahmundry.⁵Professor & Head, Department of General Medicine, GSL Medical College, Rajahmundry.

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Abstract

Introduction: COPD, prevalent and incurable, often coexists with cardiovascular comorbidities. Cardiac biomarkers like troponins and NT-proBNP aid in detecting cardiac dysfunction in COPD, crucial for timely intervention. Elevated biomarker levels during exacerbations signify myocardial damage and predict mortality, highlighting the need for comprehensive management strategies in COPD patients.

Methods: A cross-sectional study conducted at GSL Medical College, Rajahmundry, from January 2021 to June 2022, assessed left heart function in COPD exacerbations. Patients aged over 25 admitted with acute exacerbations were evaluated using 2D echocardiography and correlated with troponin levels. Inclusion criteria followed GOLD guidelines, while cardiac biomarkers were measured using a Roche kit.

Results: Out of 138 individuals, >80 age group comprised 8.7%. Male-female ratio was 3; 5% were nonsmokers. Shortness of breath was the common complaint (60%), with tachycardia in 102. Crepitations were noted in 61%. Elevated troponin T (60.8%) and BNP (32.6%) levels were prevalent. Echocardiography revealed dilated right atrium and ventricle (61.59%) and left ventricle dysfunction (31.88%). Among those with elevated troponin, 83.3% required ventilator support.

Conclusion: The study underscores the significant burden of cardiovascular comorbidities in COPD patients, with elevated troponin T and BNP levels indicating cardiac involvement. Echocardiographic findings reveal prevalent right atrial and ventricular dilation, alongside left ventricular dysfunction. These results emphasize the importance of comprehensive management strategies addressing both respiratory and cardiovascular health in COPD patients.

Keywords: COPD, Cardiovascular Comorbidities, Troponin, Echocardiography, Ventilator Support.

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Introduction

Chronic obstructive pulmonary disease (COPD), as per GOLD 2018, is a prevalent, preventable, and incurable disease characterized by persistent airway obstruction due to chronic inflammation from noxious particles. [1] Patients often have cardiovascular comorbidities. Abnormal lung development and various host factors contribute to its progression.

Cardiac biomarkers like creatine phosphokinase-MB (CPK-MB), Troponin-T, and N-terminal pro-brain natriuretic peptide (NT-proBNP) aid in detecting cardiac dysfunction in COPD patients. [2] Troponins, regulating skeletal and cardiac muscle contraction, are globular protein complexes attached to actin filaments in myocytes. Elevated

levels of these biomarkers indicate myocardial injury or strain, offering valuable insight into the extent of cardiac involvement during COPD exacerbations. [3] This underscores the importance of monitoring such biomarkers for timely intervention and improved management of comorbidities in COPD patients.

In COPD exacerbations, biochemical signs of cardiac injury, such as elevated troponins and CPK-MB, along with indicators of myocardial stretch like BNP, are prevalent. These markers not only signify myocardial damage but also predict both short-term and long-term mortality. Their presence underscores the severity of cardiac involvement during exacerbations, emphasizing the need for vigilant monitoring and comprehensive

management strategies to improve outcomes and reduce mortality rates in COPD patients. [4] A study was conducted to assess the left heart function in patients admitted with an episode of acute exacerbation of COPD (AECOPD) and correlate Left Ventricle function with cardiac biomarkers.

Methods

It was a cross-sectional study, conducted in the department of General Medicine, GSL Medical College, Rajahmundry. Study was conducted between January 2021 to June 2022. Study protocol was approved by the Institutional Ethics Committee. Informed written consent was taken from the study members.

The inclusion criteria for this study encompassed individuals aged over 25 years who were admitted due to acute exacerbation episodes of COPD. Patients with marked renal failure, hemodynamic instability necessitating inotropic or vasoactive support, pulmonary embolism, pre-existing cardiac disease, myocardial infarction, sepsis, or cardiac arrest before admission were excluded from the study.

The cardiac function of patients experiencing acute exacerbation episodes of COPD was assessed through 2D echocardiography, with particular attention paid to correlations with Troponin levels. Patients previously diagnosed with COPD, as per the GOLD criteria 2020 (defined by a post-bronchodilator FEV1/FVC ratio of less than 0.70), were examined clinically by experienced physicians or pulmonologists. Clinical evaluations were conducted following a pre-structured questionnaire to systematically document findings.

The diagnosis of COPD followed the GOLD criteria, ensuring consistency and standardization across the patient cohort. Cardiac function was evaluated using 2D echocardiography equipment (specifically, the GE – Logiq F8-154862641 model), allowing for detailed assessment of cardiac structure and function. Furthermore, cardiac biomarkers were measured using a Roche kit known for its high sensitivity, specificity. The kit also demonstrated a positive predictive value of 84% and a negative predictive value of 99.9%, ensuring reliable detection of cardiac involvement in COPD exacerbations. [5]

Statistical analysis: All statistical analyses were conducted using SPSS software trial version 20.0 and MS Excel-2010. The t test was employed to evaluate associations among categorical variables. A P value of <0.05 was deemed statistically significant, indicating meaningful associations between variables.

Results

Out of the 138 (100%) individuals in the study, 21% were aged between 25 to 40 years, 31.8% fell within the 41 to 60 years, 38.4% in 61 to 80 years group and 8.7% were >80 group. The male female ratio was 3. Just 5% were nonsmokers and shortness of breath (SOB) was the common (60%) complaint, tachycardia was detected in 102 members. Crepitations were recorded in 61% (84). Mean SpO₂ was 91.4 ± 1.8% and 31.8 ± 3.55 was the mean respiratory rate (RR). Most (60.8%) had elevated troponin T levels. Additionally, 32.6% had elevated BNP levels, with 67.3% within normal limits. Most (61.59%) exhibited dilated right atrium and ventricle on echocardiography, 31.88% showed left ventricle dysfunction, and 6.52% had normal findings. Among 84 COPD patients with an elevated troponin levels, ventilator support was required by 70 (83.3%) of subjects.

Discussion

Cardiovascular disease is a significant comorbidity in COPD patients, contributing to approximately 37% of mortality cases. [6] Individuals with COPD face an elevated risk of cardiovascular disease due to common risk factors such as aging and smoking, which intricately contribute to the pathophysiology of both conditions. Despite this, the coexistence of lung and cardiovascular ailments extends beyond smokers, suggesting additional underlying mechanisms linking these diseases. [7, 8] Shared inflammatory pathways, oxidative stress, and genetic predispositions might interplay in the complex relationship between COPD and cardiovascular disease, emphasizing the need for comprehensive management strategies targeting both respiratory and cardiovascular health to mitigate the burden of morbidity and mortality in affected individuals. [9]

The mean age of the study population was 58.8 ± 17.07 years, 21% were between 25 to 40, 31.8% within 41 to 60, 38.4% in 61 to 80 and 8.7% were >80 years.

In India, COPD ranks as the second leading cause of non-communicable disease-related deaths. The prevalence of COPD surges notably after age 30, highlighting its significant impact on public health and emphasizing the imperative for early detection and intervention strategies to address this escalating burden of respiratory illness. The prevalence was around 30% in above 40 years age group. [10, 11]

The male female ratio in this study was 3. In the literature also more prevalence was reported among male. [12] Just 5% were nonsmokers and SOB was the common (60%) complaint, tachycardia was detected in 102 members. In a study by Kalaycioglu E et al. [13] non-smoking history was reported to be 4% and SOB at the rate of 49%.

Crepitations, mean SpO₂, mean RR were at par with the literature.

Most (60.8%) had elevated troponin T levels, while 39.13% had normal levels. In a study by Mujumdar D et al. [14] elevated troponin T was diagnosed in 54% among the COPD patients. Additionally, 32.6% had elevated BNP levels, with 67.3% within normal limits. Gupta et al. [15] also reported similar findings and concluded that BNP is a significant biomarker for the diagnosis of COPD. Most (61.59%) exhibited dilated right atrium and ventricle on echocardiography, 31.88% showed left ventricle dysfunction, and 6.52% had normal findings. In another India research it was reported to be 45.3% and 35.3%, respectively. [16] Among 84 COPD patients with an elevated troponin levels, ventilator support is required by 70 (83.3%) of subjects.

The study underscores the significant burden of cardiovascular comorbidities in COPD patients, with elevated troponin T and BNP levels indicating cardiac involvement. Echocardiographic findings reveal prevalent right atrial and ventricular dilation, alongside left ventricular dysfunction. These results emphasize the importance of comprehensive management strategies addressing both respiratory and cardiovascular health in COPD patients.

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