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Frequency of undiagnosed Chronic Obstructive Pulmonary Disease amongst Coronary Artery Disease patients: A single centre study

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A B S T R A C T

Background: Chronic Obstructive Pulmonary Disease (COPD), a respiratory illness with persistent symptoms and limited airflow, is commonly caused by tobacco smoking and other factors. It is the world's fourth leading cause of death, and it could reach number three. COPD patients often have co-morbidities such as coronary artery disease (CAD), which complicates treatment and can lead to increased morbidity and mortality.

Objective: This study aimed to determine the frequency of undiagnosed chronic obstructive pulmonary disease in individuals with coronary artery disease.

Methodology: This cross-sectional study was carried out at the Department of Pulmonology and Cardiology, Timergara Teaching Hospital, Dir Lower from January 2020 to January 2021. A total of 160 participants diagnosed with CAD were included. We did not include patients who were unable to undergo spirometer testing (such as intubated, in shock, with active angina pain), nor did we consider those with a history of bronchial asthma or pulmonary edema. The COPD diagnosis was confirmed with FEV1/FVC having less than 70 percent. SPSS-15 was used for statistical purposes. We used frequencies and percentages for categorical variables such as gender, COPD. The SD for continuous variables, including age, was computed.

Results: Out of 160 participants 58.1% were male and 41.8% were Female. The study population mean age was 57.97 ± 11.08 years. Out of 160 patients, 60 (37.7%) were diagnosed with COPD. Among the 60 patients of COPD, 41 (68.42%) were male and 19 (31.66%) were Female. Maximum numbers of COPD individuals were in age group between 66–80 years. Mean pre and post bronchodilator values of FEV1 in COPD subjects were 58.65 and 60.82 respectively. COPD was categorized on the foundation of GOLD standards as: eight individuals (13.3%) were in grade 1, twenty eight participants (46.6%) were in grade 2 , 19 patients (31.6%) were in grade three and five patients (8.3%) were in grade four of COPD .Among male individuals with COPD, 32 (78.0%) were smokers.

Conclusion: The present study concluded that the frequency of COPD is high amongst patients with CAD. To determine the exact incidence of COPD in individuals with coronary artery disease, comprehensive multi-centric prospective studies need to be conducted which will provide a thorough explanation of the co-existence between these conditions.

Keywords: Coronary Artery Disease; Chronic Obstructive Airway Disease; PFT

Introduction

COPD, a respiratory illness with persistent symptoms and limited airflow, is commonly caused by tobacco smoking and other factors.[1] It is the world's fourth leading cause of death, and it could reach number three COPD patients often have co-morbidities such as coronary artery disease (CAD), which complicates treatment and can lead to increased morbidity and mortality. Moreover, it remains the leading cause of disability and mortality in individuals over 35 years of age.[2-4] Half of all deaths in the United States are caused by cardiovascular disease. Given the increased risk of COPD and CAD with age, smoking cigarettes is now considered a common risk factor. The occurrence of both diseases rises as one ages. Modifiable mechanisms for cardiovascular morbidity and mortality in COPD patients include augmented arterial stiffness and impaired endothelial dysfunction.[5,6] The risk of developing CAD is seven times higher in individuals with COPD, with up to 60% being reported as having it.[7] In addition, CAD is frequently linked to individuals with COPD.[8] The number of cases of COPD in individuals with CAD is unknown, but reports suggest that it falls within the range of 10 to 20 cases. 5% to 33. COPD was diagnosed in the majority of cases at 6 %.[9,10] Patients with CAD and COPD exhibit elevated rates of morbidity and mortality. Cardiovascular disease comorbidity is a significant factor in mortality among COPD patients.[11,12] Due to an expected increase in the rate of tobacco consumption and a growing number of risk factors, both CAD and COPD are expected to become more common in developing countries. The Middle East has a lower prevalence of COPD than most other regions, with the majority being under 18 years old.[13,14] The diagnosis and treatment of COPD are still lacking. The lack of evidence linking COPD and CAD in developing countries, particularly the Middle East, raises concerns.[15-17] This study was conducted to find out the Frequency of undiagnosed chronic obstructive pulmonary disease in patients with coronary artery disease

Objective

Objective of the study was to determine the Frequency of undiagnosed chronic obstructive pulmonary disease in patients with coronary artery disease

Methodology

This cross-sectional study was carried out at the Department of Pulmonology and Cardiology, Timergara Teaching Hospital, Dir Lower from January 2020 to January 2021. A total of 160 participants diagnosed with CAD were included. The WHO software was used to calculate the sample size for health studies using the assumptions of a 25 percent COPD rate in patients with coronary artery disease, 5% confidence interval, and 7 percent margin of error. CAD patients of both genders, aged over 35, were part of the sample. We did not include patients who were unable to undergo spirometer testing (such as intubated, in shock, with active angina pain), nor did we consider those with a history of bronchial asthma or pulmonary edema.

Patients diagnosed with CAD and given informed consent through written informed notice were admitted to pulmonology/cardiology wards/OPD as per the criteria. A trained technician utilized the MIR Spiro Laboratory machine in the Timergara Teaching Hospital. Dir Lower laboratory to perform spirometer. The spirometries were executed while standing. Inhalation force was used to

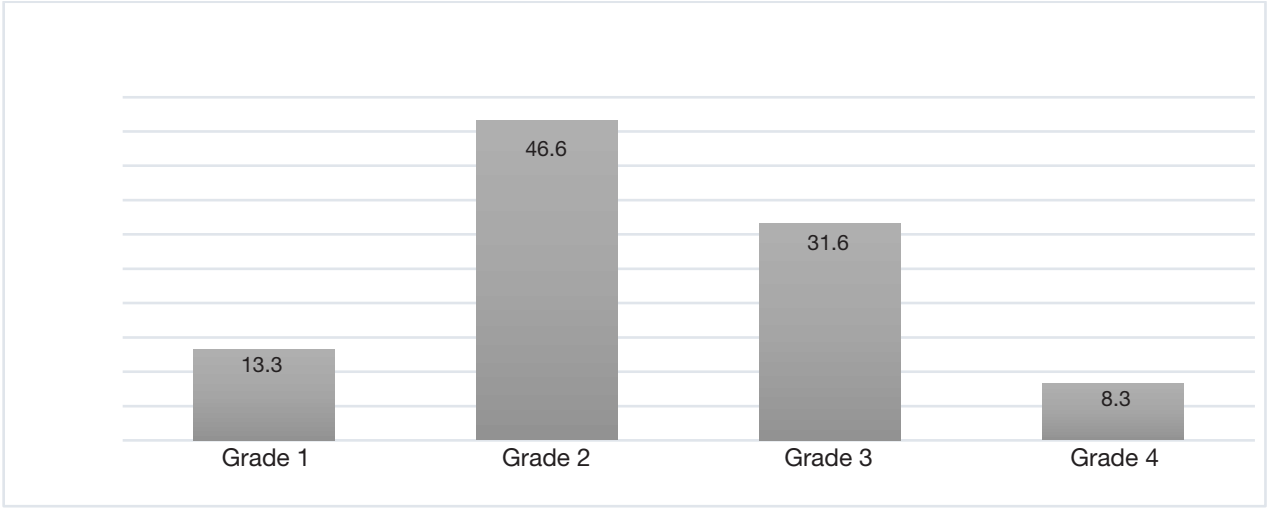

Figure 1. Percentage of patients with chronic obstructive pulmonary diseases stages

Table 1. Gender distribution of study cases

Gender	Frequency (%)
Male	93 (58.1%)
Female	67 (41.8%)

induce patients to undergo prolonged and intense death. Nebulizer was used to administer spirometer before and after taking 5mg of salbutamol for 5 minutes. The COPD diagnosis was confirmed with FEV1/FVC having less than 70 percent. SPSS-15 was used for statistical purposes. We used frequencies and percentages for categorical variables such as gender, COPD. The SD for continuous variables, including age, was computed.

Results

Out of 160 participants 93 (58.1%) were male and 67 were female (41.8%) (Table 1). The study population mean age was 57.97 ± 11.08 years. There were 56 (35%) patients in age group 35 - 50, 62 (38.7%) patients in age group 51–65, 36 (22.5%) patients in age group 66–80 and 6 (3.7%) patients in age group greater 80 years.as displayed in table 2. Out of 160 patients, 60 (37.7%) were diagnosed with COPD while 100 (62.5%) existed with no COPD. Among the 60 patients of COPD, 41 (68.42%) were male and 19 (31.66%) were Female. (Table 3) Maximum figure of COPD individuals were in age group between 66 - 80 years. Mean pre and post bronchodilator values of FEV1 in COPD subjects were 58.65 and 60.82 respectively. COPD rigorousness was categorized on the foundation of GOLD standards disseminated as: 8 individuals (13.3%) were in grade 1 (FEV1 >80%), 28 participants (46.6%) were in grade 2 (FEV1 <80 and >50), 19 patients (31.6%) were in grade 3 (FEV1 <50 and >30) and 5 patients (8.3%) were in grade 4 (FEV1<30%) of COPD as shown in figure no 2. Among male individuals with COPD, 32 (78.0%) were smokers. All female participants with COPD (n=18) were nonsmokers.

Discussion

A chronic obstructive airway disease is defined as an illness that results in limited airflow. The presence of atherosclerotic plaque in the coronary arteries leads to angina and myocardial infarction. Studies have revealed a connection between these two ailments. The most frequent risk factor between these two is smoking.[18,19] Smoking emerges as a central risk factor linking these two conditions, with studies suggesting its prevalence in a significant portion of the population. Furthermore, individuals with COPD, particularly smokers, are more susceptible to developing cardiovascular diseases such as CAD. Interestingly, while COPD may increase the risk of CAD, the development of cardiovascular disease can also occur independently of COPD.[20-22]

This underscores the multifactorial nature of cardiovascular health, where factors such as inflammation, as indicated by C-reactive protein levels, play a crucial role. Additionally, the study notes that non-smokers can still develop both COPD and CAD, with factors like biomass burn exposure contributing to this occurrence.[23] Notably, while smoking remains a primary cause of COPD, other factors such as passive smoking, chemical exposure, and occupational hazards can also contribute to COPD development. Finally, the observation that women's hat (likely referring to biomass smoke exposure from cooking) is a common reason for COPD development emphasizes the need for targeted interventions addressing various risk factors across different demographics. Overall, these findings underscore the importance of comprehensive preventive strategies addressing smoking cessation, environmental exposu-res, and inflammation manage-

Table 2. shows the study population age group in years (n= 160)

Age in years	N (%)
35-50	56 (35%)
51-65	62 (38.7%)
66-80	36 (22.5%)
Greater than 80 years	6 (3.7%)

Table 3. Frequency of COPD amongst CAD patients

COPD	N (%)
Yes	60 (37.7%)
No	100 (62.5%)

ment to mitigate the burden of COPD and CAD.[24-26]

A minority of COPD patients have a deficiency in alpha-1 antitrypsin, which is encoded by SERPINA1 gene has a limited impact on individuals with COPD.[27] Recent research indicates a significant co-occurrence of chronic obstructive pulmonary disease (COPD) among individuals diagnosed with coronary artery disease (CAD), with a prevalence rate of 31%. Our study outcomes are nearer to those of Jan et al (33.6 percent)[28] and Rovers (25–35 percent).[29] Emerging research suggests potential gender disparities in the development of COPD, with women being more susceptible to the disease due to various factors, including hormonal influences and differences in lung anatomy and physiology. Additionally, genetic predispositions and epigenetic factors are increasingly recognized as contributors to COPD development, independent of smoking. Furthermore, recent studies have highlighted the role of air pollution, particularly fine particulate matter and ambient pollutants, in exacerbating respiratory conditions like COPD and increasing the risk of cardiovascular events such as myocardial infarction. These findings underscore the importance of considering diverse risk factors and individualized approaches to disease prevention and management in both COPD and CAD.

This finding suggests a substantial overlap in these two chronic conditions, highlighting potential shared risk factors or pathophysiological mechanisms. The implications of this high prevalence underscore the importance of comprehensive health management strategies for individuals with CAD, necessitating a holistic approach that addresses both cardiovascular and respiratory health to improve overall outcomes and quality of life for affected individuals. The research finding of a higher prevalence of chronic obstructive pulmonary disease (COPD) among male patients with coronary artery disease (CAD) compared to female patients, with rates of 68.42% and 31.57% respectively, likely reflects the influence of smoking as a prominent risk factor for both conditions, particularly more prevalent among men. Smoking is a well-established contributor to the development and exacerbation of COPD, and its association with CAD is similarly well-documented. The observed gender disparity in COPD prevalence within the CAD population aligns with broader epidemiological trends showing higher rates of smoking among men historically. These findings underscore the importance of targeted interventions aimed at smoking cessation, particularly among male CAD patients, to mitigate the risk of COPD development and improve overall cardiovas-cular and respiratory health outcomes. Additionally, it highlights the necessity of considering gender-specific factors in preventive and therapeutic approaches for COPD and CAD management. In rural Sindh, a study revealed that 28 percent of COPD patients had respira-tory symptoms. In our study, out of 160 patients, 60 (37.7%) were diagnosed with COPD while 100 (62.5%) existed with no COPD. In contrast to 37.3% of individuals with coronary artery disease, COPD is less common in another study.[30]

Conclusion

In conclusion, our study underscores the high prevalence of COPD among patients with coronary artery disease (CAD). However, to accurately determine the precise incidence and elucidate the complex relationship between these two conditions, further comprehensive multi-centric prospective studies are warranted. Such endeavors will not only enhance our understanding of the co-existence of COPD and CAD but also pave the way for more effective preventive and therapeutic interventions tailored to address the needs of individuals with both conditions. By leveraging interdisciplinary collaboration and robust research methodologies, we can advance our knowledge and ultimately improve the management and outcomes for patients affected by these overlapping chronic diseases.

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