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ORIGINAL ARTICLE

Frequency of Pulmonary Hypertension in Patients Suffering from Chronic Obstructive Pulmonary Disease

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ABSTRACT… Objective: To establish the frequency in regards to pulmonary hypertension within individuals suffering from chronic obstructive pulmonary disease. **Study Design:** Cross-sectional study. **Setting:** Department of Pulmonology, Jinnah Hospital Lahore. **Period:** January, 2023 to April, 2023. **Material & Methods:** A total of 200 patients of both male and female patients with age from 40 to 70 years having chronic obstructive pulmonary disease were included by nonprobability consecutive sampling. Patients with history of other respiratory disease like interstitial lung disease, bronchiectasis, allergic broncho-pulmonary aspergillosis (ABPA), sarcoidosis, occupational lung diseases, asthma, ischemic heart disease, pulmonary hypertension, collagen vascular disease were factored out of the study. Cardiac echocardiography was performed in all the patients and pulmonary hypertension is assessed. **Results:** In this study, 87 (43.5%) were between 40-55 years of age while 113 (56.5%) were within the ages of 56-70, and thus the mean age was 57.28±8.44 years. 131 (65.5%) patients were male and 69 (34.5%) were females. 49 (24.5%), 103 (51.5%) and 48 (24%) patients had mild, moderate and severe COPD respectively. Pulmonary hypertension was found in 105 (52.5%) patients. Pulmonary hypertension is more prevalent in severe cases of COPD than mild and moderate patients with p-value = 0.0001. **Conclusion:** Patients with chronic obstructive lung disease have a high prevalence of pulmonary hypertension. This is shown to be more common within patients suffering from severe cases of COPD.

Key words: Asthma, Chronic Obstructive Pulmonary Disease, Echocardiography, Ischemic Heart Disease, Pulmonary Hypertension.

INTRODUCTION

The illness known as chronic obstructive pulmonary disease (COPD) is a common, progressive and preventable disorder having unrelenting respiratory symptoms (dyspnea, cough and sputum production) in addition to constrained airflow because of abnormalities in the alveoli (airways) as a result of extensive exposure to harmful particles or gases.[1]

COPD is the most prominent health problem globally, accounting for approximately 3 million deaths per annum. According to WHO, a total of 210 million individuals suffer from the impact of COPD. This illness is regarded as the third most significant cause for death in the world. Its prevalence ranges from 8% to 20% worldwide.[2]

Patients diagnosed with COPD can be affected by local effects of the disease as well as systemic effects. Although the precise mechanism of COPD's pervasive effects is not fully understood, it is generally accepted that oxidative stress and heightened systemic inflammation are causally related to COPD.[3] Smoking is the most probable risk for developing COPD.[4] It causes local as well as systemic lung inflammation. It has been speculated that the extensive effects of smoking with COPD cause cardiovascular, metabolic and malignant disorders.[3]

Pulmonary hypertension (PH) is considered to be an associated problem with severity of COPD.[5] In patients of PH, the narrowing of the pulmonary arteries poses significant challenges for the

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normal flow of blood, impeding the blood's ability to flow normally.[6] In patients of PH, mean PAP is > 25 mmHg at rest or 30 mmHg with exercise.[5] The primary mechanisms for increase in mean PAP has three major factors. The first one is hyperinflation of the lung, causing rise of thoracic pressure and decline of blood volume in cardiac chambers, lessening stroke volume and rising sympathetic drive. 2nd factor is the rising filling pressure of the left ventricle because of systolic, diastolic, or combined heart failure, resulting in an increase in PAP yet the pulmonary vascular resistance (PVR) remains normal. The 3rd factor is rise in PVR, resulting in both the elevated transpulmonary arterio-venous pressure gradient and a decline in cardiac output.[7] When this condition develops in these patients, the likelihood of mortality and morbidity increases significantly, resulting in a five-year survival rate that ranges from only 20% to 36% among affected individuals.[8] Furthermore, research indicates that even patients with moderate PH and COPD exhibit higher rates of morbidity and mortality.[9]

Within the population of people who have been identified as having chronic obstructive pulmonary disease (COPD), the purpose of this investigation is to determine the prevalence of pulmonary hypertension. There are, to the best of my knowledge and understanding, very few estimates available pertaining to the prevalence of PH-related COPD in Pakistan.

MATERIAL & METHODS

The following evaluation is a cross-sectional study carried out in the Pulmonology Department of Jinnah Hospital Lahore spanning from January, 2023 up until April, 2023 after approval from Ethical Review Board (ERB146/5/18-07-2023/S1 ERB). Two hundred patients of COPD were included in this study by taking prevalence of pulmonary hypertension in COPD patients 45.4%[2], confidence level 95%, and taking absolute precision 7%.

Both male and female patients with ages varying from 40 to 70 years presenting with COPD (patients had FEV1 <80% predicted or FEV1/FVC ratio <70% on spirometry) were incorporated in the study by means of non-probability consecutive sampling after taking patient's informed consent.

Patients with respiratory diseases like interstitial lung disease, bronchiectasis, allergic broncho-pulmonary aspergillosis (ABPA), sarcoidosis, occupational lung diseases, asthma, ischemic heart disease, pulmonary hypertension, collagen vascular disease were excluded.

The investigation was carried out in accordance with the recommendations made by the hospital's Ethical Committee. Patients were obtained from the outpatient department (OPD) and the inpatient ward of the Pulmonology division. A senior cardiologist from the hospital's Cardiology department was the one who carried out the Doppler echocardiography. Patients were considered to have pulmonary hypertension if their calculated mean pulmonary arterial pressure was greater than 25 mm Hg using Doppler echocardiography. I used a Performa that had been designed ahead of time to collect the data.

The data was analyzed by using SPSS V-16. For all quantitative variables like age, mean and standard deviation was calculated. Both percentage and frequency was measured for qualitative variables such as age groups, gender, and severity of COPD as well as pulmonary hypertension. Pulmonary hypertension was compared between different severities of COPD patients with the use of the chi-square test. P-value ≤ 0.05 were considered to be significant.

RESULTS

The study involved a total of 200 patients. Out of these, 87 patients (43.5%) fell in the age range of 40 to 55 years, while 113 patients (56.5%) were between the ages of 56 and 70. The average age of all the patients combined was 57.28 years, with a standard deviation of 8.44 years.

Among the patients, 131 (65.5%) were male and 69 (34.5%) were female. This provides insight into the gender distribution within the sample population.

The study categorized the patients based on the

severity of their Chronic Obstructive Pulmonary Disease (COPD). The distribution is as follows:
- Mild COPD: 49 patients (24.5%)
- Moderate COPD: 103 patients (51.5%)
- Severe COPD: 48 patients (24%)

The study also assessed the presence of pulmonary hypertension among the patients. Out of the total patients, 105 (52.5%) were found to have pulmonary hypertension.

Relationship Between COPD Severity and Pulmonary Hypertension

The study aimed to understand if there was a connection between the severity of COPD and the presence of pulmonary hypertension. The analysis indicates that pulmonary hypertension is more prevalent in severe cases of COPD compared to mild and moderate cases. This conclusion is based on a statistical test with a p-value of 0.0001. A p-value of 0.0001 indicates that the observed relationship between the severity of COPD and the prevalence of pulmonary hypertension is very unlikely to have occurred by chance. In other words, it suggests a strong association between severe COPD and pulmonary hypertension.

Variables	Frequency (%)
Age (in years)	
40-55	87 (43.5%)
56-70	113 (56.5%)
Gender	
Male	131 (65.5%)
Female	69 (34.5%)
Severity of COPD	
Mild	49 (24.5%)
Moderate	103 (51.5%)
Severe	48 (24%)

Table-I. Demographics (n=200)

Malignant Urinary Bladder Lesions	No. of Patients (%)
Yes	105 (52.5%)
No	95 (47.5%)
Total	200 (100%)

Table-II. Frequency of pulmonary hypertension (n=200)

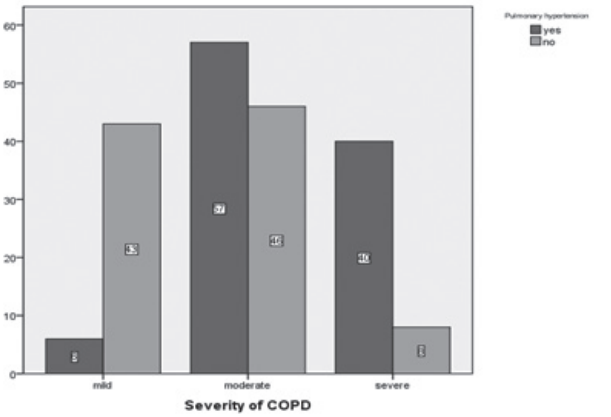

Figure-1. Pulmonary hypertension among severity of COPD (n=200) p-value = 0.0001

DISCUSSION

Chronic obstructive pulmonary disease is a fatal condition characterized by exertional dyspnea, functional restraint, compromised quality of life, repeated exacerbations, in addition to the need for hospitalization.[10] If it is left untreated, this condition inevitably progresses to right ventricular failure, and death.[11]

The occurrence of pulmonary hypertension in COPD patients is progressively becoming more familiar as a vital causative factor contributing to its clinical manifestations and poor clinical outcomes such as an increased mortality rate.[10] Pulmonary hypertension is permeated by increase in pulmonary artery pressures of varying etiologies, where one of the factors is COPD.[12] PH is normally identified in later stages of COPD.[13] In literature, different studies have revealed varying degrees of pulmonary hypertension among patients diagnosed with COPD.

In a prior study, Halvani and his colleagues established that 63.4% of COPD patients had pulmonary hypertension.[5] According to a different investigation conducted by Mohamed et al, it was observed that the occurrence of pulmonary hypertension in chronic obstructive pulmonary disease reached a rate of 63%.[14]

Gupta et al. conducted a study that was in the form of a cross section. According to their findings, pulmonary hypertension was found to be a complication of chronic obstructive

pulmonary disease (COPD), and the researcher discovered that 62.4% of cases of PH were found in COPD patients. According to the findings of a study that was carried out in Pakistan by Suleman et al., 45.4% of people who had been diagnosed with COPD also exhibited signs of pulmonary hypertension.[2] The findings of our study align closely with the outcomes observed in these prior research studies.

Blanco et al led an investigation[15], in which it was observed that 37.4% of individuals with COPD had pulmonary hypertension. Buklioska et al[16] noticed the echocardiographic changes in patients of COPD. They noted the prevalence of pulmonary hypertension in 33.3% of COPD patients. Nakayema et al conducted their investigation in regards to the characteristics of COPD patients on echocardiography and observed that 21.9% of patients suffered with both pulmonary hypertension and COPD. The study demonstrated a correlation of PH with the exacerbations of COPD.[17]

In a study carried out by Sridhara et al in which the comorbidities of COPD patients were evaluated, it was noted that 16% patients experienced pulmonary hypertension along with COPD. It was determined that pulmonary hypertension has a correlation with poor outcomes and an increased number of hospitalizations in COPD patients.[18] SImilarly, the study of Sun et al found that 22.6% of patients diagnosed with COPD also had pulmonary hypertension.[19] Yazici et al evaluated the various cardiac functions in patients with chronic obstructive pulmonary disease. They noted the prevalence of 26.2% of pulmonary hypertension in COPD patients.[20] Zhang et al conducted a systematic review on the frequency of pulmonary hypertension in individuals diagnosed with chronic obstructive pulmonary disease patients and noted a collective prevalence of 39.2% of PH in COPD.[1]

Most of the studies found that as the case of chronic obstructive pulmonary disease becomes more severe, the probability of having pulmonary hypertension increases.[2,6,16] Results of our study also showed that pulmonary hypertension is more likely in individuals suffering from severe chronic obstructive pulmonary disease.

CONCLUSION

According to the results of this study, we concluded that pulmonary hypertension is prevalent in individuals diagnosed with chronic obstructive pulmonary disease in Pakistan. Findings of this study also showed that echocardiographic screening of chronic obstructive pulmonary disease should be done specially in moderate and severe patients of COPD.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Zeeshan Ashraf	Concept and Study Design, Data collection, Drafting of discussion, Literature Review, Statistical analysis.	
2	Muhammad Ashraf	Concept and Study design, Supervision of whole process, Critical review of intellectual content.	