

Original Article

Chronic Obstructive Pulmonary Disease in Patients Presenting with Heart Failure

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Abstract

Objective: To determine the frequency of chronic obstructive pulmonary disease in patients presenting with Congestive Heart Failure.

Methods: This cross sectional study was undertaken in Department of Internal Medicine, Combined Military Hospital, Lahore, from September 2015 to March 2016. 100 cases fulfilling inclusion criteria were enrolled in study through purposive sampling technique. Pulmonary function test was performed in patients by using spirometry to measure their forced vital capacity (FVC), forced expiratory volume in the first second (FEV1) and FVC to FEV1 ratio. If the levels of spirometry assessment were low, then the patient was labeled as having poor pulmonary function. All the data was entered and analyzed utilizing SPSS version 26.

Results: In this study, the mean age of the patients was 60.31±11.08 years. There were 64(64.0%) males and 36(36.0%) females. The male to female ratio was 1.7:1. The mean values of FVC, FEV1, and FVC/FEV1 ratio of the patients were 80.30±7.26, 59.75±5.99, and 0.75±0.102, respectively. The COPD was observed in 33(33%) patients with CHF. There was no statistically significant difference between the age group and gender with COPD (p>0.05).

Conclusion: The prevalence of COPD is substantial in patients admitted with CHF (33.0%). Therefore, spirometry ought to be done earlier in CHF patients to timely diagnose COPD, if present. So that early and appropriate therapeutic strategies can be planned to improve the prognosis and quality of life in such patients.

Keywords: Chronic Obstructive Pulmonary Disease, Spirometry, Congestive Heart Failure, Forced expiratory volume in the first second, Forced Vital Capacity.

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Introduction

Congestive heart failure befalls in which heart becomes unable to pump the apt amount of blood and oxygen required to meet the demands of the body¹. It is a major public health issue causing a significant number of premature morbidity and mortality and reduced quality of life all around the globe². According to 2021 statistical report of American Heart Association (AHA), the prevalence of heart failure is estimated to be 6 million which is around 1.8% of the total population of United States³. Other reports showed the prevalence of heart failure in Europe to be 1-2% and in U.S. and Canada to be 1.5-1.9%⁴. In Pakistan, the incidence of HF was reported as 14.75% in 2008, 19.32% in 2009 and 22.87% in 2010 out of total admissions into the cardiology unit.⁵

Chronic inflammatory condition causing persistent limitation of airflow from the lungs may be called as COPD⁶. It is also a serious public health concern, and mortality caused by COPD is expected to increase greatly in future. In 2019, the prevalence of COPD was estimated to be around 10.3% among individuals aged 30-79 years in low and middle income countries. In South Asian countries, the reported COPD cases were approximately 109.3 million⁷. In Pakistan, the estimated prevalence of COPD is 2.1% in individuals ages 40 years or more⁸. Gold standard for the diagnosis of COPD is spirometry⁹.

HF and COPD seem to coexist more frequently than expected from their separate prevalence, leading to poor prognosis and increased mortality. Both conditions share common risk factors such as advanced age and

smoking, and show similar clinical manifestations such as cough, dyspnea, and fatigue thus posing a great diagnostic and management challenge for the healthcare providers¹⁰. Studies have demonstrated that the approximated prevalence of COPD in patients with CHF ranges from 11-52% in the North American population and 9-41% in European population¹¹⁻¹⁴.

It has been observed in routine that COPD often coexists with CHF worsening the condition of the patient and increases the chances of mortality. Literature regarding COPD in CHF showed contradictory results. Some studies reported a high prevalence while a few studies reported low. However, very scarce literature is present on the current topic in Pakistan. So, the rationale of this study was to determine the frequency of chronic obstructive pulmonary disease in patients presenting with Congestive Heart Failure so that early diagnosis, management and prevention can be planned to reduce further complications and improve the quality of life of patients.

Methods

This cross sectional research was carried out at Unit II, Department of Internal Medicine, Combined Military Hospital, Lahore, from September 30, 2015 to March 31, 2016. Sample size of 100 was measured utilizing 95% confidence level, 8% margin of error and expected percentage of COPD as 20% in patients presenting with HF¹⁵. Consecutive sampling technique was utilized to gather the data.

Inclusion criteria: Patients aged 40-80 years of either gender presenting with congestive heart failure (incapability of heart to pump sufficiently and maintain perfusion to meet the body's demands caused by decreased ejection fraction i.e. <40% on echocardiography).

Exclusion criteria: Patients with current episodes of any cardiovascular event like myocardial infarction, or have had percutaneous coronary intervention before current myocardial infarction.

- Asthmatic patients (confirmed on history and medical record)

A total of 100 cases achieving the inclusion criteria were enrolled in the study from Department of Medicine, Combined Military Hospital, Lahore. Prior informed consent was taken from all study participants and approval was also taken from the review board of the institution. Demographic data (including age, and gender) was noted on performa. Pulmonary function tests were performed by utilizing spirometry to measure the forced vital capacity (FVC), forced expiratory volume in the first second (FEV1) and FVC to FEV1 ratio in all patients. If the levels of spirometry assessment were low (FEV1 <80%, FVC<80% and FEV1/FVC ratio <0.70), then the patient was labeled as having poor pulmonary function. All the data was noted on a pre-designed ques-

tionnaire.

All the gathered data was analyzed utilizing SPSS version 26. Quantitative data like age, FVC, FEV1 and FVC/FEV1 was expressed in mean ± standard deviation. Qualitative variables including gender, poor pulmonary function were expressed in frequency and percentage. Data was segregated for age and gender in comparison to COPD. Chi-square test was applied and p-value ≤0.05 was considered as significant.

Results

A total of 100 patients were included in the study. The mean age of the patients was 60.31±11.08 years with least and the most age ranges of 40 & 80 years respectively. 64(64%) patients were male and rest were females with female to male ratio of 1:1.7. Findings presented the mean value of FEV1 of the patients was 59.75±5.99 with minimum and maximum values of 50 & 70 respectively. While the mean value of FVC of the patients was 80.30±7.26 with minimum and maximum values of 63 & 90 respectively. The mean value of FVC/FEV1 ratio of the patients was 0.75±0.102 with minimum and maximum values of 0.56& 1.02 respectively. Demographic and clinical characteristics of the patients are demonstrated in table 1.

Table 1: Demographic and clinical characteristics of study participants (n=100)

Characteristics	Frequency	Percentage
Age* (years)	60.31±11.08	
Gender		
Male	64	64.0
Female	36	36.0
FVC* (%)	80.30±7.26	
FEV1* (%)	59.75±5.99	
FVC/FEV1 ratio*	0.75±0.102	

n = number of study participants; % = percentage; FVC=forced vital capacity; FEV1=forced expiratory volume in the first second; * = mean ± standard deviation were used to demonstrate the data.

In this study the COPD was observed in 33(33.0%) patients while it was not observed in 67(67.0%) patients, as demonstrated in figure 1.

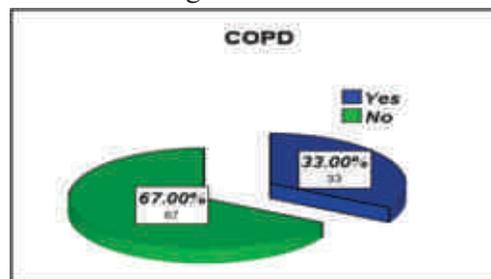


Figure 1: Frequency distribution of COPD.

Table 2 showed the comparison of COPD with age and gender. The study results showed there were 51 patients with age less than 60 years. Among whom, COPD was found in 18(35.2%) patients. Similarly, the 60 years or above aged patients were 49. Among whom COPD was found in 15 (30.6%) cases. No statistical difference was found between two age groups ($p=0.619$). Among 64 male patients, COPD was found in 17(26.5%) cases while among 36 female patients, COPD was found in 16 (44.4%) cases. No statistical difference was found between male and female gender ($p=0.068$).

Table 2: Comparison of COPD with age and gender (n=100)

Factors	COPD			p-Value*
	Yes	No	Total	
Age (years)				
<60	18	33	51	0.619
≥60	15	34	49	
Total	33	67	100	
Gender				
Male	17	47	64	0.068
Female	16	20	36	
Total	33	67	100	

n=number of study participants; COPD= Chronic obstructive pulmonary disease; *= Chi-square test was utilized to calculate p-value and $p \leq 0.05$ was taken significant.

Discussion

Globally, significant mortality and morbidity are caused by CHF and COPD. The co-existence of CHF and COPD presents many diagnostic and therapeutic challenges¹⁶. This study was undertaken in unit II, Department of Internal Medicine, Combined Military Hospital, Lahore to determine the frequency of COPD among patients presenting with Congestive Heart Failure. According to the current study results, the prevalence of COPD was 33(33%) in patients with CHF and there was no statistically significant difference found between the age groups and gender with COPD in patients presenting with CHF.

Prevalence of COPD along CHF has been reported in the range of 11-52% among patients in North America and 9-41% in European Cohorts¹¹⁻¹⁴. A systematic review carried out in 2009 demonstrated varying frequencies of COPD in hospitalized patients with HF; United States 24%, Netherlands 19%, Malaysia 12%, and Canada 21%, with an overall prevalence ranging from 9% to 52¹².

In a study carried on adults more than 65 years of age, the prevalence of COPD in CHF was 20%.¹⁷ Another study was conducted in Netherlands to assess the prevalence of COPD in CHF using pulmonary function test

and it was reported that 32.6% CHF patients were diagnosed with COPD.¹⁸

Medical records of 34,587 HF patients were reviewed by Havranek et al. reported that about 33.33% of the patients had COPD¹⁹. While a review aiming to observe co-morbidities amongst HF reported by Dahlstrom presented around 20-30% cases of COPD.²⁰ On the other hand a retrospective cohort analyzed 186 cases of left ventricular systolic malfunction and went through spirometry presented a frequency of 39.2% COPD where severity of COPD is directly proportional to worse prognosis.²¹ In one more study including 391 cases of HF also presented 25.1% co-existence of COPD.²² Lainscak et al. reported 638 subjects discharged after recovery from HF and 17% of them were having COPD who had a higher frequency of mortality in followups.²³

A cross-sectional study conducted by Valk, et al. on 106 HF patients reported that COPD was diagnosed in 28.3% cases. In this study, GOLD criteria was utilized to define COPD²⁴. The results of the current study are also concomitant with the study conducted by Iversen et al. showing the prevalence of COPD ranging from 10-33% in HF patients²⁵. Griffo et al. reported the prevalence of COPD in 375 patients admitted with CHF in 10 Italian centers to be 31.5%¹⁴.

The current findings support the prior results expressing higher frequency of co-existence of COPD with HF while findings are not comparable to Brenner et al who presented a minimal 9% concomitance of COPD with CHF.²⁶

Old age is regarded to be a significant associating factor of COPD and HF. In a study carried out by Hugo et al., it was noted that elderly patients aged ≥65 years had significant association with COPD1. This also agreed with the findings of Apostolovic, et al. who reported the older age (≥65 years) as an associating factor of COPD²⁷. However, through the findings of the present study, it was reported that there was no significant difference between age groups ($p=0.619$).

Male gender is also considered as a significant associating factor of COPD with CHF. Griffo et al. reported that 82.2% male patients had CHF accompanied by COPD as compared to 17.8% females ($p=0.04$)¹⁴. In the study by Valk et al., there were 57% males and 43% females but the association was insignificant ($p=0.14$)²⁴. Hugo et al. found out that the percentage of male sex affected was 50% ($p=0.70$). These findings are in line with the findings of the current study in which CHF was predominant in male patients (64.0%) but there was no significant association with COPD ($P=0.06$)¹.

The current study had a few limitations. Firstly, a small sample size was taken as compared to the disease burden in the local population. Secondly, it was a cross-sectional

study giving the findings at only one point of time. Thirdly, if total lung capacity and residual volume was also measured, it would have been beneficial to refine the COPD diagnosis, typically in patients in whom findings of spirometry were close to the critical cut-off point of FEV1/FVC 0.7.

Conclusion

The prevalence of COPD is substantial in patients admitted with CHF (33.0%). Therefore, spirometry ought to be done earlier in CHF patients to timely diagnose COPD, if present. So that early and appropriate therapeutic strategies can be planned to improve the prognosis and quality of life in such patients.

Conflict of Interest: *None*

Funding Source: *None*

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