Pak. J. Chest Med. 2023;29(01)

Original Article

journal homepage: https:/www.pjcm.net/

Pakistan Journal of Chest Medicine

Official journal of Pakistan Chest Society

Chronic Obstructive Pulmonary Diseases in Post Tuberculosis Patients

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Article History:

Received:	Nov 17, 2022
Revised:	Jan 28, 2023
Accepted:	Feb 22, 2023
Available Online:	Mar 02, 2023

Author Contributions:

BA TI RU conceived idea, BA JU US drafted the study, TI QI RU collected data, US JU RU did statistical analysis and interpretation of data, BA TI RU did crititcal reviewed manuscript, all approved final version to be published.

Declaration of conflicting interests

The authors declare that there is no conflict to interest.

How to cite this article:

Ali B, Iqbal, T, Iqbal Q, Saeed U, Umar J, Ullah R. Chronic Obstructive Pulmonary Diseases in Post Tuberculosis Patients Pak J Chest Med. 2023;29(1):13-7

ABSTRACT

Background: Tuberculosis (TB) and chronic obstructive pulmonary disease (COPD) are well-known causes of morbidity and mortality. The relationship between COPD and TB is very complex. A substantial number of post-tuberculosis (Post-TB) patients develop COPD.

Objective: The present study was conducted to determine the prevalence of COPD in post-Tuberculosis patients.

Methodology: This cross-sectional study was carried out in In Pulmonology unit of Khyber Teaching hospital, Peshawar from 16th October 2021 to 15th April 2022. Post-TB patients of age group 18-70 years and both genders were included in the study. Patients with a current or past history of smoking, diagnosed COPD, exposure to coal or silica, asthma, congestive cardiac failure (CCF), interstitial lung diseases, bronchiectasis and severe anaemic patients were excluded. Written informed consent was taken from all the patients. Each patient underwent spirometry as per the American thoracic society (ATS) protocol and COPD was diagnosed as FVE1/FVC <0.70. COPD was then classified into mild, moderate, severe and very severe according to the GOLD guidelines.

Results: Among these 149 patients, 40.9% were male while 59.1% were female. Mean age was 53.17 years ± 12.54 SD. Mean FVC was 59.38 ml ± 20.12 SD and mean FEV1 was 54.77 ml ± 23.46 SD. COPD was found in 51% and stratified among age, gender, FEV1/FVC ratio and time since completion of ATT.

Conclusion: This study concludes a high prevalence (51%) of COPD in post-TB patients. COPD causes significant morbidity and proper screening of post-TB patients for COPD will help in the effective management and prevention of complications.

Keywords: COPD; Post-TB; Pulmonology Unit; Peshawar

Introduction

Tuberculosis is a chronic disease caused by mycobacterium tuberculosis and affects multiple systems of the body, having a different forms of presentation. If talk about mortality, TB is the most common infectious disease world accounting for the most deaths related to infectious disease.[1] As it is clear that the prevalence of tuberculosis is decreasing in the United States and other developed countries of the world, however in the developing countries of the world including Pakistan, its prevalence is increasing and reported to be 55.3%.[2] The prevalence of resistance of mycobacterium to multi drugs is increasing across the globe.

Chronic obstructive pulmonary disease is a neglected lung problem which affects sixty-five million people across the globe. It is estimated to be the 3rd leading cause of mortality and accounts for nearly three million deaths annually.[3] Of the total number of deaths, 90% are in low-income and middle-income countries where the prevalence of pulmonary TB remains high.[4] Chronic obstructive pulmonary disease (COPD) and tuberculosis (TB) are two important causes of mortality and morbidity in our country and are among the top 10 causes of death. The interrelationship between TB and COPD is very complex. A substantial number of TB patients develop post-tubercular airway disease or TB-associated COPD. This is the most commonly reported relationship. Mohamed and his colleagues reported 44% of post-TB patients to have COPD and a risk factor for high mortality in these patients.[5]

A relationship between pulmonary TB and the development of COPD has been suggested in several reports. However, a serious limitation is the confounding caused by concurrent exposure to risk factors such as tobacco smoking, dust and biomass fuel, and childhood respiratory illnesses, and a lack of diagnostic precision when distinguishing COPD from other forms of structural lung disease (e.g. bronchiectasis) found in patients who had pulmonary TB. Chronic obstructive airway disease as a complication of Pulmonary TB has been re-studied recently in many regions of the globe.[6]

In the executive summary of the 2021 update of the Global initiative for chronic obstructive lung disease (GOLD) guidelines, the role of tuberculosis (TB) in the development of chronic airway obstruction has been recognized. According to the GOLD Workshop summary, chronic bronchitis or bronchiolitis and emphysema can occur as complications of treated TB leading to obstructive airway disease.[7] The prevalence of chronic obstructive airway disease in post-TB patients varies greatly. Available resources reported post-pulmonary TB lung obstructive disease having a prevalence of 33%-60% in local and international studies. In Brazil, its prevalence is 49% in patients who fully recovered from pulmonary TB. Kampen S in his systematic review of literature that overall 33% of post-TB patients had obstructive lung disorders or lung function impairment.[8]

Taking into account the high prevalence of COPD in this population and the scarcity of locally available studies, we designed this study of post-TB COPD occurrence to help quantify the burden of this disease and adopt an early management strategy.

Objective

The present study was conducted to determine the prevalence of COPD in post-Tuberculosis patients.

Methodology

This cross-sectional study was carried out in the Pulmonology unit Khyber Teaching hospital, Peshawar from 16th October 2021 to 15th April 2022. Post-TB patients of the age group 18-70 years and both genders were included in the study. Patients with a current or past history of smoking, diagnosed as COPD, exposure to coal or silica, asthma, CCF, interstitial lung diseases, bronchiectasis and severe anaemic patients were excluded. Written informed consent was taken from all the patients. Each patient underwent spirometry as per the American thoracic society (ATS) protocol and COPD was diagnosed as FVE1/FVC <0.70. COPD was then classified into mild, moderate, severe and very severe according to the GOLD guidelines.

The sample size for my study was 149 using the WHO sample size calculator considering 55.3%[2] prevalence of Post-TB COPD, based on 95% confidence interval and 8% of margin. All sample was calculated using a consecutive non-probability sampling technique.

Both male and female treated patients of pulmonary tuberculosis (according to operational definition) and had taken the last dose of ATT 6 months ago and the age range 18-70 years were included in the study. Patients with active tuberculosis, History of current or previous smoking, diagnosed case of COPD, asthma, CCF, interstitial lung disease, bronchiectasis and severe anemia, and history of occupational exposure (Coal worker, Stone cutter, tandoor workers etc.) were excluded from the study because these mentioned conditions were potential confounders.

Data Collection Procedure

After getting approval from the local ethical committee, the study was conducted at the Department of Pulmonology, Khyber Teaching Hospital Peshawar. The pool of patients intended to be included in the study was selected from the outpatient, emergency department and

pulmonology ward KTH. The purpose and benefits of the study were explained to all patients. Written informed consent was taken from all patients.

Patients meeting the inclusion criteria were interviewed and the demographic variables were recorded for each patient on a pre-designed proforma. Each patient underwent spirometry according to ATS protocols. Spirometry was done by the same spirometer spirodoc

Table 1. Classification of COPD severity according to Gold guideline.

In the Presence of COPD (FEVI/FVC <0.70)		
Gold I	Mild	FEV 1>/= 80% Predicated
Gold II	Moderate	FEV 1< 80% Predicated
Gold III	Severe	FEV 1< 50% Predicated
Gold IV	Very Severe	FEV 1< 30% Predicated

"MIR 3B" by a trained operator with having minimum five-year experience. Spirometry values were recorded for FEV1, FVC, and FEV1/FVC. COPD was diagnosed as per operational definition i.e., FEV1/FVC <0.7 and was further classified as mild, moderate, severe, or very severe according to GOLD guidelines.

Data Analysis Procedure

Data were entered and analysed using the statistical software SPSS version 22. All the quantitative variables like age, forced vital capacity (ml), Forced Expiratory volume in one second FEV1, time since completing ATT and ratio of FEV1/FVC, were analysed for Mean and standard deviation. Frequencies and percentages were calculated for qualitative variables like gender, and severity of COPD. Post-TB COPD was stratified for age, gender, a ratio of FEV1/FVC and time since completing ATT to see effect modifications. Post-stratification chi-square test was applied keeping the P-value equal to or less than 0.05. All the results will be presented in tables and graphs.

Results

Out of 149 patients, 61(40.9%) were males and 88 (59.1%) were females (Figure1). The mean age was 53.17 years ± 12.54 SD. Patients were divided into 3 groups on the bases of age (Table 2). COPD was found in 76 (51%) OF post-TB patients (Table 3).

Post-TB COPD was stratified based on age. The majority of Post-TB cases fall in group B i.e. between 41-60 years (Table 4). The P-value for this post-stratification analysis was 0.0001 which was statistically significant.

Post-TB COPD was also stratified based on gender. Among 76 Post-TB COPD patients, 26 (42.6%) were male

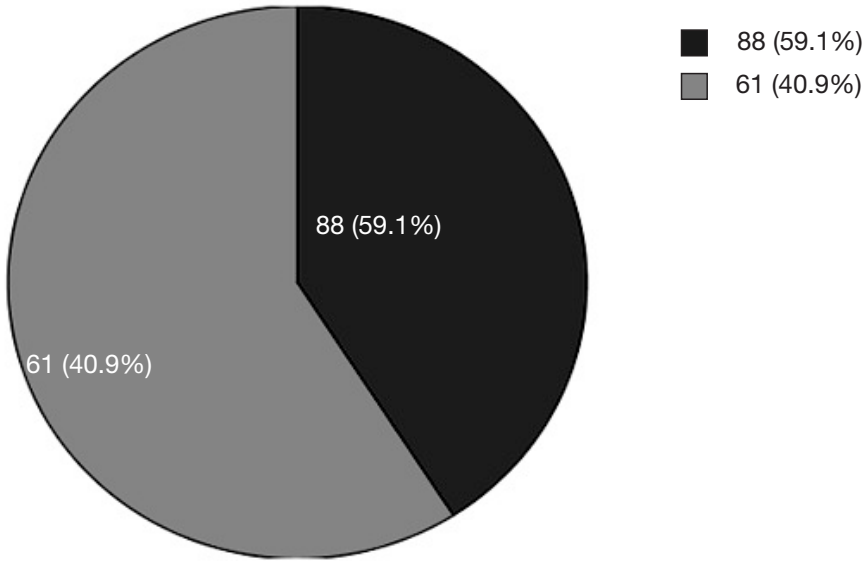

Figure 1. Gender Wise Distribution of Patients

Table 2. Distribution of Patients on Basis of Age (n=149)

	Age of Patients	Gender of Patients	Frequency (%)
Group 1	18 - 40 years	Male 16 (53.3%)	30 (20.1%)
		Female 14 (46.7%)	
Group 2	41 - 60 years	Male 22 (30.5%)	72 (48.3%)
		Female 50 (69.5%)	
Group 3	>61 years	Male 23 (48.9%)	47 (31.5%)
		Female 24 (51.1%)	
Total	18 - 70 years	Male 61 (40.9%)	149 (100%)
		Female 88 (59.1%)	

Table 3. Frequency of COPD in Post TB patients

COPD	Frequency (%)
Present	76 (51%)
Absent	73 (49%)
Total	149 (100%)

Table 4. Distribution of Post TB COPD based on age (n=149)

	Age of patients	Post TB COPD (yes /no)	Frequency (%)	P-value
Group A	18 - 40 years	Yes 7 (23.3%)	30 (100%)	**0.001**
		No 23 (76.7%)		
Group B	41 - 60 years	Yes 36 (50.0%)	72 (100%)	
		No 36 (50.0%)		
Group C	>61 years	Yes 33 (70.2%)	47 (100%)	
		No 14 (29.8%)		
Total	18 - 70 years	Yes 76 (51.0%)	149 (100%)	
		No 73 (49.0%)		

Table 5. Distribution of frequency of Post TB COPD based on gender (n=149)

Gender	Post TB COPD		Total	P-value
	Yes	No		
Male	26(42.6%)	35 (57.4%)	61 (100%)	**0.08**
Female	50 (56.8%)	38 (43.2%)	88 (100%)	
Total	76 (51%)	73 (49%)	149 (100%)	

while 50 (56.8%) were female. Post-stratification chi-square test was applied and the p-value was 0.08. Table 5

Discussion

Although cigarette is considered to be the main causative agent for COPD development and was thought to be a separate entity, recent GOLD guidelines categorized COPD based on causative agents like COPD-S for smoking-associated COPD, COPD-I for infection-related COPD etc. this emphasises the importance of many

factors including tuberculosis as a risk for development of COPD in these patients.

Post-TB COPD is an important complication of pulmonary tuberculosis. In our study, the frequency of post-TB COPD was 51%. It's almost half of the total post-TB population of the study. Similar findings have been observed in a study conducted by Mohamed W et al. where the frequency of post-TB COPD was 44% which is almost close to the results of our study.[5] Similarly, Allwood BW et al. demonstrated the prevalence of post-TB COPD to be 33-60% in their study. These results match the results of our study which also lies in between.[9] The similarity in results can be explained by the fact that pulmonary tuberculosis is an infection rather than an external factor that can exert its effects on lung function.

In Pakistan, one study conducted by Baig IM et al. in post-TB patients reported the prevalence of post-TB COPD to be 53%[2]. These results are consistent with the results of our study which is 51%. These results can be because of similar environmental, and genetic factors and healthcare facilities in our society. Another study by Bekele A et al. on the prevalence of COPD among post-TB patients showed a 41.4% prevalence of COPD in these patients.[10] Nihues SS et al conducted a study in brazil on the prevalence of post-TB COPD and concluded that its prevalence was 49% which is also consistent with the results of our study.[11].

We did not study the time duration between tuberculosis treatment and enrollment into the study, the duration of signs and symptoms before he was started on anti-tuberculous therapy and radiological findings like only infiltrates, cavities with infiltrates and how many lobes on one or both sides were involved. Another limitation was not considering associated co-morbid conditions because these all factors will affect recovery and the extent of lung damage.

Conclusion

This study concludes a high prevalence (51%) of COPD in post-TB patients. COPD causes significant mortality in COPD patients so proper counselling of TB patients is necessary to prevent complications. Proper preventive measures can lead to a better outcome. Avoidance of the risk factors and earlier assessment for the complications in post-TB patients can reduce mortality significantly.

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