

Evaluation of Chronic Obstructive Pulmonary Disease Caused By Tuberculosis at a Tertiary Care Facility

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Abstract

Background: A prominent pulmonary tuberculosis (TB) complication that may be responsible for a sizable fraction of chronic obstructive pulmonary disease is irreversible airway blockage (COPD). The burden of TB in India is the highest in the world. On the prevalence and manifestation of TB-associated COPD from this location, there are, however, few data. The purpose of this study is to assess the prevalence of COPD related to TB in COPD patients who are admitted to a tertiary care facility. **Environment and Design:** A case-control research was carried out in a tertiary care medical facility. **Material and Methods:** A similar number of healthy controls and stable COPD patients who presented with the chest OPD were included. Patients with COPD had thorough clinical evaluations and pulmonary function tests. Both groups' histories of pulmonary TB were assessed by self-reporting and/or review prior records. Patients with COPD and TB were found, and their prevalence and distinguishing characteristics were assessed. **Results:** Of the 70 people diagnosed with COPD, 24 (32.4%) had a history of pulmonary tuberculosis. Patients with COPD had a 3.96 (95% CI 1.64-9.55) higher risk of having TB in the past compared to controls ($P = 0.002$). Patients diagnosed with COPD due to tuberculosis tended to be younger ($P = 0.02$), had fewer pack years of smoking ($P = 0.027$), and more frequently required hospitalization ($P = 0.01$). Similar restrictions on airflow were seen between the two groups. **Conclusion:** Patients diagnosed with COPD who also have tuberculosis make up a sizeable fraction of the overall COPD patient population. It is a separate clinical entity that seems to affect younger people more often. It may be related to more frequent hospitalizations than what is typical for COPD patients.

Keywords: Pulmonary tuberculosis, chronic obstructive pulmonary disease, and airflow restriction.

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Introduction

According to estimates, 65 million individuals worldwide suffer from the chronic obstructive pulmonary disease (COPD), which is currently the third biggest cause of death. 90% of all deaths occur in low- and middle-income nations, which also have the highest rates of pulmonary tuberculosis (TB).^[1,2] Patients with a history of pulmonary TB have also been observed to develop COPD outside of tobacco use. The phrase "post tubercular obstructive airway disease" or "TB-associated COPD" have both been used to describe this COPD phenotype. Studies on the assessment of lung function in TB patients undergoing treatment or population-based surveys on COPD have provided the majority of the evidence for the causal relationship between TB and COPD.^[3-7] Variable outcomes in these studies are a result of the various study designs, COPD diagnosis criteria, and prior TB testing. Furthermore, the

strength of their link has been constrained by the existence of confounding variables such as cigarette use, exposure to biomass fuel, and childhood respiratory diseases. India has the greatest rate of tuberculosis in the world, making it likely that a sizable number of cases of TB-related COPD exist there.^[8-11] In addition, India is second only to China in terms of the number of instances of obstructive lung disease that result in morbidity and mortality and has an increasing COPD population. Ironically, there aren't many studies on COPD linked to TB in this area.^[12] Furthermore, it is unknown whether the clinical manifestation of this COPD phenotype differs from smoking-related COPD, which could call for a different therapy strategy.^[13] As a result, we intended to carry out a retrospective case-control study to determine the prevalence of TB-associated COPD among COPD patients at hospitals and to assess its distinctive features.^[14-19]

Material and Methods

It was a six-month study carried out in a tertiary care facility (May 2021 to October 2021). As cases, 70 consecutive stable COPD patients who visited the chest OPD were included. As controls, an equal number of healthy individuals were selected, with a similar age and gender distribution. Every subject gave their informed consent. Exclusion criteria for the study included COPD patients who also had other pulmonary comorbidities like obstructive sleep apnea, interstitial lung disease, lung cancer, congestive heart failure, unstable angina, recent myocardial infarction, and acute exacerbation of COPD within the previous four weeks. The institutional ethics committee gave its approval to the project. The type and duration of symptoms, the number of prior exacerbations, prior hospitalizations, tobacco smoking exposure, and occupational exposures to dust and smoke were all heavily weighted during the thorough clinical history and medical examination. Patients' self-reports and/or a review of their medical records, if available, was used to shed light on their history of prior TB. Details such as the number of anti-tubercular treatment (ATT) courses, the overall length of treatment, time since treatment completion, and the result were noted. Using an RMS Helios 401 PC-based Spirometer, routine spirometry was carried out by the most recent ATS standards. According to the most recent GOLD guidelines, patients were divided into four stages of airflow limitation based on their post-bronchodilator forced expiratory volume in 1, forced vital capacity (FVC), and FEV1/FVC values. Body mass index (BMI), the oxygen saturation of the room's air, and a standard posteroanterior chest X-ray (CXR) were all performed. Patients were only classified as having TB-associated COPD if their COPD symptoms developed following an episode of pulmonary TB. The prevalence of the COPD patients who also had TB was calculated, and its various characteristics were contrasted with those of the other COPD patients. Statistic evaluation Where appropriate, data were statistically reported using the mean, standard deviation, median with range, or frequencies. The student's t-test for independent variables was used to compare continuous variables between two groups. Using Pearson correlation, it was possible to determine the correlation between several variables. Statistics were deemed significant at P 0.05. The computer program (IBM) SPSS Statistics, version 21.0, was used to do all statistical calculations. Data on the severity of pulmonary function are presented in [Figure 1].

Inclusion criteria

- ✚ Age >18 years
- ✚ New onset or worsening cough, dyspnea, tachypnea, wheeze, shortness of breath, chest tightness.
- ✚ Rhonchi and crackles on auscultation, decreased breath sounds, Audible Wheeze.
- ✚ Patients who were evaluated under GOLD guidelines.
- ✚ Patients on Inhaled medications who have not done reversibility testing.

✚ Patients who are a confirmed history of Pulmonary Tuberculosis

Exclusion criteria

- ✚ The age of the patient is less than 18 years
- ✚ Patients who are Sputum AFB positive and C/S positive
- ✚ Patients whose SpO₂ levels are 30 CPM), hemoptysis.
- ✚ Extrapulmonary TB cases
- ✚ Multidrug resistant TB cases
- ✚ Cases unable to cooperate during spirometry procedure or do not want to enroll in study
- 8. Fever (>38.0°C or 100.4°F), leukocytosis(>12000 WBC/mm³)

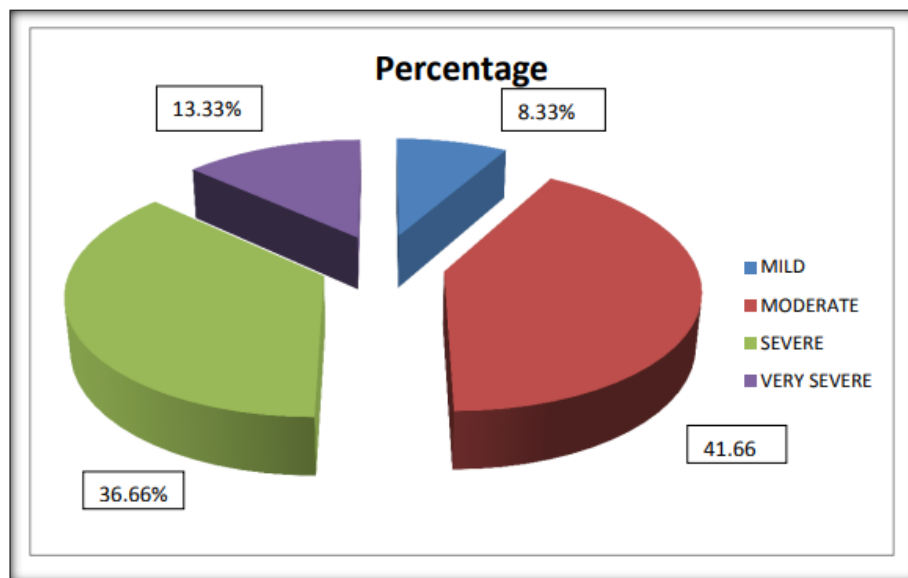


Figure 1: Pulmonary function severity

Results

The bulk of the COPD patients in our study were elderly guys. A history of >10 pack-years of tobacco use was present in 60 of the 70 patients (86.5%), of whom 19 continued to smoke. The median time it took for symptoms to start was 4 years (range: 2 months–25 years). 31% (n = 23) of the patients had a history of exacerbation in the year prior. 35 patients had a history of previous COPD-related hospitalization. 35 individuals had a history of 51 hospitalizations for COPD at any time in the course of their illness. Prevalence of chronic obstructive pulmonary disease (COPD) linked to tuberculosis In the COPD group, 24 patients (32.4%) and 8 patients in the control group both had a history of tuberculosis. In the COPD group, the unadjusted odds ratio for prior TB was 3.96 (95% confidence interval: 1.64-9.55; P = 0.002). In patients with COPD caused by TB, the median period since the end of ATT was 4 years (with a range of 1.5–35 years). The majority of the patients had only had one round of ATT. [Table 1] lists the characteristics of COPD patients as a baseline.

Table 1: Baseline features of COPD Patients

Sr. No	Patient Parameters	Values
1	Age (Yrs.)	59.1
2	Male-Female	8.5
3	No. of Smokers	87.10
4	BMI	20.43
5	Median pack yrs	31.00

6	Regular work exposures	20
7	Oxygen saturation %	95.12

Comparison of various chronic obstructive pulmonary diseases and chronic obstructive pulmonary diseases caused by tuberculosis In comparison to other COPD patients, TB-associated COPD patients were younger ($P = 0.02$) and had a higher proportion of females. Except for a high frequency of hemoptysis and repeated hospitalizations, they had similar symptoms. Even though the airflow limitation was similar to that of other COPD patients, there were fewer pack-years of smoking. On univariate analysis, the number of prior hospitalizations in TB-associated COPD patients showed a positive connection with age, the length of dyspnea, the number of exacerbations in the previous year, and BMI. After correcting for pack-years, age, and BMI, the duration of dyspnea still had a strong connection with hospitalizations ($r = 0.82$; $P = 0.022$) on multivariate analysis. In contrast, there was no association between any of the measures and FEV1. [Table 2] shows the patient's airflow obstruction patterns.

Table 2: Airflow obstruction pattern in patients

Sr. No	Airflow Obstruction Pattern	No of Patients	%
1	Obstructive	20	30
2	Restrictive	25	35
3	Mixed	25	35
	Total	70	

Discussion

The goal of the current study was to assess the characteristics of TB-associated COPD and determine its prevalence among hospital patients. The findings revealed that 32.4% of COPD patients had a history of concomitant TB. Patients with TB-associated COPD were shown to have similar levels of airway blockage to those with smoking-related COPD, despite being younger and having fewer pack years of smoking. This provides compelling evidence in favor of a coincidental link between TB and the onset of COPD. The majority of the information that has been published on the link between TB and COPD, in contrast to our study design, has come from research on TB patients who have already received treatment. In a series of cohort studies, airway obstruction was shown to be between 28% and 70% in individuals with TB who had already received treatment, as opposed to between 11% and 58%. Cross-sectional studies were conducted in hospitals. Airflow blockage was observed in 30.7% of patients with prior TB infection in one of the largest population-based PLATINO studies, compared to 13.9% of patients without a history. In contrast, using a case-control study design, we assessed "TB-associated COPD" in COPD patients receiving tertiary treatment. In the published literature, we were unable to locate any additional Indian studies with a similar approach.^[20] Authors of a significant population-based investigation (the BOLD study) on COPD in never smokers did not discover any link between TB and the development of COPD. In contrast to our findings, their investigation found that just 5.3% of COPD patients had a history of prior TB. This is probably because the study was conducted on nonsmokers, which eliminated smoking's role as a cause of COPD and TB. Moreover, the relationship between the two diseases may have been highlighted by a community-based study from a country with low TB prevalence. Our study included COPD patients who presented to the hospital with some symptoms and may have had a higher likelihood of having had TB in the past. Another study from India that included participants who had smoked many packs per day revealed a 57% prevalence of prior TB in COPD patients. Various theories have been put out as causes for the onset of COPD in TB patients. It

involves endobronchial involvement that results in airway obstruction, bronchiolar constriction, and bronchiolitis obliterans as a result of per bronchial fibrosis, as well as accelerated emphysematous alterations brought on by persistent, recurrent inflammation that affects lung compliance. The degradation of the pulmonary extracellular matrix brought on by the increased activity of the matrix metalloproteinases enzymes induced by tuberculosis (TB) may be a shared factor in the pathogenesis of both diseases.^[21-23]

There is evidence that the radiological extent of TB, the number of prior TB episodes, and the delay in starting anti-TB therapy all raise the risk of COPD. In our investigation, 90% of patients with TB-associated COPD had a history of a single episode of TB and had modest CXR alterations, therefore this could not be validated (unilateral involvement and apical linear fibrotic strands). The findings are comparable to a Korean study, which likewise found that TB patients with modest CXR alterations had reduced FEV1. Additionally, because individuals with mixed obstruction and limitation are more likely to present with substantial CXR alterations, they were not included in our analysis. The prevalence of TB-associated COPD may have increased in our analysis as a result of the inclusion of these patients.^[24, 25]

Our study provided a realistic portrait of TB-associated COPD and provided information on its frequency seen in a typical OPD. It also implies that effective TB control may help lower the incidence of TB-related COPD. The case-control study design and intrinsic recollection bias made it impossible to confirm the causal relationship between TB and COPD. After TB incidence, which can start at the time of diagnosis or several years after the completion of therapy, TB-associated COPD can develop. Additionally, ATT and bronchodilators may help to alleviate the airflow restriction that was observed in it.^[26] As a result, cohort study designs that track TB patients until any point in time may not accurately depict their connection. It appears that a retrospective research design, like the one used in our investigation, is a better method for evaluating COPD patients for prior TB. In our investigation, the impact of confounding variables, particularly tobacco use, could not be completely ruled out. Although the number of pack years was much lower in individuals with TB-associated COPD compared to other COPD patients, it did not appear to have an impact on the outcome.

Conclusion

In a hospital context, tuberculosis-associated COPD makes up a sizeable fraction of the overall COPD population. Because it is a separate clinical condition from COPD caused by smoking in general, treating it may require a different approach. India has a high TB burden, hence there is a need to perform large-scale research and population surveys on COPD patients there to determine the burden of TB-associated COPD and its progression. In addition, longitudinal research on TB-associated COPD in never smokers may assist in the formulation of guidelines for the therapy of this condition.

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