

A Study on Association of Obstructive Airway Disease in Previously Treated Pulmonary Tuberculosis PatientsLaxmi Niwas Tiwari¹, Prakash Sinha², Ritesh Kamal³¹Assistant Professor, Department of Pulmonary Medicine, Katihar Medical College and Hospital, Katihar, Bihar²Associate Professor, Department of Pulmonary Medicine, Katihar Medical College and Hospital, Katihar, Bihar³Professor and Head of Department, Department of Pulmonary Medicine, Katihar Medical College and Hospital, Katihar, Bihar

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Abstract:

Background: In a developing nation similar to India, pulmonary tuberculosis (PTB) and obstructive airway disease are becoming more and more prevalent. A significant proportion of tuberculosis patients get post-tubercular respiratory illness. The association between PTB antecedents and COPD antecedents has not been extensively studied in India. PTB significantly affects one's quality of life. The purpose of this research is to determine the prevalence of obstructive airway disease in patients with pulmonary tuberculosis who have received prior treatment and to assess, using SGRQC, the effect of post-TB obstructive airway illness on quality of life.

Methods: 116 research participants who satisfied the inclusion criteria were enrolled in a prospective, observational cross-sectional study from January 2023 to September 2023 at the Department of Pulmonary Medicine, KMCH, Katihar, Bihar, after obtaining informed consent. The main factor used to categorize study participants was their prior history of PTB. Consequently, PTB-associated COPD and COPD were the two study subject groups included in this investigation. The MIR Spirobank smart app was used to measure subjects' PFT, and the SGRQ-C scale was used to measure their quality of life.

Results: Out of 116 patients, PTB-associated COPD was diagnosed in 19 (22.6%) women, 65 (77.4%) men, and 5 (15.6%) women and 27 (84.4%) men, respectively. The most prevalent symptoms reported by 76 (94.04%) and 62 (71.42%) patients, respectively, were dyspnea and a cough with sputum. The study outcome shown a notable decrease in QOL of PTB related COPD patients (72%) compared to COPD patients (66.4%). The effect of airflow limitation (FEV1) was marginally enhanced in PTB associated COPD patients (25.65%) compared to COPD patients (26.4%).

Conclusion: In a clinical setting, a sizable fraction of COPD cases are PTB-associated. It is a separate risk factor for OAD in nations with high tuberculosis rates. The findings suggested that in order to lower OAD, smoking cessation and early identification, treatment, and control of tuberculosis are equally important. Early detection of post-tubercular COPD and prompt treatment start increase quality of life and lower morbidity and death in these patients.

Keywords: PTB, COPD, SGRQ-C scale, OQL.

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Introduction

Both pulmonary tuberculosis (PTB) and chronic obstructive pulmonary disease (COPD) are more common in low- and middle-income nations. These nations account for 90% of the 9 million instances of active PTB and the projected 3 million COPD deaths that occur each year.[1] In these groups, the pathophysiology of COPD is influenced by variables other than cigarette smoking, such as biomass fuel and occupational exposures. A number of sizable cross-sectional studies with a broad population have also demonstrated a high

correlation between PTB and the existence of chronic airflow limitation (CAL).[3-6] This relationship is nearly as substantial as that for cigarette smoking in several studies.[5-7] 49.2% of persons aged 40 years or older who reported a history of PTB had signs of chronic obstructive lung disease (CAL; Global Initiative for Chronic Obstructive Lung Disease (GOLD) stage 1 or higher) in a community-based study conducted in South Africa (SA).[8] The exact mechanisms causing CAL after PTB are unknown. Exuberant

fibrosis, which causes bronchiectasis, fibrocystic regions, and shrinking of the afflicted lobes, is a characteristic of PTB resolution. Large-airway (bronchial) stenosis, bronchiectasis, and large-airway distortion have all been implicated in the development of CAL in healed PTB. [9–12] Therefore, the current study objectives were to assess the prevalence of obstructive airway disease in patients who had previously had treatment for tuberculosis and to determine how post-TB obstructive airway illness affected patients' quality of life using the St. George's Respiratory Questionnaire for COPD patients (SGRQ-C).

Material and Methods

From January to September of 2023, the Department of Pulmonary Medicine at Katihar Medical College and Hospital in Katihar, Bihar, conducted this prospective, observational cross-sectional study.

The study included 116 patients in total. Of them, 32 had a diagnosis of COPD and 84 had a diagnosis of PTB-associated COPD. The study participants gave their informed consent after being educated about the technique.

Exclusions from the trial were patients having a history of interstitial lung cancer, unstable angina, congestive heart failure, obstructive sleep apnea, relapsed or active PTB, and pregnant women. The purpose of the demographic questionnaire was to collect information on important factors such as weight, sex, and age. The length of the illness, the pharmacological treatment for the illness, the length of the therapy, the history of smoking, and any prior PTB episodes are all included in the medical data.

Patients who tested negative for sputum smears underwent spirometry utilizing the MIR Spirobank Smart App-Based Spirometer (Ispirometer App). Next, in accordance with the COPD GOLD Guidelines 2022, the patients were divided into four stages of airflow limitation (FEV1). The St.

George's Respiratory Questionnaire (SGRQ-C), a standard questionnaire, and the airflow limitation (FEV1) measured by spirometry were used to evaluate and compare the quality of life of the two patient groups. We assessed the frequency of PTB-associated COPD and contrasted the effects of COPD and TB-associated COPD on patients' quality of life.

The mean±SD of the data was compared. If a probability value was less than 0.05, it was deemed statistically significant. Information obtained from the survey and data from it were entered into an electronic spread sheet (MS Excel). MS Excel was used to summarize the findings. Response rates were evaluated by comparing PTB related COPD and COPD using demographics, past medical history, pulmonary function tests, and SGRQ-C data. Version 23.0 of IBM SPSS Statistics for Windows was used to conduct all of the tests.

Results

Males predominate in our study compared to females, and the majority of patients are under the 51–70 year age range. Smokers made up a larger portion of the study subjects' population than non-smokers.

Among those with COPD, the prevalence of TB-associated COPD was 72%. Dyspnea and a cough with sputum were considerably more common in both research groups, although hemoptysis was limited to COPD patients with a history of PTB. Based on their FEV1, research participants were categorized as mild, moderate, severe, or very severe using the COPD GOLD recommendations 2022, as shown in Table 1.

All study participants had clinically substantial pulmonary impairment, defined as a FEV1 <80% of the expected value, which was linked to an obstructive pattern. Patients with COPD combined with tuberculosis had somewhat greater obstruction than COPD patients, which may also be explained by obstruction.

Table 1: Characteristics of the patients in the study sample (n=116)

Characteristic	TB associated COPD	COPD
Gender		
• Male	65(77.4%)	27(84.4%)
• Female	19(22.6%)	05(15.6%)
Age		
• 18-30yrs	06(7.1%)	00(0.00%)
• 31-40yrs	07(8.3%)	00(0.00%)
• 41-50yrs	14(16.7%)	04(12.5%)
• 51-60yrs	25(29.8%)	10(31.3%)
• 61-70yrs	24(28.6%)	10(31.3%)
• 71-80yrs	07(8.3%)	07(21.8%)
• Above 80yrs	01(1.2%)	01(3.1%)
Smoking		
• Smoker	52(61.9%)	24(75%)
• Non-smoker	32(38.1%)	08(25%)

Previous history		
• With PTB	84(100%)	00(0.00%)
• Without PTB	00(0.00%)	32(100%)
Symptoms		
• Dyspnea	77(94.04%)	31(93.75%)
• Cough with sputum	60(71.42%)	19(50%)
• Fever	26(33.33%)	08(29.42%)
• Edema	08(8.3%)	06(17.64%)
• Severe	21(25%)	08(25%)
• Very severe	59(70.2%)	22(68.7%)
FEV1(mean±SD)	25.65±10.22	26.4±14.97
P-value	0.863	0.063
P-value(b/w groups)	0.039	

The study participants' mean SGRQ scale scores were tallied based on their clinical and demographic characteristics. Men scored higher on the symptoms scale, whereas women scored significantly higher on the activities scale. For all scales, elder groups had significantly higher SGRQ ratings. On activity ratings alone, smokers' scores

were substantially higher. As FEV1% dropped, SGRQ scores also declined statistically significantly.

The SGRQ components' effects on the two groups' quality of life were compared, and the results showed that patients with COPD and TB were related.

Table 2: St. George's Respiratory Questionnaire scale scores by demographical and clinical characteristics

Gender	Symptoms	Activity	Impacts	Overall
Male	68.74	83.78	62.15	69.95
Female	68.51	91.86	66.65	74.72
Age				
18-30yrs	73.5±19.5	89.2±18.7	65.6±28.9	74.3±23.4
31-40yrs	60.8±11.4	86.2±19.4	65.5±19.6	71±13.6
41-50yrs	69.5±12.5	85.6±16.7	61.3±23.2	70.2±15.8
51-60yrs	69.5±16.9	83.5±15.5	60.6±21.8	69.2±14.8
61-70yrs	69.8±14.2	86±8.5	64.8±23.8	71.7±18.2
71-80yrs	67±15.8	83.3±17.3	57.3±22.7	67±17.4
>80yrs	60.6±7.66	100±0	83.5±7.0	84.5±5.0
Symptoms (PTB associated COPD)				
Dyspnea	69.4±15.2	86±17	66±20.2	72.5±15
Cough with sputum	72±15.1	85.2±17.2	66.6±20.9	73±15.5
Fever	72.9±14.5	84.1±15.8	67.7±19.8	73.7±14
Edema	60.2±9	94.2±12.2	66.3±18.3	73.7±8.6
Hemoptysis	69.8±9.2	77.2±17.5	47.6±27.8	60.6±20
Chestpain	82.9	59.34	59.34	63.51
COPD				
Dyspnea	66.8±15	83.5±17.4	55.9±25.4	66.3±19.1
Cough with sputum	69.9±11	87.1±16.6	63±18.1	71.6±13.7
Fever	70.5±13	79.2±18.3	59.4±20.9	67.5±16.1
Edema	75.5±8.3	94.6±9.78	68±19	77.5±12.4
Hemoptysis	00	00	00	00
Chestpain	70.1±5.8	95.8±5.95	89.2±1.07	87.6±0.6
Smoking (PTB associated COPD)				
Smoker	69.6±15.2	83.8±16.6	65.5±21.9	71.6±15.4
Nonsmoker	69.1±15.1	89.4±16.6	63.07±20	72.2±15.5
COPD				
Smoker	66.7±16.8	81.3±18.4	53±26.2	64.1±20.4
N onsmoker	68.9±5.5	90.7±11.9	68.3±17.2	75.3±10.2
P value				
PTB associated COPD	69.57	85.83	65.02	72.04
COPD	66.92	83.96	55.78	66.38
P-value	0.198	0.298	0.023	0.049

Discussion

The objective of the current study was to determine the prevalence of TB-associated COPD in hospitals and assess its defining characteristics. The findings indicated that nearly two thirds of COPD patients (72%) had previously had tuberculosis. It was shown that, in comparison to COPD related to smoking, patients with TB-associated COPD had nearly identical degrees of airway blockage. This provides compelling data supporting the tenuous link between tuberculosis and the onset of COPD.

Out of 116 patients, 92 (79.3%) were male and 24 (20.7%) were female in the current study. This is comparable to the study of Upadhyay et al., which found 26 FEV1 in patients. [27]

This study predicted FEV1 values for patients with airflow limitation were 25.65 ± 10.22 for TB-associated COPD patients and 26.40 ± 14.97 for COPD patients; these values are comparable to COPD of GOLD stage IV, which differs from Kim et al.'s study, which found that airflow limitation was comparable to COPD of GOLD stage III. [28] This disparity in the rate of FEV1 reduction could be due to factors such as airflow limitation between COPD and TB-damaged lung.

In the current investigation, we discovered low HRQoL and a significant symptom burden in all SGRQ components, especially the impact and activity components. Similar to the research done by Ozoh et al., increasing dyspnea shown a substantial correlation with poor HRQoL across all component scores, and fev1 was similarly highly related with poor HRQoL. [29] Of the 84 patients with COPD associated with tuberculosis in our study, 52 (61.9%) were smokers and 32 (38.1%) were not. This finding suggests that smoking significantly contributes to both lower FEV1 levels and parenchymal damage. Therefore, in contrast to the work done by Kim et al., smoking is one of the confounding factors in our investigation. [28] In the present study, 72% of the sample group had COPD linked to tuberculosis. Comparable studies by Mohamed A. et al. revealed a prevalence of 16% among 500 patients, and Upadhyay et al. found a prevalence of 32.4% among 500 patients. [26]

Numerous theories have been put out to explain how COPD develops in TB patients. It comprises severe emphysematous alterations brought on by residual chronic or recurring inflammation that affects lung compliance, bronchiolar constriction, bronchiolitis obliterans, and endobronchial involvement that results in airway obstruction. The breakdown of the pulmonary extracellular matrix brought on by the elevated activity of matrix metalloproteinase enzymes triggered by tuberculosis (TB) may be a shared pathway to both diseases.

Research has indicated that there is a correlation between the radiological extent of tuberculosis (TB), the number of prior TB episodes, and the delay in starting anti-TB therapy and the likelihood of developing COPD. In our investigation, we discovered that patients with COPD and TB-related chest X-rays had significant parenchymal damage. FEV1 values are correlated with radiological results.

Conclusion

A substantial fraction of COPD in a hospital setting is TB related COPD. In nations with high tuberculosis rates, it is a separate risk factor for obstructive airway disease. In nations with high TB prevalence, post-tubercular COPD should now be more widely acknowledged as a cause of COPD in non-smokers. Our study's findings suggested that, in order to lessen obstructive airway disease, early detection of tuberculosis and proper treatment and control of the condition are just as crucial as quitting smoking. Prompt detection of post-tubercular COPD and prompt commencement of treatment enhances life expectancy and lowers morbidity and mortality rates in these individuals.

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