

Original Research Article

**“PREVALENCE OF CHRONIC OBSTRUCTIVE
PULMONARY DISEASE IN TUBERCULOSIS AND VICE-
VERSA IN A TERTIARY CARE HOSPITAL”**

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ABSTRACT:

Background: Chronic obstructive pulmonary disease (COPD) and tuberculosis (TB) are both diseases that mainly affect the lungs and are major causes of morbidity and mortality worldwide. They have common risk factors such as smoking and low socioeconomic status.

OBJECTIVES:

1. To study the prevalence of Tuberculosis associated Obstructive airway disease in treated pulmonary tuberculosis patients.
2. To assess the prevalence of Tuberculosis in diagnosed cases of Chronic Obstructive Pulmonary Disease.

MATERIAL & METHODS: Study Design: Prospective hospital based observational study. **Study area:** The present study was conducted in the department of TB & Respiratory medicine, M V J Medical College and Research Hospital, Hosakote, Bangalore, Karnataka. **Study Period:** 6 months. **Study population:** Those presenting to chest OPD with history of TB and COPD. **Sample size:** study consisted a total of 200 cases. **Sampling method:** Simple Random sampling method. The patients involved in this study are those presenting to chest

OPD with history of TB and COPD. Detailed history was taken including the prior history of anti-tubercular treatment, years lapsed after completion of treatment, smoking history, prior diagnosis of COPD and use of related treatments. Patients meeting the criterion were interviewed and proper consent was taken. The patients were divided into two groups. One group consisted of 80 patients who are never smokers with history of pulmonary TB and presented with dyspnoea and other group who were diagnosed to have COPD earlier.

Results: A total of 260 patients were screened for eligibility into this study of which 200 met the inclusion criterion. Among them 80 didn't have diagnosis of COPD but had history of TB and were taken into consideration for the study on prevalence of COPD in TB. 120 were known COPD patients and were considered for the study on prevalence of TB in COPD. Among the first group, 47 were males and 33 were females. In the second group, out of 120, 86 were males and 34 were females.

CONCLUSION: The results of this study show that COPD patients carry a significant risk of developing TB. TB may worsen their airway obstruction and decrease their life-expectancy. It is imperative for clinicians and health care personnel to observe for any symptoms of TB in such patients and to educate them in this regard so as to facilitate early diagnosis and treatment.

Keywords: Chronic obstructive pulmonary disease, pulmonary TB, tobacco smoke

INTRODUCTION:

Chronic obstructive pulmonary disease (COPD) and tuberculosis (TB) are both diseases that mainly affect the lungs and are major causes of morbidity and mortality worldwide. They have common risk factors such as smoking and low socioeconomic status. In addition, both diseases have a significant genetic vulnerability component, although little is known regarding the extent to which these traits are shared.

The development of COPD results from a combination of polygenic inflammatory vulnerability and environmental factors, mainly tobacco smoke, leading to lung tissue remodeling and a non-reversible airflow limitation. The prevalence of COPD is increasing worldwide, and it is estimated that COPD will become the third-leading cause of death by 2020¹. In India, around 22.2 million suffer from COPD and India contributes to 20% of COPD related mortality.²

Though they are known to share genetic vulnerability, and presence of either disease is known to increase the risk of other one there is no adequate literature to ascertain the statement. COPD patients are suspected to be at high risk of developing pulmonary TB potentially due to steroid use and COPD patients suffer from conditions that could potentially increase the risk of active TB such as low body mass index and impaired muco-ciliary

clearance. Several bacterial species are important both as colonizers and as inducers of COPD exacerbations.

Apart from tobacco smoke, COPD has been known to occur in patients with previous pulmonary TB. This COPD phenotype has been variably termed as post-tubercular obstructive airway disease or TB-associated COPD. India is the highest TB burden country in the world and hence is likely to harbor significant burden of TB-associated COPD.

Hence, the present prospective case-control study was carried out to find out hospital-based prevalence of TB-associated COPD among previously treated TB patients and to evaluate its characteristic features.

OBJECTIVES:

1. To study the prevalence of Tuberculosis associated Obstructive airway disease in treated pulmonary tuberculosis patients.
2. To assess the prevalence of Tuberculosis in diagnosed cases of Chronic Obstructive Pulmonary Disease.

MATERIAL & METHODS:

Study Design: Prospective hospital based observational study.

Study area: The present study was conducted in the department of TB & Respiratory medicine, M V J Medical College and Research Hospital, Hosakote, Bangalore, Karnataka.

Study Period: 6 months.

Study population: Those presenting to chest OPD with history of TB and COPD.

Sample size: study consisted a total of 200 cases.

Sampling method: Simple Random sampling method.

Inclusion criteria:

- Adults aged 18 + years, who has a definite history of pulmonary or extra pulmonary tuberculosis, had received complete anti-tuberculous therapy course, history of COPD diagnosis and presenting with chronic dyspnea.
- Only those were included who had typical post-tuberculous radiological changes in form of fibrosis, scarring, cavitation's etc. as it is difficult to ascertain history of TB due to unavailability of past medical records.

Exclusion criteria: Patients with bilateral destructive bronchiectasis, Interstitial lung disease, diagnosed cases of asthma, anaemia, renal failure, heart disease.

Ethical consideration: Institutional Ethical committee permission was taken prior to the commencement of the study.

Study tools and Data collection procedure:

The patients involved in this study are those presenting to chest OPD with history of TB and COPD. Detailed history was taken including the prior history of anti-tubercular treatment, years lapsed after completion of treatment, smoking history, prior diagnosis of COPD and use of related treatments. Patients meeting the criterion were interviewed and proper consent was taken.

The patients were divided into two groups. One group consisted of 80 patients who are never smokers with history of pulmonary TB and presented with dyspnoea and other group who were diagnosed to have COPD earlier.

The study was conducted in two parts, one part to assess the prevalence of obstructive airway disease in TB patients who were never smokers and other part to assess the prevalence of pulmonary and extra pulmonary TB in COPD patients.

The patients were subjected to spirometry using SPIROLAB-II-MIR S/N 507213.

The technique was explained and test was conducted only after patients became familiar with technique.

Spirometry values were recorded as FVC, FEV1, FEV1/FVC, FEF 25-75.

American Thoracic Society criterion for quality spirometry were strictly followed.

The subjects in group A showing obstructive ventilatory defect were then classified as mild, moderate and severe according to GOLD guidelines. The second group consisting of 120 patients who are known COPD cases, confirmed by spirometry were interviewed about history of TB, and if present, the type i.e. Pulmonary or Extra- pulmonary TB.

Statistical analysis:

Data was summarized by Mean±SD for continuous data, and percentages for categorical data. The comparison between two groups was done by Unpaired t-test/Mann Whitney U test for continuous data. The association between variables was done by Chi-Square test/Fisher exact test/Proportion test for categorical data. All P-values less than 0.05 were considered statistically significant.

OBSERVATIONS & RESULTS:

A total of 260 patients were screened for eligibility into this study of which 200 met the inclusion criterion. Among them 80 didn't have diagnosis of COPD but had history of TB and were taken into consideration for the study on prevalence of COPD in TB. 120 were known COPD patients and were considered for the study on prevalence of TB in COPD.

Among the first group, 47 were males and 33 were females. In the second group, out of 120, 86 were males and 34 were females.

PART – I: Prevalence of COPD in TB patients

Table 1: Gender-Wise Distribution of Spirometry Pattern in Study Group

GENDER	OBSTRUCTIVE	RESTRICTIVE	MIXED
MALE	28	12	7
FEMALES	21	9	3

In males, 28 had obstructive, 12 had restrictive and 7 had mixed spirometry pattern while in females, 21 had obstructive, 9 had restrictive and 3 had mixed pattern.

Table 2: Characteristic similarities between COPD and TOPD patients IN MALE POPULATION

	TOPD	COPD	P value	Not significant
AGE	56.11 ± 3.55	58.38 ± 2.464	0.6225	
BMI	19.73 ± 0.7588	20.45 ± 0.982	0.5546	
FEV1	1.649 ± 0.1672	1.797 ± 0.1481	0.5231	
FVC	2.549 ± 1.17	2.761 ± 0.96		
FEF 25-75	2.005 ± 0.2694	2.288 ± 0.2344	0.4467	

Table 3: Fev1 Comparison Between Copd, Topd & Control Groups

Groups	N	Range	Mean	SD	P-value
CONTROL	22	1.86 to 4.31	2.626	0.653	<0.0001
COPD	21	0.9 to 3	1.797	0.679	
TOPD	27	0.51 to 3.5	1.649	0.869	

Table 4: Comparison of FVC Between Three Groups

GROUPS	N	MEAN	RANGE	SD	P VALUE
TOPD	27	2.549	1.48-3.26	1.17	<0.0001
COPD	21	2.761	1.89-3.68	0.96	
CONTROL	22	3.252	2.81-3.76	0.65	

FVC VALUES HAVE SIMILARITY BETWEEN COPD AND TOPD GROUPS

Table 5: Comparison of Study Group with COPD Group in Female Population

	<u>TOPD</u>	<u>COPD</u>	<u>P VALUE</u>
AGE	49.68 ±12.68	63.33 ± 10.87	**
BMI	21.83 ± 4.79	21.23 ± 2.23	NOT SIGNIFICANT
FEV1	1.565± 0.15	1.987± 0.15	
FVC	2.727± 0.26	3.469 ± 0.25	
FEF 25-75	2.385 ± 0.24	2.598 ± 0.28	

Table 6: FEV1 COMPARISON BETWEEN THREE GROUPS

GROUPS	N	RANGE	MEAN	SD	P VALUE
TOPD	22	0.92-3.03	1.565	0.70	≤0.005
COPD	12	1.41-3.02	1.987	0.54	
CONTROL	15	2.35-3.84	3.08	0.49	

PART – II: PREVALENCE OF TB IN COPD**Table 7: Gender-Wise Distribution of Disease Pattern in Study Group**

GENDER	PULMONARY	EXTRA-PULMONARY	MIXED
MALE	23	10	2
FEMALE	7	6	1

Out of 49, 30 had pulmonary TB ,16 had extra-pulmonary TB and 3 had mixed disease.

Table 8: Comparison of TB prevalence in two groups

	SAMPLE SIZE	NUMBER OF PATIENTS IN WHOM DISEASE OCCURED	P VALUE
STUDY GROUP	120	40.83% (N=49)	< 0.0001
CONTROL GROUP	120	19% (N=19)	

In the study group 40.83% had history of contradicting TB while it is 19% in controls.

Table 9: Comparison of TB prevalence in Male Population of both groups

	N	NO. OF PATIENTS WHO DEVELOPED DISEASE	P VALUE
STUDY GROUP	76	46.05% (N=35)	< 0.0001
CONTROL GROUP	81	17.28% (N=14)	

Table 10: Comparison of TB prevalence in Female Population of both groups

	N	NO. OF PATIENTSWHO DEVELOPED DISEASE	P VALUE
STUDY GROUP	44	31.81% (N=14)	NS
CONTROL GROUP	39	12.82% (N=5)	

MALE COPD PATIENTS ARE AT HIGHER RISK THAN FEMALE COUNTERPARTS.

DISCUSSION:

The present study done in two parts was conducted to find out hospital based prevalence of TB associated COPD and vice versa. The first part is discussed in detail in the following paragraphs. TB associated COPD was present in 61.25% of study group. Male population of these patients were compared to smoking related COPD patients. The female population was compared to biomass exposure related COPD group.

Both the sexes showed significant spirometric similarities to COPD groups. A similar study conducted in 2007 by INAM MUHAMMED BAIG et al.³ showed that 55.3% of treated pulmonary TB patients had obstructive ventilatory defect. The study was conducted on patients presenting with exertional dyspnoea to the military hospital, Rawalpindi. The inclusion and exclusion criterion were similar to this study and so it was chosen for comparison. They concluded that extensive post tuberculous scarring manifested mainly as COPD like syndrome, and in view of the fact that smoking and other confounding factors that may lead to COPD were excluded, TB was established as an independent etiological factor for developing chronic obstructive pulmonary disease.

Inam Baig et al.³ conducted study in 47 patients out of which 76.5%(n=36) were males and rest were females. In our study conducted in 80 patients, 58.7% were males (47/80) and 41.25%(33/80) were females. In Inam baig et al.³ 2 patients had mild, 6 had moderate and 18 had severe grades of airway obstruction. In the present study, 8 had mild,16 had moderate,17 had severe and 7 had very severe airway obstruction. In INAM BAIG ET AL.¹⁷ the mean age in males was 56.4 and in females it was 44.2. In the present study, the mean age in males is 56.1 and in females it is 49.6.

In Inam baig et al.³.55.31% had obstructive airway disease,29.78% had restrictive and 14.89% had mixed defect. In present study, a total of 61.25% of the study group had obstructive airway defect with 12.5% having mixed defect while rest had restrictive disease.

Though the patients in the study group were age matched, there was significant decrease in BMI values when compared to control population. TB associated COPD group had similar BMI values as COPD groups despite being not exposed to known risk factors of COPD. Fev1 and FEF25-75 values also showed statistically significant similarity in study population in

both TOPD and COPD groups compared to control group. This gives strong evidence in favour of casual association between TB and development of COPD.

The female TOPD patients are younger than COPD counterparts but have similar grades of airway obstruction and BMI values unlike male study population whose age groups doesn't have significant difference when compared to COPD patients implying that females develop airway obstruction secondary to TB at earlier age than males.

A common link to the pathogenesis of both the conditions may lie in the destruction of pulmonary extracellular matrix due to increased activity of matrix metalloproteinases enzymes precipitated by TB.⁴

The second part of study was conducted to study the prevalence of TB in known COPD patients those who are on treatment regimens. In the study, about 120 patients with diagnosis of COPD were evaluated for history of TB. Those patients with COPD diagnosis prior to development of TB were only included. These patients were then compared to healthy population and prevalence of TB among COPD patients was studied. About 49 patients developed tuberculosis of either pulmonary or extra pulmonary forms.

Out of 49, 30 patients developed pulmonary TB, 16 had extra- pulmonary TB and 3 had both. The prevalence of TB was 40.83% among COPD patients and they were 2.57 times more prone for developing TB than control subjects (R. R=2.57, p value =0.0001). Males were more prone for risk of developing TB than female counterparts. Pulmonary TB appears to be more common in both the sexes than other forms of TB.

A large population based study conducted in Sweden by Inghammer et al.⁵ compared risk of developing TB in COPD patients with normal population. The study population consisted of patients discharged from Swedish hospitals with a diagnosis of COPD between 1983-2005 (n=115867). The data was then co-related with national TB register and the relative risk of active TB in patients with COPD compared to control subjects randomly selected from the general population was estimated.

In Inghammer et al.⁵ 201 patients in study group and 90 in control group had TB prevalence. In our study, 49 in the study group and 19 in the control group reported TB. Inghammer et al.²¹ 127 male and 74 female patients in the study group had TB prevalence. In present study, 35 of males and 14 females had TB. Although female patients who have COPD secondary to biomass exposure are at risk of developing TB, their male counterparts have higher prevalence ratio. This might be because cigarette smoke-exposed patients have fewer cytokine-producing macrophages with diminished influx of interferon- γ producing effector T-cells in the lung than those without smoke exposure⁶. Long term use of oral corticosteroids in treating COPD causes diminished immunity which may be a risk factor for developing TB⁷.

CONCLUSION:

The results of this study show that COPD patients carry a significant risk of developing TB. TB may worsen their airway obstruction and decrease their life-expectancy. It is imperative for clinicians and health care personnel to observe for any symptoms of TB in such patients and to educate them in this regard so as to facilitate early diagnosis and treatment.

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