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STUDY OF PREVALENCE OF TUBERCULOSIS IN DIAGNOSED CASES OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Abstract

Background: Chronic respiratory disease is a collection of conditions that affect the lungs and airways primarily. It is linked to considerable morbidity and mortality. Because India has the biggest TB burden of any country on the planet, it is quite likely that it also has a significant burden of COPD that is related with TB. Present study was aimed to study prevalence of tuberculosis in diagnosed cases of chronic obstructive pulmonary disease. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in adults more than 18 years age, who had a definite history of pulmonary or extra pulmonary tuberculosis, had received complete anti-tuberculous therapy course & with a history of COPD diagnosis and presenting with chronic dyspnoea. **Results:** Among 119 patients, majority were males (73.1%). Mean age of the study population was 58.59 ± 12.89 years. Majority of the study Population had GOLD stage 2 of COPD (53.8%), while 21% had Stage 3 and 10.1% had stage 4 COPD. Prevalence of TB in COPD patients in the present study was found to be 28.6%. Amongst those with a history of TB, Patients with history of extra pulmonary TB had less severe stage of COPD. Majority of those with history of Pulmonary TB, presented with Stage 3 (12.6%) and Stage 4 (7.6%) of COPD. Spirometry observations of FEV1, FVC and FEF25-75 were significantly lower in Patients of COPD with previous history of Tuberculosis. There is a statistically significant association between history of TB and Severity of COPD. **Conclusion:** Prevalence of Tuberculosis in patients of COPD was 28.6%. Spirometry observations of FEV1, FVC and FEF25-75 were significantly lower in Patients of COPD with previous history of Tuberculosis.

Keywords: Tuberculosis, COPD, Spirometry, Pulmonary TB

Introduction

Chronic respiratory disease is a collection of conditions that affect the lungs and airways primarily. It is linked to considerable morbidity and mortality.[1] More than five percent of all deaths are attributed to chronic respiratory diseases, according to the World Health Organization (WHO), and about ninety percent of those deaths happen in low- and middle-income countries.[2]

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In adults, COPD is the most prevalent chronic respiratory disease, and bronchiectasis is another severe airway disease that combines clinical characteristics with bronchiectasis but is typically overlooked.[3] It is characterized by localized airway dilatation and a chronic productive cough[4], which leads to recurring respiratory infections, a decline in lung function, and a decrease in quality of life.[5,6]

The percentage of a country's population that is at risk for COPD because of cigarette smoking can range anywhere from over 70 percent in some high-income countries to around 40 percent in some low- and middle-income countries.[7] Other factors that may contribute to COPD in countries with low and intermediate incomes have not been identified; nevertheless, tuberculosis (TB) may very possibly play an essential influence.[8] Because India has the biggest TB burden of any country on the planet, it is quite likely that it also has a significant burden of COPD that is related with TB. Present study was aimed to study prevalence of tuberculosis in diagnosed cases of chronic obstructive pulmonary disease.

Material And Methods

Present study was single-center, prospective, observational study, conducted in Department of Pulmonary Medicine, Malla Reddy Narayana Multi-Speciality Hospital, Tertiary care centre attached to Malla Reddy Medical College for Women, Suraram, Quthbullapur, Hyderabad, Telangana, India. Study duration was of 18 months (January 2021 to July 2022). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- Adults more than 18 years age, who had a definite history of pulmonary or extra pulmonary tuberculosis, had received complete anti-tuberculous therapy course & with a history of COPD diagnosis and presenting with chronic dyspnoea, willing to participate in present study

Exclusion criteria

- Patients with bilateral destructive Bronchiectasis, Interstitial lung disease
- Patients previously diagnosed as cases of asthma, anaemia, renal failure, heart disease
- Patients who did not consent to participate in the study

Study was explained to patients in local language & written consent was taken for participation & study. The patients involved in this study are those presenting to chest OPD with history of TB and COPD. Only those were included who had typical post-tuberculous radiological changes in form of fibrosis, scaring, cavitation's etc. as it is difficult to ascertain history of TB due to unavailability of past medical records. 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.

The patients were subjected to spirometry using SPIROLAB-11-MIR S/N 507213. The technique was explained and test was conducted only after patients became familiar with the technique. Spirometry values were recorded as FVC, FEV1, and FEF 25-75. American Thoracic Society criterion for quality spirometry were strictly followed.

Data was analysed by SPSS version 16. Data was summarized by Mean ± SD for continuous data, and percentages for categorical data. The association between variables was

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done by Chi-Square test/Fisher exact test/Proportion test for categorical data. Comparison among three groups was done by one way analysis of variance (ANOVA) test for continuous data. All P-values less than 0.05 were considered statistically significant.

Results

A total of 119 patients who fit in the inclusion and exclusion criteria were studied. Mean age of the study population was 58.59 ± 12.89 years, with a range between 24 to 82 years. Majority of the study population were males (73.1%). Most of the Study population were males in the age group between 51 to 75 years (47.1%) followed by males in the age group between 26 to 50 years (16%). Most of the females in the study group were between 51 to 75 years (16%).

Table 1- General characteristics

Age Group	Sex		Frequency (%)
	Male	Female	
18-25 years	01 (0.8)	0 (0)	01 (0.8)
26-50 years	21 (17.6)	10 (8.4)	31 (26.1)
51-75 years	56 (47.1)	19 (16)	75 (63)
≥ 76 years	9 (7.6)	3 (2.5)	12 (10.1)
Total	87 (73.1)	32 (26.9)	119 (100)

Majority of the study population had normal BMI (73.1 %).

Table 2- BMI

BMI	No. of patients	Percentage
Undernourished (BMI <19.00)	18 (15.1)	
Normal (BMI 19.00 – 24.99)	87 (73.1)	
Overweight (BMI 25.00 – 29.99)	7 (5.9)	
Obese (BMI ≥30)	7 (5.9)	

Majority of the study Population had GOLD stage 2 of COPD (53.8%), while 21% had Stage 3 and 10.1% had stage 4 COPD. Prevalence of TB in COPD patients in the present study was found to be 28.6%. Pulmonary TB was observed to be more Prevalent amongst COPD patients with a history of TB compared to extra pulmonary TB. Majority of Patients with History of TB had stage 3 of COPD (13.45%). Amongst those diagnosed with Stage 3 and Stage 4 COPD, majority had a history of a TB proportionately.

Amongst those with a history of TB, Patients with history of extra pulmonary TB had less severe stage of COPD. Majority of those with history of Pulmonary TB, presented with Stage 3 (12.6%) and Stage 4 (7.6%) of COPD.

Table 3: Staging of COPD in Patients vs History of TB

GOLD Staging of COPD	History and Type of TB			Total (%)
	No TB	Pulmonary TB	Extra Pulmonary TB	
Stage 1	18 (15.1)	0 (0)	0 (0)	18 (15.1)
Stage 2	55 (46.2)	4 (3.4)	05 (4.2)	64 (53.8)

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Stage 3	09 (7.6)	15 (12.6)	01 (0.8)	25 (21)
Stage 4	03 (2.5)	09 (7.6)	0(0)	12 (10.1)
Total (%)	85 (71.4)	28 (23.5)	06 (5)	119 (100)

Mean FEV1 of 1.75±0.65, Mean FVC of 2.89±1.02, Mean FEV1/FVC of 0.58±0.83 and a Mean FEF 25-75 of 2.46±1.01 was reported in the study Population. There is a statistically significant difference in Patients of COPD with a history of TB when compared to Patients with no History of TB with respect to FEV1 observations in Spirometry. The Mean FEV_1 values of COPD Patients with History of TB were less than those without a history of TB

There is a statistically significant difference in Patients of COPD with a history of TB when compared to Patients with no History of TB with respect to FVC observations in Spirometry. The Mean FVC values of COPD Patients with History of TB were less than those without a history of TB.

There is no statistically significant difference in Patients of COPD with a history of TB when compared to Patients with no History of TB with respect to FEV1/FVC observations in Spirometry.

There is a statistically significant difference in Patients of COPD with a history of TB when compared to Patients with no History of TB with respect to FEF 25-75 observations in Spirometry.

Table 4: Tests for Association between TB and COPD in the study Population

	FEV1 (Mean ± SD)	**FVC (Mean ± SD)**	**FEV1/FVC (Mean ± SD)**	**FEF 25-75 (Mean ± SD)**
Total Study Population	1.75 ± 0.65	2.89 ± 1.02	0.58 ± 0.83	2.46 ± 1.01
Patients with History of TB	1.37 ± 0.46	2.24 ± 0.64	0.58 ± 0.08	1.61 ± 0.52
Patients without History of TB	1.89 ± 0.65	3.16 ± 1.03	0.59 ± 0.09	2.81 ± 0.95
ANOVA Test statistic	6.77 at df = 117	8.83 at df = 117	0.013 at df = 117	7.09 at df = 117
p value	0.01	0.004	0.91	0.009

There is a statistically significant association between history of TB and Severity of COPD.

Table 5: Association between history of TB and Stage of COPD

Severity of COPD*	**History of TB**		**Total (%)**	χ^2	**p value**
	No TB	**Pulmonary TB**			
Low	73 (61.3)	09 (7.6)	82 (68.9)	40.01, df=1	0.0001
High	12 (10.1)	25 (21)	37 (31.1)		
Total (%)	85 (71.4)	34 (28.6)	119 (100)		
Interpretation: Highly Significant					

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Discussion

The present study was conducted to find out hospital-based prevalence of TB associated COPD and to compare and analyse characteristics of Pulmonary function in patients of COPD with Tuberculosis with patients of COPD without Tuberculosis.

The mean age of the study population was 58.59 ± 12.89 years, with a range between 24 to 82 years. Most of the study population were in the age group between 51 to 75 years (63.1%) and majority were males (73.1%). Similar findings were noted by Baig *et al.*[9] (mean age was 56.4 years & majority were males). In study Agarwal *et al.*[10] studied 74 patients of COPD in a case control study in Chandigarh, India. Mean age of the study participants was 60.2±8.9 years, Males to females ratio was 8:1.

Prevalence of TB in COPD patients in the present study was found to be 28.6%. Majority of Patients with History of TB had stage 3 of COPD (13.45%). Amongst those diagnosed with Stage 3 and Stage 4 COPD, majority had a history of a TB proportionately. Amongst those with a history of TB, Patients with history of extra pulmonary TB had less severe stage of COPD. Majority of those with history of Pulmonary TB, presented with Stage 3 (12.6%) and Stage 4 (7.6%) of COPD.

Baig *et al.*[9] in their study on previously treated pulmonary TB patients found that 55.3% had an obstructive ventilatory defect of different degrees. Agarwal *et al.*[10] reported that out of the 74 patients with COPD, 30 (40.5%) had moderate stage of disease, 28 (40%) had severe stage of COPD and 12 (16.2%) had very severe stage of COPD.

Yakar *et al.*,[11] in their study observed that 93 patients (15%) had a past history of TB. On average, TB had been diagnosed 28.2±15 years before the study entry. The time of COPD diagnosis was observed to be 5 years earlier for the group with TB history as compared to the group without TB history (58.6±12.3 years vs 63.2±11.2 years, respectively; P = 0.001). During the prospective follow-up, the mean age for death was found to be ~5 years earlier in the group with TB history (68.3±11.4 years vs 73.4±9.8 years, respectively; P = 0.001).

A higher prevalence of TB reported in the current study participants is in consensus with the above studies, where it was also noted that prevalence of TB was higher in COPD patients. The high prevalence of TB in the current study despite major TB control activities being implemented in India since 4 decades maybe because Tuberculosis is highly endemic in the Indian Sub-continent. Inspite of the higher global prevalence and endemicity, the study concludes that Prevalence of TB is higher in COPD patients than in general populations.

In the present study, a statistically significant difference was observed in Patients of COPD with a history of TB when compared to Patients with no History of TB with respect to FEV1, FVC and FEF 25-75 observations in Spirometry.

Yakar *et al.*,[11] reported that Mean FEV1 value was notably lower in the group with past TB, and the difference approached near statistical significance (P=0.069). No significant association was found between TB history positivity and mean BMI or length of hospital stay (P=0.092 and P=0.58, respectively). Hnizdo *et al.*,[12] reported in their study that FEV_1 and FVC consistently decrease with episodes of Tuberculosis for all ages.

J.H.Lee and J.H.Chang[13] also reported that the FVC and FEV1 values were lower in TB related Chronic Airflow Obstruction (CAO) than in COPD group with no previous history of TB. The mean FVC of C COPD patients was 2.60±0.69 litres of COPD patients (P<0:05), and the average FVC% predicted was 57.9±14.8% (P<0:01). Following the bronchodilator

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inhalation, FEV1 of CAO patients was significantly lower than that of COPD patients (1.1570.30% vs. 1.3770.44l%; P<0:05).

The study by Agarwal *et al.*[10], the mean FEV_1 was 46.3±18.4 in COPD patients with TB compared to the patients of COPD without TB in whom the mean FEV_1 was 56.2±18.4. The mean FVC was 56.2±18.4 in COPD patients with TB compared to the patients of COPD without TB in whom the mean FVC was 59.3±18.2.

The present study resonates the findings regarding Pulmonary function tests in the above studies. Therefore, it can be stressed that Tuberculosis affected lungs have increased damage when additionally affected by COPD, thereby inflicting further respiratory function damage which may not fully be relieved even with bronchodilator therapy. The observations in this study are far more exaggerated when compared to the other studies with regards to depletion of pulmonary function tests in COPD patients with TB. This may be explained by the fact that diagnosis of TB usually happened later and a much-advanced stage in the past in India thereby causing more damage to the lungs before the initiation of therapy to treat TB.[14,15]

Limitations of present study were due to COVID 19 outbreak, many mild to moderate cases of COPD were not admitted. Other risk factors for COPD like smoking, genetic factors were not adjusted for.

Conclusion

Prevalence of Tuberculosis in patients of COPD was 28.6%. Majority of Patients with History of TB had stage 3 of COPD (13.45%). Amongst the COPD patients with Stage 3 and Stage 4 disease, majority had a history of a TB. Spirometry observations of FEV1, FVC and FEF25-75 were significantly lower in Patients of COPD with previous history of Tuberculosis. History of Pulmonary TB was significantly associated with severity of COPD.

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References

1. Murray CJ, Lopez AD. Measuring the global burden of disease. N Engl J Med 2013;369:448–57.
2. World Health Organisation website. Available online at; http://www.who.int/ respiratory/en/ (Accessed 3rd November, 2014).
3. Roberts H, Wells A, Milne D, Rubens M, *et al.* . . Airflow obstruction in bronchiectasis: correlation between computed tomography features and pulmonary function tests. Thorax 2000;55(3):198–204.
4. Rosen MJ. Chronic cough due to bronchiectasis. Chest 2006;129:122s–31s.
5. Martinez-Garcia MA, Soler-Cataluna JJ, Perpina-Tordera M, Roman-Sanchez P. Factors associated with lung function decline in adult patients with stable non-cystic bronchiectasis. Chest 2007;132:1565–72.
6. Martinez-Garcia MA, Perpina-Tordera M, Roman-Sanchez P, Soler-Cataluna JJ. Quality of life determinants in patients with clinically stable bronchiectasis. Chest 2005;128:739–45

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 01, 2024

7. Lopez AD, Mathews CD, Ezzati M, Jamison DT, Murray CJL. Global burden of disease and risk factors. Washington: The World Bank; 2006.
8. Buist S, Vollmer WM, McBurnie MA. Worldwide burden of COPD in high- and low-income countries. Part I. The burden of obstructive lung disease (BOLD) initiative. Int J Tuberc Lung Dis 2008;12:703–8.
9. Inam Muhammad Baig1 WSaKFK. Post-Tuberculous Chronic Obstructive Pulmonary Disease. Journal of the College of Physicians and Surgeons Pakistan. 2010 AUGUST; 20(8): p. 542-544.
10. Deepak Aggarwal AGAJMB. Evaluation of tuberculosis-associated chronic obstructive pulmonary disease at a tertiary care hospital: A case–control study. LUNG INDIA. 2017 AUGUST; 34(5): p. 415-419.
11. Halil Ibrahim Yakar, Hakan Gunen, Erkan Pehlivan. The role of tuberculosis in COPD. International Journal of COPD, 2017:12 323–329
12. Eva Hnizdo TSGC. Chronic pulmonary function impairment caused. BRITISH MEDICAL JOURNAL. 2000; 55: p. 32-38.
13. J.HLee JH. Lung function in patients with chronic airflow obstruction due to tuberculous destroyed lung. Respiratory Medicine. 2003 NOVEMBER; 97(11): p. 1237-1242.
14. Brian W. Allwood LM. A systematic review of the association between pulmonary tuberculosis and the development of chronic airflow obstruction in adults. RESPIRATION. 2013 MAY; 86: p. 76-85.
15. Chakrabarti B CPDP. Tuberculosis and its incidence, special nature, and relationship with chronic obstructive pulmonary disease. International Journal of Chronic Obstructive Pulmonary Disease. 2007 SEPTEMBER; 2(3): p. 263-272.