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TO EVALUATE THE PREVALENCE OF TUBERCULOSIS-ASSOCIATED OBSTRUCTIVE PULMONARY DISEASE (TOPD) AND ALSO CORRELATE CLINICO-RADIOLOGICAL CHARACTERISTICS AMONG NEVER SMOKERS IN A TERTIARY CARE HOSPITAL

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Abstract:

Background: Every day in India, more than 900 people die of Tuberculosis (TB) (~2 deaths every 3 minutes). Irreversible airway obstruction is an important sequelae of pulmonary tuberculosis (PTB) that might contribute to a significant proportion of Chronic obstruction pulmonary disease (COPD).

Objectives: This hospital-based study was planned to throw an insight into the prevalence of tuberculosis-associated obstructive pulmonary disease (TOPD) among non-smoking adults and to evaluate their clinico-radiological profile.

Materials and Methods: This was a cross-sectional study which was undertaken for a period of six months (January 2023- July 2023) and had a sample size of 100 patients all above the age of 18 years, never smoker. The relevant information was noted in a predesigned proforma. The pulmonary function test and radiological picture are analysed, and their interpretation were discussed.

Results: A total 100 treated tuberculosis patients who fulfilled our inclusion criteria were included in this study after obtaining informed consent. Among these patients, 46 were males

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and 54 were females. Mean age in our study was 48.3 years. Dyspnoea was the most common presentation in 75% of patients, followed by cough in 60% of patients. Out of these 100 patients, an obstructive pattern was seen in 45 patients (45%) and restrictive 38(38%). Among the 45 patients presented with an obstructive pattern, majority (48%) had moderate obstruction. The most common radiological presentation was parenchymal fibrosis (98%). The correlation between the Modified Medical Research Council (MMRC) grading of dyspnoea and the type of obstruction was performed, and it shows a significant association ($P< 0.05$). The correlation between ATT spells, lung lobe involvement in CT chest and number of lung lobe involvement with the pattern of obstruction showed a shows a significant association ($P<0.05$).

Conclusion: From our study, we conclude that there is significant airflow obstruction in patients who have been treated for pulmonary tuberculosis previously. We also noted that airflow obstruction among these patients is correlated with multi-lobar involvement and multiple numbers of anti-tuberculosis treatments.

Keywords: TB, COPD, TOPD, non-smoker, dyspnoea

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Introduction

Obstructive lung disease is characterized by chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible. The obstructive lung diseases include Chronic Obstructive Pulmonary Disease (COPD), bronchial asthma, bronchiectasis, cystic fibrosis, bronchiolitis, bullous diseases of the lung, and upper airway obstruction.

The mortality due to COPD is also showing an increasing trend. COPD was the fourth leading cause of death in 1990 and at present, it is the third leading cause of death globally[1]. By 2060, there will be more than 5.4 million deaths annually[2].

Every day in India, more than 900 people die of Tuberculosis (TB) (~2 deaths every 3 minutes).TB continues to be the leading killer disease for Indian adults among all infectious diseases. One-fifth of the world's TB incident cases are in India. India has the highest TB burden in the world. However, there are limited data on the prevalence and presentation of TB-associated COPD from this region[3].

Advanced tuberculosis (TB) can cause extensive destruction of lung parenchyma, which occurs over years in cases of chronic progressive TB, and this damage causes chronic airflow obstruction (CAO)[4]. Irreversible airway obstruction is important sequelae of pulmonary tuberculosis (PTB) that might contribute to a significant proportion of COPD. Patients were labelled as TB-associated COPD only if their symptom of COPD started after the episode of pulmonary TB.

COPD and tuberculosis are significant public health problems, particularly in developing countries. Smoking is the conventional risk factor for COPD[5]. However, non-smoking-related risk factors such as biomass fuel exposure, childhood lower respiratory tract infections, chronic asthma, outdoor air pollution, and prior history of pulmonary tuberculosis have become important risk factors of COPD, particularly in developing countries. Prompt diagnosis and

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treatment of tuberculosis should be emphasized to lessen the future burden of chronic airflow obstruction.

Although several studies focused on various aspects of COPD, there is limited data regarding non-smoker tuberculosis patients progressing to chronic obstructive airway disease. This current study helps to focus on the risk of development of COPD in post-tuberculosis patients who were non-smokers. This hospital-based study was planned to throw an insight into the prevalence of tuberculosis-associated obstructive pulmonary disease (TOPD) among non-smoking adults and to evaluate their clinico-radiological profile.

Materials and Methods

Our study was done at the Department of Respiratory Medicine of a tertiary care hospital in Mangalore, Karnataka. This was a cross-sectional study which was undertaken for a period of six months (January 2023- July 2023) and had a sample size of 100 patients all above the age of 18 years, never smoker (A never smoker was defined as a person who had smoked fewer than 100 cigarettes in their lifetime, including lifetime non-smokers), previously diagnosed as pulmonary tuberculosis (as per RNTCP/ NTEP guidelines) presenting with respiratory symptoms like dyspnoea, cough, wheeze and haemoptysis for which no alternative cause identified were included in our study based on simple random sampling method and patients with reactivated TB, History of current or previous smoking, bronchial asthma, interstitial lung disease, known history of cardiac disease, HIV/AIDs patients, and those not willing to participate in the study were excluded. The relevant information was noted in a predesigned proforma (case report form) after explaining about the study to the participant and getting approval of the participant in the specified consent form.

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The procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional) and with the Helsinki Declaration of 1975 that was revised in 2013.

Data presentation was done in the form of pie charts and bar diagrams. The software analysis were carried out using SPSS software version 19 and Microsoft Excel 2016. The pulmonary function test and radiological picture are analysed, and their interpretation were discussed.

Results:

A total 100 treated tuberculosis patients who fulfilled our inclusion criteria were included in this study after obtaining informed consent. Among these patients, 46 were males and 54 were females. Thus, males accounted for 41% of our study population while females accounted for 59%.

The age group of our study population (Table 1) was in the range of 18-74 years. The mean age was 48.3 years. The number of patients in the age group of 18-30 years was 8(8%) patients, in the age group of 31-45 years was 34(34%), patients in the age group 46- 60 years were 48 (48%) and patients above 60 years were 10(10%).

Table 1: Age Distribution of patients

Age group	**No. of patients**		**Total**	**Percentage (%)**
	Male	**Female**		
18-30	6	2	8	8
31-45	10	24	34	34
46-60	18	30	48	48
> 60	7	3	10	10

Among the 100 patients who fulfilled our inclusion criteria, were further evaluated for clinical manifestation. The common clinical presentations were: dyspnoea, wheezing, cough, and

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hemoptysis. Dyspnoea was the most common presentation in 75% of patients, followed by cough in 60% of patients. The wheeze was given in 20% of patients and hemoptysis was the least common clinical presentation, only in 10%.

Spirometry was performed in clinical settings. Out of these 100 patients, an obstructive pattern was seen in 45 patients (45%), restrictive 38(38%), normal 13(13%), and mixed 4 (4%). Among the 45 patients presented with an obstructive pattern, further grading of these patients was done into mild (43%), moderate (48%), severe (7%), and very severe (2%) obstruction. The correlation between the Modified Medical Research Council (MMRC) grading of dyspnoea and the type of obstruction (Table 2) was performed, and it shows a significant association ($P< 0.05$).

Table 2: Correlation between mMRC grading of dyspnoea and severity of obstruction in Spirometry

MMRC grading	**Type of Obstruction (No. of Patients)**				**Total**
	Mild	**Moderate**	**Severe**	**Very Severe**	
Grade 0	3	1	0	1	5
Grade 1	12	5	0	0	17
Grade 2	2	10	1	0	13
Grade 3	1	4	3	0	8
Grade 4	1	1	0	0	2

The correlation between ATT spells and the pattern of obstruction was performed (Table 3) and it shows a significant association ($P<0.05$).

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Table 3: Correlation between ATT spells and type of obstruction.

ATT spells	Type of Obstruction				Total
	Mild	Moderate	Severe	Very Severe	
1	13	12	2	1	28
2	6	8	1	0	15
3	0	2	0	0	2

Participants with obstructive patterns (45 patients) were further evaluated with Computed Topography (CT) Chest. The most common radiological presentation (Table 4) was parenchymal fibrosis (98%), followed by bronchiectasis (60%). Other CT abnormalities found were thin-walled cavity (36%), fibrothorax (24%), lymph node calcification (20%), aspergilloma (11%), pulmonary hypertension (11%) and pleural thickening present in (4%).

Table 4: Pattern of various radiological abnormalities (CT Chest)

CT Chest findings	No of Patients(n)	Percentage (%)
Parenchymal fibrosis	44	98%
Bronchiectasis	27	60%
Thin walled cavity	16	36%
Fibrothorax	11	24%
Lymph node calcification	9	20%
Aspergilloma	5	11%

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Pulmonary hypertension	5	11%
Pleural thickening	2	4%

The correlation was done between the pattern of obstruction and radiological evaluation (Table 5) and it shows a significant association ($P<0.05$) between these parameters.

Table 5: Correlation between radiological findings and severity of obstruction in spirometry.

Radiological findings	**Type of Obstruction**			
	Mild	**Moderate**	**Severe**	**Very Severe**
Parenchymal fibrosis	14	23	6	1
Bronchiectasis	4	15	8	0
Thin walled cavity	3	8	5	0
Fibrothorax	0	7	4	0
Lymph node calcification	0	6	3	0
Aspergilloma	0	5	0	0
Pulmonary Hypertension	0	3	2	0
Pleural thickening	2	0	0	0

The correlation between the number of lung lobe involvement in the CT Chest and the pattern of obstruction in spirometry (Table 6) was done and it shows a significant association ($P<0.05$) between these parameters.

Table 6: Correlation between spirometry findings and number of lung lobe involvement.

Spirometry	**No. of lung lobes involved**					**Total**
	One	**Two**	**Three**	**Four**	**Five**	
Mild	12	4	1	1	1	19

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Moderate	1	6	10	5	0	22
Severe	0	0	0	1	2	3
Very Severe	0	0	0	0	1	1

Discussion

This cross-sectional study was done over six months in a tertiary care hospital. Data were collected from the participants in a case report form and were recorded and analyzed. Based on the inclusion criteria, 100 patients were included in our study, after obtaining consent from each participant. In our study, the prevalence of tuberculosis-associated obstructive pulmonary disease patients was 45%, whereas a study conducted by Allwood BW et al.[6], shows a prevalence of 83.5%. Another study conducted in India by Aggarwal D et al.[3], shows a prevalence of tuberculosis-associated obstructive pulmonary disease of 32.4%. However, in both these studies, smokers were not excluded.

Gender Distribution

The participants were randomly included in this study and it showed a slight female predominance of 59% and the rest were males 41%. Inspite of a large male smoking population being excluded to focus on never smokers, the obstructive pattern was seen in males than females, in line with other studies[7.,8].

Age Distribution

The age group of patients included in this study range from 18-74 years. The mean age of the study was 48.3 years. In general, tuberculosis-associated lung damage occurs earlier (<40 years) whereas smoking-associated lung damage occurs slowly and 76 later in age group[9]. In a

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study conducted by Aggarwal et. al.[3], there was a younger age preponderance in TB-associated COPD. In the PLATINO study[10], a history of tuberculosis and airflow obstruction had a strong association among subjects aged more than 40 years. In our study, TOPD was common among age group 46-60 years (48%).

Clinical characteristics

The common clinical presentation of our study participants was dyspnoea (75%), cough (60%), wheeze (20%) and hemoptysis (10%).

Spirometry

The majority (45%) of the patients (45 patients) showed an obstructive pattern in spirometry, followed by restrictive 38%, normal 13%, and mixed pattern 4%. The most common presentation among these patients with airflow obstruction were dyspnoea and cough. In the previous related study shows, that hemoptysis was commonly associated with TOPD when compared to COPD[9]. There are quite a number of participants in our study with similar manifestations.

Among the patients presented with obstructive patterns, further grading of these patients was done. Mild obstruction was seen in 43%, moderate obstruction in 48%, severe 7%, and very severe obstruction in 2% of the participants. In general pattern of obstruction depends on the degree of involvement of the airway.

Correlation between mMRC grading of dyspnoea and severity of obstruction in spirometry

The test of association was performed between the mMRC grading and type of obstruction and it showed a significant association ($P < 0.05$) between these two parameters. In our study, nine out of 45 patients had a cough as a presenting complaint without dyspnoea but had mild (6) and moderate (3) obstruction in spirometry. The patients with a higher grade of dyspnoea had

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a more severe obstruction in the airways. The observation found in this study is consistent with the other studies[11,12]. The severity of airflow obstruction of patients showed a positive association with the grading of the dyspnoea.

Correlation between ATT spells and type of obstruction

The test of association was performed between number of ATT spells and pattern of obstruction and it show positive association ($P<0.05$) between the ATT spells and pattern of obstruction. As the number of ATT spells increases, there will be more destruction of the lung parenchyma which may probably lead to severe airflow obstruction[3].

Radiological patterns in patients with airflow obstruction

CT Chest further evaluated participants with obstructive pattern (45 patients). The most common radiological presentation was parenchymal fibrosis (98%), followed by bronchiectasis (60%), both of which are common sequelae of pulmonary tuberculosis. Mycobacterium tuberculosis microorganism is known to 78 spread via the endo-bronchial route and is seen to produce a chronic granulomatous reaction in airways and lung parenchyma which later heals by fibrosis and can lead to bronchiectasis. A study conducted by Panda A et al.[13] showed predominant radiological findings as fibrosis and bronchiectasis and our study also shows similar findings. Moreover, there was clinical significance in these radiological findings. Fibrosis and bronchiectasis were significantly different in patients with or without complaints of dyspnoea. A significant correlation with grades of dyspnoea was also seen in our study. The majority of patients showed one or more pattern of abnormalities radiologically. Although a majority of patients presented with overlapping radiological features, patients who had predominant parenchymal fibrosis, cystic type of bronchiectasis, fibrothorax, and fibro cavity disease had moderate to severe types of obstruction. The test of association between the number of lobes of lung involvement in the CT chest and pattern of obstruction in spirometry was done

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and it shows a significant association (P<0.05) between these parameters. The most common lobe involved was right upper lobe, followed by the left upper lobe. Those presented with multiple lobe involvement had a severe grade of obstruction in spirometry. The increasing extent of the disease, increasing age, and location of the involved lobe can all affect the airflow. The major limitation of our study was less sample size, inadequate information about the second-hand smoking, post tubercular asthma had not be excluded in two patients who showed bronchodilator reversibility in spirometry and comparison of radiological findings of patients with other patterns in spirometry were not included.

Conclusion

From our study, we conclude that there is significant airflow obstruction in patients who have been treated for pulmonary tuberculosis previously. We also noted that airflow obstruction among these patients is correlated with multi-lobar involvement and multiple numbers of anti-tuberculosis treatments. As pulmonary tuberculosis is one of the risk factors for the development of chronic obstructive pulmonary disease, appropriate treatment is to be instituted in these patients and then be regularly followed up to reduce the future development of obstructive pulmonary disease.

References

1. Sarkar M, Srinivasa, Madabhavi I, Kumar K. Tuberculosis associated chronic obstructive pulmonary disease. Clin Respir J. 2017 May;11(3):285-295

2. Halbert RJ, Natoli JL, Gano A, Badamgarav E, Buist AS, Mannino DM. Global burden of COPD: systematic review and meta-analysis. Eur Respir J 2006; 28(3): 523-32

3. Aggarwal D, Gupta A, Janmeja AK, Bhardwaj M. Evaluation of tuberculosis-associated chronic obstructive pulmonary disease at a tertiary care hospital: A case-control study. Lung

ISSN: 0975-3583, 0976-2833 VOL16, ISSUE 01, 2025

India. 2017 Sep-Oct;34(5):415-419.

4. Lee JH, Chang JH. Lung function in patients with chronic airflow obstruction due to tuberculous destroyed lung. Respir Med. 2003 Nov;97(11):1237-42.

5. Michael A. Grippi, Jack A. Elias, Jay A. Fishman, Robert M. Kotloff, Allan I. Pack, Robert M. Senior, Mark D. Siegel, Fishman's Pulmonary Diseases and Disorders, Fifth Edition, McGraw-Hill Education,2015

6. Brian W. Allwood , Rencia Gillespie , Maya Galperin-Aizenberg , Mary Bateman , Helena Olckers , Luis Taborda-Barata ,Mechanism Of Airflow Obstruction In Tuberculosis-Associated Obstructive Pulmonary Disease (TOPD),ATS Journal;2014,22;189

7. Zhou Y, Wang C, Yao W, et al. COPD in Chinese nonsmokers. Eur Respir J. 2009;33(3):509–518.

8. Celli BR, Halbert RJ, Nordyke RJ, Schau B. Airway obstruction in never smokers: results from the Third National Health and Nutrition Examination Survey. Am J Med. 2005;118(12):1364–1372.

9. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012; 380(9859): 2095-128.

10. Menezes AM, Perez-Padilla R, Jardim JR, et al. Chronic obstructive pulmonary disease in five Latin American cities (the PLATINO study): a prevalence study. Lancet 2005; 366(9500): 1875-81.

11. Lopez AD, Shibuya K, Rao C, et al. Chronic obstructive pulmonary disease: current burden and future projections. Eur espir J 2006; 27(2): 397-412

12. Miller MR, Hankinson J, Brusasco V, et al. Standardisation of spirometry. Eur Respir J 2005; 26(2): 319-38.

ISSN: 0975-3583, 0976-2833 VOL16, ISSUE 01, 2025

13. Panda A, Bhalla AS, Sharma R, Mohan A, Sreenivas V, Kalaimannan U, Upadhyay AD. Correlation of chest computed tomography findings with dyspnea and lung functions in posttubercular sequelae. Lung India. 2016 Nov-Dec;33(6):592-599.