



## Original Research Article

# Chronic obstructive pulmonary disease as a comorbidity in pulmonary tuberculosis patients in Manjeri, Kerala

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## ABSTRACT

**Introduction:** Chronic obstructive pulmonary disease as a comorbidity among pulmonary tuberculosis patients is less studied in south India.

**Objective:** To determine the proportion of Pulmonary tuberculosis patients in Manjeri Tuberculosis Unit who have COPD as a co-morbidity.

**Materials and Methods:** Study design -Cross sectional study. Study setting -Manjeri Tuberculosis unit of Malapuram district. Study population -All diagnosed Pulmonary Tuberculosis patients registered in the Manjeri Tuberculosis unit of Malapuram district. Sample size- 178 patients satisfying inclusion criteria. Study tools- Questionnaire – A structured questionnaire used for collecting the basic demographic data and patient characteristics. COPD screener tool to be applied at the start of treatment. Pulmonary function test at end of intensive phase in patients or when patients are sputum smear negative, whichever is later.

**Results:** Of the total 181 persons who participated in the study 114[62.98%] were males. 35[19.34%] were smokers. 70 persons reported to have some form of chronic respiratory illness in the past. By using the COPD screener tool, 70 persons [38.89%] had score from 5 to 10 implying that they had high chance of having COPD. Spirometry was done for 174 persons. 31(17.81%) persons showed evidence of obstructive airway disease.

**Conclusion:** The prevalence of COPD among pulmonary tuberculosis patients was 17.81%. In a high tuberculosis burden country like India, more studies are needed to find out how COPD in tuberculosis patients adversely affects the disease progression, morbidity, and mortality.

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## 1. Introduction

Tuberculosis (TB) is a major cause of mortality and morbidity from a curable infectious disease in adults. Tuberculosis is caused by Mycobacterium Tuberculosis. TB has been affecting mankind for the last 5000 years. Sir Robert Koch discovered the bacilli in 1882. More than 1.3 million people die of tuberculosis every year worldwide. Tuberculosis continues to be a major public health problem in India and the World. There are about 10 million new cases of tuberculosis in the world every year.<sup>1</sup> India has the

largest number of tuberculosis patients in the world. India has an incidence of 2.79 million new cases and 435,000 deaths every year. In our country a major proportion of the TB burden is among the working age group. The people in the age group of 15-69 years account for 89% of TB cases in our country.<sup>2</sup>

For tackling the menace of tuberculosis in our country, the Government of India launched the National Tuberculosis Programme (NTP) in 1962. In 1992, a joint review conducted by the Government of India and World Health Organization found out that despite the existence of the NTP, many TB patients were not being accurately diagnosed and that the majority of diagnosed patients

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could not complete treatment. There was shortage of medicines as well as good diagnostic modalities. Based on the recommendations of the review, a new programme the Revised National Tuberculosis Control Programme (RNTCP) was developed. The major highlight of this programme was DOTS (Directly observed therapy short course). RNTCP was started in the year 1993, however large scale implementation of the RNTCP began in the year 1998, and by 2006 the whole country was covered. 1.29 million TB patients were initiated on treatment in 2005. By 2006 this number grew to 1.39 million and in 2007, 1.48 million patients were put on treatment. In 2009, the number of patients put on treatment reached 1.53 million.<sup>3</sup>

RNTCP with its DOTS strategy was a success in India. It has consistently achieved treatment success rate of more than 85%, and case detection was close to the global target. Success of RNTCP greatly helped in TB control in India. In 2007 RNTCP for the first time was able to achieve case detection ratio of 70% which was the global target. In the first phase of RNTCP (1998-2005), the programme focussed on ensuring expansion of quality DOTS services to the entire country.<sup>3</sup> In 2018, RNTCP was able to notify 21.5 lakh cases. Compared to the previous year this represents a 16% increase. Of the total notified cases, 25% (5.4 lakh) cases were from the private sector. This signifies a mammoth 40% increase from the last year. Among the notified cases, treatment was successfully initiated for about 19.1 lakh cases (~90%), across both public and private sectors. Thus private sector has been actively engaging in RNTCP activities.<sup>2</sup>

In May 2014, The World Health Assembly, adopted the WHO's "Global strategy and targets for tuberculosis prevention, control and cure after 2015". This was called the "END TB Strategy". This was a 20 year strategy. The vision of this strategy is a "world free of TB", and has targets to reduce TB deaths by 95% and to cut new cases of TB by 90% between 2015 and 2035, and it also aims to ensure that no family is burdened with catastrophic expenses due to TB. India is doing a lot to improve the diagnosis of TB and to move towards goal of universal drug susceptibility testing. India is committed to achieve the targets under the END TB Strategy.

The state of Kerala in south India had notified 20969 TB patients in the government sector and 26324 cases in the private sector in the year 2016.<sup>4</sup> The state has a robust health system in place. The state however is now facing an epidemiological transition from infectious diseases to non-infectious diseases. Dr. SK Jindal and team have studied the epidemiology of chronic obstructive pulmonary disease (COPD) in India. The Insearch study conducted by them showed the burden of COPD (as measured by chronic bronchitis) as 3.5% in persons above 35 years of age.<sup>5</sup> However in the same INSEARCH study, the site in Kerala, Trivandrum had a high prevalence of COPD at 10%. This

is much higher than the National average. Another study done in Kollam district in Kerala showed that the prevalence of self reported asthma was 2.82% and that of chronic bronchitis was 6.19%, while other chronic respiratory diseases which did not fit to either of these two constituted 1.89%.<sup>6</sup> Identifying COPD as a major non communicable disease in Kerala, the state government started a public health program for COPD, The Kerala COPD Prevention and Control Programme, "SWAAS".<sup>7</sup> This initiative was one of the first such in the public sector in our country.

Previous studies have shown that diabetes as a common co-morbidity in TB patients.<sup>8</sup> The proportion of Diabetes in TB patients in Kerala ranges from 32% to 44% in various studies.<sup>9</sup> However fewer studies have looked at COPD as a co-morbidity in TB in Kerala. Developing countries in the world are facing the double burden of communicable diseases like tuberculosis, and human immunodeficiency virus infection (HIV) infection, and noncommunicable diseases like smoking and COPD. The convergence of these factors may create a huge health problem and thereby increase the susceptibility to diseases. Optimal management of these conditions is required to tackle this menace.<sup>10</sup> In the article by Agarwal et al. published in Lung India, 32.4% of COPD patients had a history of TB.<sup>11</sup> In the PLATINO study which was done in south America, a comparison was done in COPD patients with and without history of TB. They found out that airway obstruction was observed in 30.7% of patients with a positive history of TB, whereas the incidence for the same in those patients without a prior history of TB was only 13.9%.<sup>12</sup>

TB is common in COPD patients because

1. Common risk factors like smoking.<sup>13,14</sup>
2. Macrophage dysfunction making the COPD patients more susceptible to TB.<sup>13</sup>
3. Recurrent hospitalization in Pulmonary Medicine wards putting them at high risk of recent infection from TB patients
4. Corticosteroids reducing immunity and making patients susceptible to develop TB disease

TB is now considered as an independent risk factor for developing COPD (GOLD guidelines).

The problems in COPD-TB as co-morbidity include

1. Increase risk of complications like pneumothorax
2. Increased chance of drug-drug interaction
3. Increased risk of respiratory failure and mortality
4. Greater need for hospitalization
5. Issues related to infection control when patients need care in high dependency units and intensive care units.

COPD as a co-morbidity in TB patients would greatly hinder the state efforts to achieve the END TB targets owing to higher mortality and increased risk of catastrophic expenditure. Hence this study would result in evaluating

this major association among TB patients, and help in formulating strategies for screening and management of COPD in TB patients.

## 2. Materials and Methods

To determine the proportion of Pulmonary TB patients in Manjeri Tuberculosis Unit (TU) who have COPD as a comorbidity

### 2.1. Study design

Cross sectional study.

### 2.2. Study setting

Manjeri TU of Malapuram district.

### 2.3. Study population

All diagnosed Pulmonary TB patients registered in the Manjeri TU of Malapuram district.

### 2.4. Sample size

Expecting that about 35% of patients would have co-existing COPD, the sample size was estimated as 178 using the formula.

$$n = (1.96)^2 \times (0.35 \times 0.65) / (0.07 \times 0.07)$$

(P is set at 0.35, q=1-p, d is set at 20% of p)

### 2.5. Sampling

About 45 pulmonary TB patients are diagnosed and registered in Manjeri TU in each quarter, hence recruitment for one year will yield the sample size required for the study.

### 2.6. Study period

July 2018 to June 2019.

### 2.7. Selection of samples

All consecutive pulmonary TB patients diagnosed and registered in Manjeri TU in one year.

### 2.8. Inclusion criterion

Pulmonary TB patients diagnosed and registered in Manjeri TU.

### 2.9. Exclusion criterion

1. Patients diagnosed as Rifampicin resistant and started on Multi drug resistant TB treatment.
2. Any patient not willing to take part in the study.
3. Children less than 15 years of age.

### 2.10. Definitions

1. Pulmonary TB – microbiologically confirmed or clinically diagnosed pulmonary TB cases.
2. COPD – Initial clinical diagnosis by using modified COPD screener tool – a tool by COPD Foundation.

It is a self-administered questionnaire that contains five items. It was validated for screening individuals in the general population who are at high risk of having COPD. The five questions included in this tool, consists of three COPD-related questions (breathlessness, productive cough, and activity limitation) and one question, each regarding smoking history and age. Score of 5 to 10 implies high chances of COPD.

Diagnosis confirmed at end of IP or when the patient turns smear negative, whichever is later, by GOLD criteria by doing spirometry (post bronchodilator  $Fev1/FVC < 0.7$ )

### 2.11. Study tools

1. Questionnaire – A structured questionnaire used for collecting the basic demographic data and patient characteristics
2. COPD screener tool to be applied at the start of treatment
3. Pulmonary function test at end of IP in patients or when patients are sputum smear negative, whichever is later

Analysis – Data entry was done in Epidata and data analysis was done using EPI Info.

### 2.12. Ethical issues

Institutional ethical committee clearance was obtained. Administrative sanction from the State tuberculosis officer and State OR committee were obtained. Informed consent from patient was obtained. Confidentiality over patient information was strictly maintained

## 3. Results

Patients participated in the study.

Of the total 181 persons who participated in the study 114[62.98%] were males. 35[19.34%] were smokers. 70 persons reported to have some form of chronic respiratory illness in the past. There was one HIV positive patient. Table 1

70 persons [38.89%] had score from 5 to 10 implying that they had high chance of having COPD. Table 2

Spirometry was done for 174 persons. It was normal in 123 persons. 31 persons showed evidence of obstructive airway disease. Table 3

Persons had random blood sugar levels above 200 mg/dl at the start of treatment. Table 4

**Table 1:** General characteristics of patients included in the study

Variables	Number	Percentage
Females	67	37.02
Diabetes	48	26.52
Hypertension	38	20.99
Chronic respiratory diseases	70	38.67
IHD	2	1.10
Psychiatry illness	1	0.55
Seizure disorder	0	0
HIV	1	0.55
Liver disease	0	0
Smoking	35	19.34
Alcoholic	8	4.42
Pan chewing	10	5.52
Other drug addictions	1	0.55

**Table 2:** COPD screening tool

Score of COPD screening tool	Frequency	Percentage
0	3	1.67%
1	7	3.89%
2	33	18.33%
3	32	17.78%
4	35	19.44%
5	34	18.89%
6	17	9.44%
7	10	5.56%
8	6	3.33%
9	1	0.56%
10	2	1.11%

**Table 3:** Spirometry.

Spirometry	Frequency	Percentage
Normal	123	70.69%
Obstructive	21	12.07%
Restrictive	20	11.49%
Mixed	10	5.75%

**Table 4:** Blood sugar levels at the start of treatment

RBS	Frequency	Percentage
< 200 mg/dl	150	84.26
200- 300 mg/dl	24	13.48
>300 mg/dl	4	2.25

**Table 5:** Chest X-Ray

CXR	Frequency	Percentage
Consolidation	120	66.67%
Cavity	28	15.56%
Fibrosis	13	7.22%
Miliary shadows	3	1.67%
Fibrocavity	8	4.44%
Normal	6	3.33%
Bronchiectasis	2	1.11%

Consolidation was the most common abnormality found in X-ray chest. In 6 persons X-ray was normal. Table 5

**Table 6:** Sputum AFB

Sputum AFB	Frequency	Percentage
1+	50	27.93%
2+	42	23.46%
3+	32	17.88%
scanty	50	27.93%
negative	5	2.79%

Sputum AFB was negative in 5 persons. Majority were 1+ or scanty positive. Table 6

**Table 7:** CBNAAT

CBNAAT	Frequency	Percentage
Mycobacteria detected rifampicin sensitive	178	98.89%
Mycobacteria not detected	2	1.11%

CBNAAT was negative for mycobacterium tuberculosis in 2 persons. Table 7

**Table 8:** Death & lost to follow up

	Frequency	Percentage
Death	2	1.10
Lost to follow up	2	1.10

#### 4. Discussion

181 persons participated in the study. 114 [62.98%] were males. 35 [19.34%] were smokers. 70 persons reported to have some form of chronic respiratory illness in the past. There was one HIV patient. Two persons had died and two were lost to follow up.

Using COPD screener tool, 70 persons [38.89%] had score from 5 to 10 implying that they had high chance of having COPD. This was confirmed by doing a spirometry when the patient became smear negative. Spirometry was done for 174 persons. It was normal in 123 persons. Obstructive pattern was present in 21 patients. 10 persons had mixed pattern. 31 [17.81%] persons had evidence of obstructive airway disease. This was lower than the study conducted by Agarwal et al. in which 32.4% of COPD patients had a history of TB. In the PLATINO study conducted in South America, a comparison was made between COPD patients with history of TB and those without. It was found that airway obstruction was observed in 30.7% of patients who had a positive history of TB, while the incidence for the same without a positive history of TB was 13.9%.

X-ray chest was taken and Consolidation was the most common abnormality found in X-ray chest. It was present in 120 [66.67%] persons. In 6 persons X-ray was normal

Sputum AFB was negative in 5 persons. Majority were 1+ or scanty positive. CBNAAT was negative for mycobacterium tuberculosis in 2 persons. In 178[98.89%] persons mycobacteria was detected and it was rifampicin sensitive

## 5. Limitations

70 persons (38.67%) reported to have some form of chronic respiratory illness in the past. There were 35(19.34%) smokers. We could not do spirometry for all patients at the beginning of the study itself as majority of them were sputum positive. When they turned sputum negative, spirometry was done. Hence we are not able to say accurately, whether the obstructive pattern in spirometry was present earlier itself or developed after patient developed tuberculosis.

## 6. Conclusion

17.81% of patients started on anti tuberculous therapy had evidence of chronic obstructive pulmonary disease in our study. Hence we recommend early diagnosis and management of COPD among pulmonary tuberculosis patients to reduce mortality and morbidity. In a high TB burdened country like India, more studies are needed to find out how COPD in TB adversely affects the disease progression, morbidity, and mortality.

## 7. Acknowledgment

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## 8. Conflict of Interest

The authors declare that they have no conflict of interest.

## 9. Source of Funding

None.

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