

# Diagnostic Yield of Bronchoscopy in Lower Lung Field Tuberculosis

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## Abstract

**Background:** Pulmonary tuberculosis (PTB) in the adult may present with unusual X-ray patterns that may lead to diagnosis in the direction other than TB. When TB is confined to the lower lung fields, it often presents as pneumonia and the correct diagnosis gets delayed. Early diagnosis and treatment help in the prevention of complications and hospital stay. This 2 years prospective study was designed to study clinical profile, outcome, and role of bronchoscopy in sputum negative cases.

**Materials and Methods:** All the patients of PTB with lesions below an imaginary line across the hila in the chest radiograph were included. HIV testing, sputum for acid-fast bacilli (AFB), blood sugar, and other relevant investigations were performed in each patient. The yield of bronchoscopy in bacteriologic diagnosis in sputum negative cases was noted.

**Results:** Out of 1811 cases of PTB patients, 42 cases had lower lung field TB (LLFTB). It was more common in females 28 (66%). The majority of patients 27 (64%) were in the 16-40 years age group. Unilateral disease was more common 29 (69%) and the right side was more frequently affected 31 (73.8%). Consolidation 28 (66.6%), cavitation 9 (21.4%), and nodular opacities 5 (11.9%) were the main radiological findings. Fiberoptic flexible bronchoscopy yielded AFB in 18 (42.9%) cases.

**Conclusion:** Diagnosis requires a high index of suspicion. Diabetes mellitus, HIV, and lung cancer increase the risk of LLFTB. Fiberoptic flexible bronchoscopy helps in diagnosis in sputum negative cases.

**Key words:** Fiberoptic flexible bronchoscopy, HIV, Lower lung field tuberculosis, Sputum negative pulmonary tuberculosis

## INTRODUCTION

An important preventable and treatable cause of death causing a major health problem worldwide is pulmonary tuberculosis (PTB). In the year 2011, there are 8.7 million new cases of TB (13% co-infected with HIV) and 1.4 million people died from TB including almost one million deaths among HIV-negative individuals and 430000 among people who were HIV-positive.<sup>1,2</sup>

PTB commonly affects upper lobe, however, lower lung field cannot be ruled out easily. This often causes great confusion in the diagnosis, especially in non-resolving pneumonia. HIV/AIDS epidemic has considerably

increased the incidence of middle and lower lung field TB (LLFTB)<sup>3</sup> which is frequently associated with negative sputum smear due to lower bacillary load.<sup>4</sup>

Since Laennec's era, lower lobe TB was a rare entity.<sup>5</sup> In 1866, Kidd stated that "apex of lower lobe is very prone to tubercular disease and may be attacked before the apex of the upper lobe."<sup>6</sup> When TB affects lower lung fields, it confuses clinicians as pneumonia and hence delays accurate treatment and increases cost and hospital stay of patients. Therefore, a high index of suspicion is the key to the diagnosis of LLFTB.

LLFTB is defined as "TB disease found below an imaginary line traced across the hila and including the para-hilar regions on a standard posterior-anterior chest x-ray without the concomitant involvement of upper lobe."<sup>7</sup>

Anatomically, this includes the right middle lobe and lingula, in addition to the lower lobes.

The proposed pathogenesis is the ulceration of a bronchus by a lymph node with spillage into the bronchus. Many

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authors believe it may be a continuum of primary TB or soon after, in the post-primary phase.<sup>8</sup>

Detecting patients with active LLFTB help in giving early appropriate treatment and render these patients non-infectious. Under the World Health Organization (WHO)<sup>9</sup> program, which implemented successfully in high burden countries including India's Revised National TB Control Program (RNTCP),<sup>10</sup> the diagnosis of PTB is based on sputum smear examination. Sputum microscopy is a highly specific test, a low-cost and appropriate technology and is an essential component of the directly observed treatment.

However, in patients with LLFTB sputum smears do not reveal acid-fast bacilli (AFB) in all patients. Mycobacterial cultures take at least 6-8 weeks' time for confirming the diagnosis and thereby a valuable time is lost. Sputum smear-negative (SSN) TB still remains a common problem faced by the clinicians. This is particularly true in the case of children, those with HIV, and diabetes patients.

Flexible fiberoptic bronchoscopy (FOB) and bronchoalveolar lavage and sample for AFB staining have helped in early identification with LLFTB. Since early diagnosis and treatment play an important role in the prevention of TB, therefore, a proper understanding about its clinical, radiological, and bacteriological presentations, as also the outcome of treatment is very essential.

## MATERIALS AND METHODS

This study was conducted in tertiary care hospital from July 2012 to June 2014. There were a total of 1811 patients diagnosed as cases of PTB during the study period. Patients who had pulmonary, extra PTB, or both were considered as cases of PTB and included in this study. PTB was diagnosed by detailed history, clinical examination, chest radiograph, and sputum for AFB examination by Ziehl-Neelsen method and culture on LJ media. Those patients, whose sputum was negative for AFB by direct smear and by culture, were diagnosed as cases of sputum negative PTB (SSN-PTB). Definitive diagnosis was made by recovery of AFB in the sputum or flexible FOB and bronchial lavage for AFB. Whenever the patient was sputum negative, FOB was done to make a definitive diagnosis. Informed consent was taken from all patients for the study and during the bronchoscopy procedure. After the procedure, the bronchoscope was properly checked according to guidelines for appropriate sterilization to avoid false positive cases.

An arbitrary horizontal line on chest radiograph postero-anterior view across the hila was taken as the

dividing line between upper and lower lung fields. A total of 42 patients had lower lung field TB.

Exclusion criteria included patients with age <16 years, cases involving either ipsilateral or contralateral involvement of both upper and lower lung fields, pleural effusion, and thickening unless associated with parenchymal lesions in the area involved. HbA1C level, fasting and post-prandial blood sugar levels were used to diagnose diabetes. HIV testing was done according to the NACO guidelines.<sup>11</sup> All patients were treated with short course chemotherapy according to the WHO guidelines.<sup>4</sup>

## RESULTS

During the study period from July 2012 to June 2014, there were 1811 cases with PTB of which 42 had lower lobe TB (LLT). The incidence of lower lung field TB was 2.3% Table 1. It was more common in females 28 (66%) than in males 24 (34%). The youngest patient during our study was 16-year-old, and oldest was 71 years. The highest incidence was observed in 16-45 years age group patients 27 (64%).

The presenting symptoms were a cough, with or without expectoration, in all patients (100%), followed by fever in 23 (54.7%), chest pain (49%), hemoptysis (11%), and weight loss in 13% patients. Risk factors were seen in 26 patients of which diabetes in 18 patients, HIV in 5, pregnancy and lung cancer 3 cases each (Table 2).

Radiological observation seen was consolidation in 28 (66.6%), cavity in 9 (21.4%) followed by non-homogeneous opacities in 11.9% patients. Cavitation was less common finding in HIV-infected patients. In diabetic patients, consolidation was commonly seen. Right lung involvement

**Table 1: Incidence of LLFTB**

Authors	Total tuberculosis cases	Subjects with LLT	Incidence of LLT (%)
Berger <i>et al.</i> <sup>7</sup>	386	27	7
Hamilton <i>et al.</i> <sup>15</sup>	349	10	3
Parmer <sup>8</sup>	1455	50	3.4
Viswanathan <sup>13</sup>	638	41	6.4
Present study	1811	42	2.3

LLFTB: Lower lung field tuberculosis, LLT: Lower lobe tuberculosis

**Table 2: Clinical features of patients with LLT**

Authors	Cough (%)	Fever (%)	Chest pain (%)	Hemoptysis (%)	Weight loss (%)
Berger <i>et al.</i> <sup>7</sup>	25 (1.3)	22 (82)	16 (59)	12 (44)	12 (44)
Hamilton <i>et al.</i> <sup>15</sup>	10 (100)	2 (20)	8 (80)	5 (50)	
Viswanathan <sup>13</sup>	41 (100)	6 (15)	7 (17)		
Present study	42 (100)	29 (69)	17 (40.4)	6 (14)	5 (11.9)

LLT: Lower lobe tuberculosis

was more frequently affected in 31 (73.8%) patients. Left lung was involved in 8 (19.1%) patients, and bilateral involvement was there in 3 (7.1%) patients. Sputum was positive for AFB in 24 (57.1%) patients. Fiberoptic flexible bronchoscopy was used to diagnose when there was a strong suspicion of TB. Bronchoscopy washings yielded AFB in 18 (42.9%) cases.

## DISCUSSION

Kidd first reported the case of LLFTB in 1886. The incidence of LLFTB varies from reports from different parts of the world.<sup>12-14</sup> It varies from 0.63%<sup>12</sup> to 6.4%.<sup>13</sup> In our study, we observed an incidence of 2.3%.

All studies, including our study except a few, showed female predominance.<sup>8,12</sup> The probable explanation being that females have costal type of respiration resulting in poor ventilation of and hence higher chances of TB.<sup>13,14</sup> In our study, the patients with LLFTB 27 (64%) were in the age group of 16-45 years. This was also found in other studies.<sup>15-17</sup>

About 5 of our patients had HIV with lower lobe TB. In HIV persons based on CDC counts presentation differs. With lower immune status, favors mid and lower lung zone TB<sup>3,4</sup> and cavitation is less common. In a study by Purohit *et al.*<sup>18</sup> had also reported mid and LLFTB in more than 50% cases. Diabetes mellitus was associated in 18 cases. Studies have shown<sup>15-17,19</sup> higher incidence of LLFTB in diabetics.

The common symptoms were a cough (100%) followed by fever, hemoptysis, chest pain, and weight loss. This finding was also observed in other Indian studies.<sup>8,13,17</sup> Weight loss was prominent in HIV patients. The right lung was more predominantly involved in 60% patients was also seen in other studies.<sup>8,13,15</sup> The right side of the lung is more common than left due to anatomical factors. There is a higher incidence of right-sided hilar lymphadenopathy which may rupture through any bronchus and can cause lower zone infection.<sup>18</sup>

Microbiological study of sputum yielded AFB 24 (57.1%) and flexible FOB in 18 (42.9%) cases whenever sputum was negative, and a high index of suspicion was present. Flexible FOB increases the recovery rate of AFB, and microscopic examinations of bronchoscopic specimens were found positive for AFB in 48-67%. A study by Wilcox and Wongthim showed bronchial washes increases the diagnostic yield in PTB.<sup>18,20</sup>

All the patients were treated according to the WHO Guidelines.<sup>4</sup> Success was similar to that in classical upper lung field TB. There were no deaths in our study.

## CONCLUSION

LLFTB is frequently confused with the commonly seen pneumonias. TB has to be considered as one of the possible diagnosis especially in diabetics, elderly, HIV, immunocompromised and when the radiologic picture suggests unresolved lower lobe pneumonia or bronchiectasis. The early diagnosis helps in prevention of severe sequelae. Repeated and extensive investigations are necessary to look for non-resolving pneumonia and to confirm the diagnosis in doubtful cases.

LLFTB is not uncommon finding in clinical practice. The absence of upper lobe involvement cannot rule out lower lobe TB and lack of symptoms, initial negative sputum smears, and culture for AFB and/or a negative initial tuberculin skin test do not entirely rule out the possibility of TB. The flexible FOB has been a wonderful tool in obtaining secretions and tissue specimens for definite diagnosis but also in assessing the severity of the endobronchial lesions and as a guide for early surgical intervention. Performing FOB and subjecting the bronchoscopic secretions to conventional diagnostic methods of AFB smear, mycobacterial culture and histopathology appear to be helpful in the diagnosis of SSN-PTB. The FOB may also offer the additional advantage of the confirmation of the diagnosis of several non-TB conditions that may mimic PTB as well.

In developed countries with no limitations on resources/diagnostic facilities, early use of FOB seems to be the best course of action in a patient with suspected SSN-PTB. Prognosis is similar to those cases involving upper lobe.

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