

## REVIEW ARTICLE

# The Implication of Fiberoptic Bronchoscopy in diagnosing Smear Negative or Sputum-scarce Pulmonary Tuberculosis: A Review

Md. Mahbub E Khoda<sup>1</sup>, Nazmun Sharmin<sup>2</sup>, Mohammad Aminul Islam<sup>3</sup>, Mohammad Abdun Nur Sayam<sup>4</sup>, Md. Sharif Ahsan<sup>5</sup>, MD Saiful Islam<sup>6</sup>

### Abstract:

**Objective:** The diagnosis of smear-negative pulmonary tuberculosis is both challenging and time-consuming. Fiberoptic Bronchoscopy (FOB) may provide a confirmative and early diagnosis in such patients. Our objective is to assess the role of fiberoptic bronchoscopy in diagnosing smear-negative Pulmonary Tuberculosis (PTB) along with clinical and radiological correlations.

**Method:** We searched the literature in PubMed and Google Scholar using a search strategy PICO model on 'smear-negative pulmonary tuberculosis' and 'Fiberoptic bronchoscopy' and related sampling techniques. Studies that provided sufficient data regarding the sensitivity and specificity of bronchoalveolar lavage for acid-fast bacilli, GeneXpert, and Culture were included.

**Results:** The search yields thousands of papers, of which 12 publications are included for the full review.

**Conclusion:** Fiberoptic bronchoscopy was found to be a useful tool for early recognition of PTB in patients with smear-negative patients. Its sensitivity, specificity, PPV & NPV were found more significant when a High-Resolution CT (HRCT) scan of the chest revealed tree-in-bud appearances.

**Keywords:** Fiberoptic bronchoscopy, Smear negative pulmonary Tuberculosis, Sputum scarce Pulmonary Tuberculosis, Bronchoalveolar lavage

[Chest Heart J. 2022; 46(1) : 41-43]

DOI: <http://dx.doi.org/10.33316/chab.j.v46i1.2019650>

### Introduction:

One of the top 10 killer diseases in the world is tuberculosis (TB). Every year, it has an impact on millions of people<sup>1</sup>. It is one of the most significant global public health issues. An essential part of tuberculosis control strategies is identifying patients with active pulmonary tuberculosis (PTB),

as early treatment renders these patients non-infectious and breaks the tuberculosis transmission chain<sup>2</sup>.

In order to start treatment early, getting a quick and correct diagnosis is one of the biggest hurdles in the fight against the burden of TB. The sample most frequently utilized to diagnose PTB is

1,5,6. Resident Doctor, Dept. of Respiratory Medicine, Dhaka Medical College, Bangladesh

2. Assistant. Professor, Dept. of Microbiology, Dhaka Medical College, Bangladesh

3. Associate Professor, Dept. of Respiratory Medicine, Dhaka Medical College, Bangladesh

4. Assistant. Professor, Dept. Respiratory medicine, Dhaka Medical College, Bangladesh

**Correspondence to:** Dr. Mahbub E Khoda, Resident, Department of Respiratory Medicine, Dhaka Medical College, Cell: +88 01717445793, email: mahbubekhoda27@gmail.com

**Submission on:** 7 December, 2021

**Accepted for Publication:** 28 December, 2021

Available at <http://www.chabjournal.org>

sputum. However, some PTB patients may be unable to expectorate sputum, in which case the condition is sputum-scarce pulmonary tuberculosis. In 30%–60% of instances, or smear-negative PTB, microscopy may not detect acid-fast bacilli (AFB) in individuals who can cough up phlegm<sup>3–5</sup>. This poses a diagnostic dilemma<sup>6</sup>.

In situations of smear-negative and sputum-scarce PTB, fiberoptic bronchoscopy (FOB) with bronchoalveolar lavage (BAL) may be helpful in making the diagnosis. Mycobacterial culture is regarded as the gold standard for diagnosing tuberculosis, yet it has considerable disadvantages. The technique is labor-intensive, requires skilled personnel, and takes 2–6 weeks to confirm the diagnosis. Contrarily, tests using the amplification of nucleic acids can provide results in a matter of hours, and cartridge-based improvements like Xpert MTB/RIF significantly simplify test execution<sup>6</sup>.

There are a number of research papers however, very few review articles on FOB in regard to diagnosing smear-negative PTB cases. Hence, we set out to conduct a systematic review to identify the usefulness of fiberoptic bronchoscopy in detecting smear-negative pulmonary tuberculosis.

### Method:

We performed a comprehensive search of databases named PubMed and Google Scholar from the year 2000-2022 without language restriction. We searched by the keyword “fiberoptic bronchoscopy”, “smear-negative pulmonary tuberculosis”, and “sputum scarce pulmonary tuberculosis”. Among thousands of searched papers, we kept 12 papers for review by some selection criteria. Case reports, a study conducted ADA level in BAL, small sample sized articles were excluded.

### Selection criteria

Studies on diagnostic precision utilizing respiratory specimens from adults with PTB suspicion were also included. The reference standards for pulmonary TB detection were culture.

### Result:

For the diagnosis of pulmonary TB, where sputum smear microscopy is challenging, FOB has been demonstrated to be a reliable and safe approach. The literature that is currently available on this

subject demonstrates variable bronchoscopy diagnostic yields that range from 30 to 90%<sup>7</sup>. Higher diagnostic yields were reported in the majority of studies. However, few studies have demonstrated that bronchoscopy has no significant advantages over sputum induction<sup>7</sup>. The sensitivity, specificity, PPV & NPV for PTB of FOB were found more significant when there were tree-in-bud appearances on HRCT of chest<sup>2</sup>.

### Discussion:

One of the biggest global burdens on public health is tuberculosis. Early detection of PTB halts disease progression, morbidity, disease dissemination, and lung damage<sup>8</sup>.

The organ most frequently impacted is the lung. Chest X-rays and sputum microscopy are the traditional diagnostic procedures for pulmonary tuberculosis<sup>9</sup>.

Regarding clinical manifestations, there were no discernible variations between patients with positive and negative smears. There were no differences between the AFB positive and AFB negative patients' X-ray and CT results when the results of the two patient groups were compared<sup>10</sup>.

Some clinicians start early empirical anti-TB treatment based on clinical features and chest radiography, which is frequently wrong and cannot substitute or support etiological confirmation. A sputum culture may boost the diagnostic yield, but it takes time. Hence, in order to promote the early identification of PTB and exclude other disease processes, doctors must turn to alternative procedures like FOB<sup>2</sup>.

The lower respiratory tract can be sampled for study using FOB<sup>11</sup>. It enables low-risk direct observation of the lesion as well as the collection of clean specimens for bronchoalveolar lavage, washings, brush cytology, and biopsy<sup>9</sup>.

Moreover, the best way to diagnose endobronchial TB early is through bronchoscopy. To make a diagnosis, one can employ direct bronchoscopic visualization, as well as bronchoscopic techniques like a biopsy, brushings, needle aspiration, bronchoalveolar lavage (BAL), and endobronchial ultrasonography<sup>12</sup>.

### Conclusion:

When a smear is either negative or scanty, fiberoptic bronchoscopy is regarded as a safe and

extremely reliable method to identify patients with pulmonary tuberculosis. The main issue is that strict protocols and thorough cleaning processes should be put in place to prevent the nosocomial spread of TB and other infectious pathogens via contaminated bronchoscopes. The bulk of TB cases occurs in underdeveloped nations with low resources. Because of accessibility issues, high costs, and logistical difficulties, bronchoscopy's function in the diagnosis of tuberculosis is probably limited. In order to improve early TB detection and prevent more invasive surgical operations, additional research is required to clearly characterize the function of the more recent diagnostic and therapeutic bronchoscopic methods.

### Conflict of Interest

This study has no conflicts of interest.

### Funding

This study was not supported financially.

### Acknowledgment:

Dr. Md. Nazmus Sadekin, Associate Professor, Economics, Maolana Bhasani Institute of Science & Technology for his thorough review and corrections.

### References:

1. World Health Organization. Global tuberculosis report 2013. *WHO Library Cataloguing-In-Publication Data* Preprint at <http://www.who.int/tb/country/> (2013).
2. Khan, F. Y. & Aladab, A. H. Role of fiberoptic bronchoscopy in the rapid diagnosis of sputum smear-negative disseminated tuberculosis with pulmonary miliary infiltrates. *Oman Med J* 35, 514–518 (2020).
3. Gowda, N. C., Ray, A., Soneja, M., Khanna, A. & Sinha, S. Evaluation of Xpert® Mycobacterium tuberculosis/rifampin in sputum-smear negative and sputum-scarce patients with pulmonary tuberculosis using bronchoalveolar lavage fluid. *Lung India* 35, 295–300 (2018).
4. Xiao, X., Wu, Z. C. & Chou, K. C. A multi-label classifier for predicting the subcellular localization of gram-negative bacterial proteins with both single and multiple sites. *PLoS One* 6, (2011).
5. Linguissi, L. S. G. *et al.* Diagnosis of smear-negative pulmonary tuberculosis based on clinical signs in the Republic of Congo Infectious Diseases. *BMC Res Notes* 8, (2015).
6. Bhatia, D. *et al.* Evaluation and comparison of molecular and conventional diagnostic modalities for detecting pulmonary tuberculosis in bronchoalveolar lavage fluid. *Indian J Med Microbiol* 39, 48–53 (2021).
7. Saglam, L., Akgun, M. & Aktas, E. *Usefulness of Induced Sputum and Fiberoptic Bronchoscopy Specimens in the Diagnosis of Pulmonary Tuberculosis. The Journal of International Medical Research* vol. 33 (2005).
8. Bachh, A. A., Gupta, R., Haq, I. & Varudkar, G. H. Diagnosing sputum/smear-negative pulmonary tuberculosis: Does fibre-optic bronchoscopy play a significant role. *Lung India* 27, 58–62 (2010).
9. Prakash, P., Agarwal, P., Gupta, A., Gupta Eashan & Dasgupta, A. Comparison of BAL and Sputum Induction Prashant Prakash, et al. *The Indian Journal of Chest Diseases & Allied Science* 58, 173–175 (2016).
10. Kalawat, U., Sharma, K. K., Reddy, P. N. R. & Kumar, A. G. Study of bronchoalveolar lavage in clinically and radiologically suspected cases of pulmonary tuberculosis. *Lung India* 27, 122–124 (2010).
11. Central TB Division. INDIA TB REPORT 2022 Coming Together to End TB Altogether. *Ministry of Health and Family Welfare* 1–263 Preprint at <http://www.tbcindia.gov.in> (2022).
12. Shahzad, T. & Irfan, M. Endobronchial tuberculosis-a review. *Journal of Thoracic Disease* vol. 8 3797–3802 Preprint at <https://doi.org/10.21037/jtd.2016.12.73> (2016).