

ORIGINAL ARTICLE

Diagnostic Yield of Fiberoptic Bronchoscopy Washings among Patients of Sputum Smear Negative Pulmonary Tuberculosis

MUHAMMAD NUSRULLAH¹, AFEERA HAMID², MUHAMMAD RASHID³, HAFIZ MUHAMMAD TAHA WAQAS⁴, ABDUL RAUF³

¹Department of Critical Care-Anesthesia, Mayo Hospital, Lahore- Pakistan.

²Department of Anesthesia, Lady Aitchison Hospital, Lahore- Pakistan.

³Department of Medicine, Mayo Hospital, Lahore- Pakistan.

⁴Department of Pulmonology, Shalimar Hospital, Lahore- Pakistan

Correspondence to: Muhammad Nusrullah, Email: mnusrullah195@gmail.com

ABSTRACT

Fiberoptic bronchoscopy with bronchial washing is done for diagnosis of pulmonary tuberculosis among patients who cannot produce sputum spontaneously.

Aim: To evaluate the diagnostic yield of Fiberoptic Bronchoscopy for detection of positive cases in cases of Smear negative pulmonary tuberculosis.

Study Design: Cross-sectional study.

Methodology: All patients (n=80) were advised NPO for 6 hours before carrying out the procedure. It was done using local anesthesia while retrieval of the instilled amount by 25% was considered successful. The bronchial washings were sent for AFB staining in-order to confirm the presence or absence of Mycobacterium Tuberculosis. Bronchial washing smear was considered positive if 1-9 AFB/HPF are seen on direct microscopy.

Statistical Analysis: SPSS v.26 analyzed the data. Stratification of diagnostic yield was done with respect to age and gender. Post stratification Chi-Square test was applied with P-value ≤ 0.05 was taken as significant.

Results: The diagnostic yield of FOB for detection of positive cases in cases of Smear negative PTB was 57.5%. The highest diagnostic yield was seen in patients in the age group 16-32 and 49-60 years old patients i.e. 37% in both groups. For both genders diagnostic yield for FOB was 50%. However patient's age and gender were insignificantly associated with diagnostic yield of FOB.

Conclusion: It was concluded that FOB can provide a rapid and definitive diagnosis of pulmonary tuberculosis in sputum negative patients. **Keywords:** Diagnostic Yield, Fiberoptic Bronchoscopy, Smear Negative and Pulmonary Tuberculosis.

INTRODUCTION

Tuberculosis (TB) is a dangerous communicable infectious disease. It is an infectious curable disease but needs aggressive treatment for 6-24 months. It affects the organs like lungs, kidneys, bones, spines and central nervous system.¹ As shown by Global Tuberculosis Report 2015 that in 2014, 9.6 million people approximately had TB and 1.5 million died from it. Worldwide, it was estimated that there were new (3.3%) and previously treated TB patients (20.0%) were multidrug-resistant tuberculosis (MDR-TB) cases. This means that approximately 500,000 people developed MDR-TB in 2014. On average, roughly 9.7% patients with MDR-TB turned into extensively drug resistant TB, XDR-TB.²

Pakistan is ranked 5th among heavy loaded countries for TB and 6th among countries for maximum number of multidrug-resistant tuberculosis cases, MDR-TB, (WHO, 2011). Burden of TB is high in our country. Two drugs, rifampicin and isoniazid, are the backbone of conventional first line treatment for tuberculosis.^{2,3}

Unfortunately, there is a delay in diagnosis of active Pulmonary TB as only upto 39% patients have a positive sputum smear and secondly, isolation of Mycobacterium tuberculosis as a causative agent is a time consuming process as revealed by literature review.^{3,4} Its diagnosis is aided by Acid Fast bacilli staining of smears collected sputum samples. The positive yield of sputum smear in clinically & radiologically suspected cases of PTB remains between 30 – 70% even at well-equipped centers.^{5,6} Prompt & early diagnosis of PTB helps prevent morbidity & mortality. Sputum cultures for acid fast bacilli provide quite late results (6 – 8 weeks) leading to delayed diagnosis & treatment initiation. Currently there is no serological test available for rapid pulmonary-TB diagnosis.⁶

Diagnosis and treatment among patients who have sputum smear-negative is generally based on clinical & radiological findings. Unfortunately, almost 20% pulmonary-TB patients remain asymptomatic while majority (42–86%) of them present with symptoms. Chest x-ray of sputum smear-negative TB patients are usually normal. Chest x-ray may have high false positive rate due to previous PTB infection in an intermediate or high TB burden country like Pakistan.^{6,7}

Fiberoptic Bronchoscopy (FOB) has been tried for rapid diagnosis of tuberculosis in smear negative PTB cases. FOB in such patients will be helpful in making prompt diagnosis of TB. FOB collects bronchial secretion and washing under direct vision. One researcher demonstrated the sensitivity and specificity of FOB washings AFB smear 19% and 96% respectively.⁸ One study estimated that FOB samples has diagnostic yield of 85%.⁹ Another study showed the overall diagnostic yield of FOB was 55% for diagnosis of disease in smear negative PTB cases.¹⁰ Our results helped us in making definitive diagnosis of PTB and to avoid injudicious administration of anti-tuberculosis treatment to patients. Due to lack of local data regarding the diagnostic yield of FOB for sputum negative pulmonary TB patients, we planned current study in order to evaluate FOB as diagnostic tool. Objective was to evaluate the diagnostic yield of Fiberoptic Bronchoscopy for detection of positive cases in cases of Smear negative pulmonary tuberculosis.

METHODOLOGY

After taking approval from hospital ethical committee, 80 patients fulfilling selection criteria was enrolled from OPD of Department of Chest Medicine, Mayo Hospital, Lahore with written informed consent. Their demographics including name, age, gender and duration of symptoms was also obtained. All patients (n=80) were advised NPO for 6 hours before carrying out the procedure. It was done using local anesthesia while retrieval of the instilled amount by 25% was considered successful. The bronchial washings were sent for AFB staining in-order to confirm the presence or absence of Mycobacterium Tuberculosis. Bronchial washing smear was considered positive if 1-9 AFB/HPF are seen on direct microscopy. Both male and female patients with two sputum smears negative for AFB diagnosed during last 1 month were included. Patients with bleeding diathesis (platelet $< 20,000/\mu\text{L}$) or severe dyspnea ($\text{SpO}_2 < 92\%$), history of myocardial infarction or arrhythmia, received anti-tubercular treatment (ATT) for > 1 month or HIV-positive were excluded. SPSS v.26 analyzed the data. Frequency and percentages were computed for categorical variables like gender and diagnostic yield. Stratification of diagnostic yield was done

with respect to age and gender. Post stratification Chi-Square test was applied with P-value ≤ 0.05 was taken as significant.

RESULTS

Gender distribution showed that 39 (48.8%) were males while 41 (51.2%) were females while other descriptive parameters of enrolled subjects were shown in table-1.

Table-1: Baseline Parameters (n=153)

Characteristics	Categories	Study Sample
Age (years)	16-32	29 (36.25%)
	33-48	21 (26.25%)
	49-60	30 (37.5%)
	Mean \pm SD	38.6 \pm 14.5
Gender	Male	39 (48.8%)
	Female	41 (51.2%)
Duration of symptoms (Days)	7-14	29 (36.25%)
	15-21	24 (30%)
	22-30	27 (33.75%)
	Mean \pm SD	18.1 \pm 6.5
AFB smear results	Positive	46(57.5%)
	Negative	34(42.5%)
Diagnostic Yield	Yes	46(57.5%)
	No	34(42.5%)

Data was stratified for age and gender as shown in Table-2.

Table-2: Stratified Data with Age and Gender

Age (years)	Diagnostic Yield		P-value
	Yes	No	
16-32	17(37%)	12(35.3%)	0.988
33-48	12(26.1%)	9(26.5%)	
49-60	17(37%)	13(38.2%)	
Gender	Diagnostic Yield		P-value
	Yes	No	
Male	23(50%)	16(47.1%)	0.795
Female	23(50%)	18(52.9%)	

DISCUSSION

Even in modern era of medicine, disease like tuberculosis is global health issue for mankind, particularly in developing countries. Its diagnosis is aided by Acid Fast bacilli staining smears of collected sputum samples mainly. Literature review showed that highly specific and low-cost test for its diagnosis is sputum microscopy. Unfortunately, as shown by literature previously that pulmonary-TB patients may have negative sputum smear.

One study estimated that almost 22-61% cases have sputum smear negative but culture positive for mycobacterium tuberculosis thus adds to the burden of SSN-PTB.¹¹ However, it has been seen previously that bronchoscopy has a role in the diagnosis of smear negative pulmonary tuberculosis. FOB has been tried for rapid diagnosis of TB in smear negative PTB cases. FOB in such patients will be helpful in making prompt diagnosis of TB. FOB collects bronchial secretion and washing under direct vision.

In this study diagnostic yield of FOB for detection of positive cases in cases of Smear negative PTB was 57.5%. The highest diagnostic yield was seen in patients in the age group 16-32 and 49-60 years old patients i.e. 37% in both groups. However patients in the age group 33-48 years of age among them diagnostic yield was 26.1% only. For both male and female patients diagnostic yield for FOB was 50%. Once duration of symptoms increase than occurs high diagnostic yield of FOB. However patient's age and gender were insignificantly associated with diagnostic yield of FOB.

Diagnostic yield of FOB for active PTB among sputum negative pulmonary tuberculosis is variable from 35.7-95% according to many studies.¹²⁻¹⁴ Diagnostic yield of FOB in this study lies in between the above mentioned range reported in literature for diagnosis of active PTB among smear sputum negative pulmonary tuberculosis suspects.

One researcher demonstrated the sensitivity and specificity of FOB washings AFB smear 19% and 96% respectively.⁸ One

study estimated that FOB samples has diagnostic yield of 85%.⁹ Another study showed the overall diagnostic yield of FOB was 55% for diagnosis of disease in smear negative PTB cases.¹⁰ Similarly, our results showed high diagnostic value of FOB thus in line with above mentioned studies. Few other studies showed diagnostic yield of FOB ranged from 27-56%.^{15,16}

One study reported that the diagnostic yield of FOB was 35.7% (15/42) among their patients.¹³ Diagnostic yield for FOB reported was also a bit lower. However this variation is due to the patients load and difference and sample size taken in studies.

Limited resources offer difficulty for the use of bronchoscopy in highly prevalent areas like Pakistan. However, feasibility and its cost-effectiveness for TB diagnosis in resource-limited settings require further studies. However, at tertiary care hospitals, bronchoscopic procedures should be a routine investigation among sputum negative pulmonary TB patients.

Limitations: Single centre study with financial constraints. Lack of genetic workup was a limitation too.

CONCLUSION

It was concluded that FOB can provide a rapid and definitive diagnosis of pulmonary tuberculosis in sputum negative patients. However, more studies are required for making it as a routine investigation at our clinical setups.

Author's Contribution:

MN&AH: Overall supervision, write up and literature review.

MR&HMTW: Statistics application and help in data collection.

AR: Literature review help in write-up.

Acknowledgements: I am thankful to Allah and all my colleagues for their help.

REFERENCES

- World Health Organization. Global tuberculosis control: surveillance, planning, financing. Global Tuberculosis Report. Geneva: World Health Organization; 2014.
- Mushtaq MU, Shahid U, Abdullah HM, Saeed A, Omer F, Shad MA, et al. Urban-rural inequities in knowledge, attitudes and practices regarding tuberculosis in two districts of Pakistan's Punjab province. *Int J Equity Health* 2011;10(1):8.
- Nair N, Wares F, Sahu S. Tuberculosis in the WHO south-east Asia region. *Bulletin of the World Health Organization* 2010;88(3):164.
- Association KNT. Trend of case notification rate per 100,000 by year, 2004-2011. Website in Korean[Internet Accessed August 19, 2015] Available from: www.knta.or.kr 2012.
- Bachh AA, Gupta R, Haq I, Varudkar HG. Diagnosing sputum/smear-negative pulmonary tuberculosis: Does fibre-optic bronchoscopy play a significant role? *Lung India Official Organ Indian Chest Soc* 2010;27(2):58.
- Shin JA, Chang YS, Kim TH, Kim HJ, Ahn CM, Byun MK. Fiberoptic bronchoscopy for the rapid diagnosis of smear-negative pulmonary tuberculosis. *BMC Infect Dis* 2012;12(1):141.
- Tozkoparan E, Deniz O, Ciftci F, Bozkanat E, Bicak M, Mutlu H, et al. The roles of HRCT and clinical parameters in assessing activity of suspected smear negative pulmonary tuberculosis. *Arch Med Res* 2005;36(2):166-70.
- Jacomelli M, Silva PRAA, Rodrigues AJ, Demarzo SE, Seicento M, Figueiredo VR. Bronchoscopy for the diagnosis of pulmonary tuberculosis in patients with negative sputum smear microscopy results. *J Brasil Pneumol* 2012;38(2):167-73.
- Soto A, Acurio V, Solari L, Van der Stuyt P. Incremental yield of bronchial washing for diagnosing smear-negative pulmonary tuberculosis. *Rev Saude Pùb* 2013;47(4):813-6.
- Khara NV, Kshatriya RM, Vala DH, Prajapati DN, Paliwal RP, Patel SN. Diagnostic Yield of Fiberoptic Bronchoscopy (FOB) in Three Common Lung Conditions at a Rural Teaching Hospital. *Nat J Med Res* 2013;3(4):392-5.
- Bhagiani DK, Sarkar M, Singh D, Negi RS, Sharma S. Role of Fiber-Optic Bronchoscopy in Sputum Smear Negative Pulmonary Tuberculosis. *National Journal of Medical Research* 2016;134.
- Bachh AA, Gupta R, Haq I, Varudkar HG. Diagnosing sputum/smear-negative pulmonary tuberculosis: Does fibre-optic bronchoscopy play a significant role? *Lung India* 2010;27(2):58.
- Singhal S, Gaidhane AM, Khatib N, Hrivastava T, Diwan S, Mahajan S, et al. Use of flexible bronchoscopy for rapid diagnosis of suspected tubercular cases in rural India. *The Journal of Infection in Developing Countries* 2009;3(11):860-4.
- Bhagiani DK, Sarkar M, Singh D, Negi RS, Sharma S. Role of Fiber-Optic Bronchoscopy in Sputum Smear Negative Pulmonary Tuberculosis. *National Journal of Medical Research* 2016;6(2):134.
- Joos L, Patuto N, Chhajed PN, Tamm M. Diagnostic yield of flexible bronchoscopy in current clinical practice. *Swiss medical weekly* 2006;136(9-10):155-9.
- Conde MB, Soares SL, Mello FC, Rezende VM, Almeida LL, Reingold AL, et al. Comparison of sputum induction with fiberoptic bronchoscopy in the diagnosis of tuberculosis: experience at an acquired immune deficiency syndrome reference center in Rio de Janeiro, Brazil. *American journal of respiratory and critical care medicine* 2000;162(6):2238-40.