

# Diagnosis of Pulmonary Tuberculosis by Gastric Aspirate in Adults Who are Smear Negative and X Ray Positive Suspects of Pulmonary Tuberculosis and Additional Yield by Fiberoptic Bronchoscopy

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## Abstract:-

**Background-** Tuberculosis is an age old infection caused by Mycobacterium Tuberculosis complex. Early diagnosis of Pulmonary Tuberculosis is very important in treatment and decreasing the transmission of tuberculosis. It is difficult to obtain sample in children and in adults especially in cases of females. Adequate sample can be obtained by various methods such as laryngeal swabs, BAL, sputum. Gastric aspiration is established method in children but in adults it is usually not tried. Some adults especially females instead of expectorating swallow their sputum. In this study, we have evaluated diagnostic yield of gastric aspirate and additional yield by bronchoscopy in smear negative and x ray positive suspects of tuberculosis .

**Objective-** To see the yield by gastric aspiration and additional yield on bronchoscopy in smear negative x ray positive suspects of TB cases

**Material and method-**Present study was conducted in 200 smear negative X ray suspects. Initially gastric aspiration was done, those still found negative , bronchoscopy was done and specimen for brush, Bal, Biopsy taken and examined by ZN staining, CBNAAT and culture for Mycobacterium tuberculosis .

**Results-** It was found Out of 200 X-ray suspected patients gastric aspirate was found positive for TB in 30 (15%) (smear AFB/CBNAAT) of the patients. Out of 170 gastric aspirates negative TB patient's bronchoscopy could be carried out in 50 patients only despite of counselling. Additional yield of 14.7% was observed with bronchoscopy

**Conclusion-** The present study concludes that in smear negative X ray positive suspects of TB patients, gastric aspiration can be initial tool which can be applied in peripheral institutions and bronchoscopy can provide additional yield in high center.

## I. INTRODUCTION

Tuberculosis is an age old infection caused by Mycobacterium Tuberculosis complex. It is thought to have emerged 70,000 years back in Africa, expanded to modern worlds and then onwards.<sup>1</sup>This disease most commonly affects the lungs in two third of the patient, but can involve almost all of the organ systems in body and one third of patients can have systemic involvement other than lungs .The genus Mycobacterium was known to originate 150 million years ago. The skeletal deformities of tuberculosis have been demonstrated in Egyptian mummies.<sup>2</sup>

Covid 19 pandemic has adversely affected the TB scenario despite of clear cut guidelines of government of India to have bidirectional screening of TB & Covid 19, the screening of TB in patients of covid 19 and of covid 19 in TB patients was not adhered to because of several reasons, especially because of fear of catching Covid 19/TB infection. In order to have bidirectional screening the myth can be solved by taking additional precautions especially while doing aerosol generating procedures like coughing and bronchoscopy. The most obvious impact is a large global drop in the number of people newly diagnosed with TB and reported. This fell from 7.1 million in 2019 to 5.8 million in 2020, an 18% decline back to the level of 2012 and far short of the approximately 10 million people who developed TB in 2020<sup>3</sup>.

The transmission of infection is via aerosolized particles from respiratory tract when the patient coughs. These particles are less than 5-10 microns in diameter. These remain suspended in the atmosphere for several hours, and there are approximately 3000 such particles in one cough. On an average, a person may transmit infection to 20 contacts before being recognized as a patient. Transmission through skin or placenta are uncommon and not of much significance<sup>4</sup>.

Early diagnosis of Pulmonary Tuberculosis is very important in treatment and decreasing the transmission of tuberculosis.<sup>5</sup> Various techniques available for diagnosis of tuberculosis including newer molecular methods and culture but these are of no use if specimen is not proper. It is difficult to obtain sample in children and in adults especially in cases of females.

Adequate sample can be obtained by various methods such as laryngeal swabs, BAL, sputum. Gastric aspiration is established method in children but in adults it is usually not tried. Some adults especially females instead of expectorating swallow their sputum.

Direct examination of sputum is a fast, simple and inexpensive way to diagnose pulmonary TB. However, from 30% to 50% of patients infected with pulmonary tuberculosis are not diagnosed through sputum smear.<sup>6</sup> In such cases other methods like sputum induction, gastric aspirate and Fiberoptic bronchoscopy (FOB) have been evaluated for this purpose. But these methods have their own advantages and disadvantages.

In this study, we have evaluated diagnostic yield of gastric aspirate and additional yield by bronchoscopy in smear negative and x ray positive suspects of tuberculosis.

**II. MATERIALS AND METHODS**

200 adult patients suspected of pulmonary tuberculosis on chest X ray but smear negative were undertaken for gastric aspirate after taking consent. Gastric aspirate was taken by inserting Ryles tube at night after 4 hours of dinner and early morning sample was taken. In this study the patients in whom gastric aspirate specimen on smear examination was negative were counselled for FOB and the those agreed were subjected to FOB.

An observation was made about diagnostic yield by gastric aspirate after smear negativity and further additional yield by FOB in patients whose gastric aspirate specimen was negative

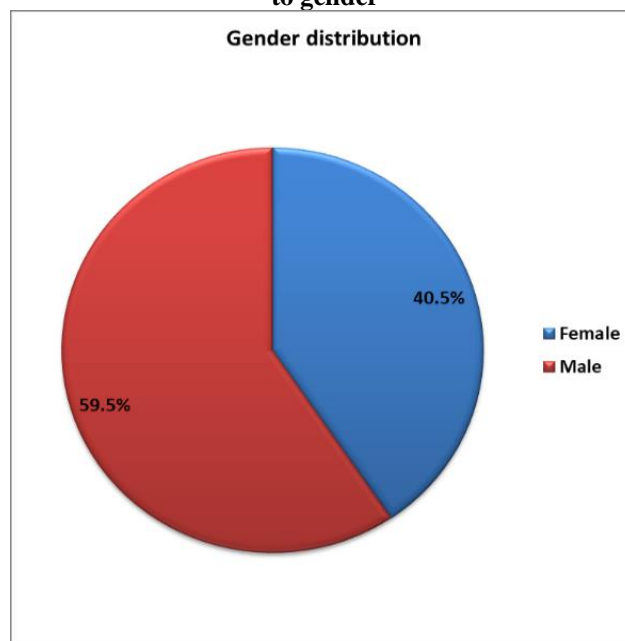
**III. RESULTS**

**Table 1: Distribution of the study population according to gender**

Gender	Frequency	Percent
Female	81	40.5
Male	119	59.5
Total	200	100.0

During the selection of patients both male and female were selected. Majority of the patients were male (59.5%) and rest (40.5%) were female.

**Graph 1: Distribution of the study population according to gender**

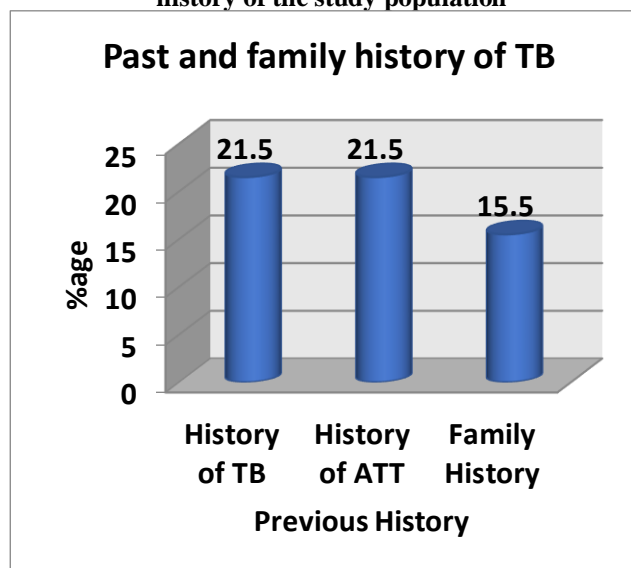


**Table 2: Distribution according to past and family history of the study population**

Previous History	Frequency	Percent
History of TB	43	21.5
History of ATT	43	21.5
Family History	31	15.5
Total	200	100.0

Out of total 200 patients 21.5 shown past history of TB and ATT. Family history was observed in 15.5% of the study population

**Graph 2: distribution according to past and family history of the study population**

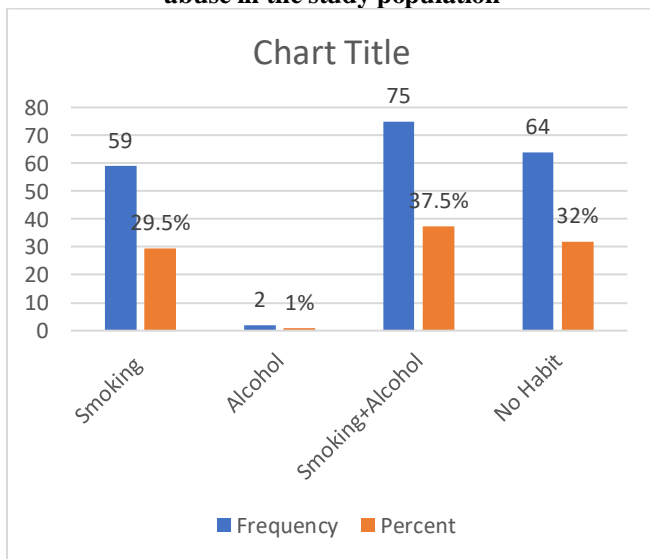


**Table 3: Distribution of deleterious habits/substance abuse in the study population**

Habits	Frequency	Percent
Smoking	59	29.5
Alcohol	2	1.0
Smoking+Alcohol	75	37.5
No Habit	64	32.0
Total	200	100.0

Out of total 200 study subjects, 29.5% were smokers , 1% were alcoholics, 37% were both alcoholic and smoker.

**Graph 3: distribution of deleterious habits/Substance abuse in the study population**

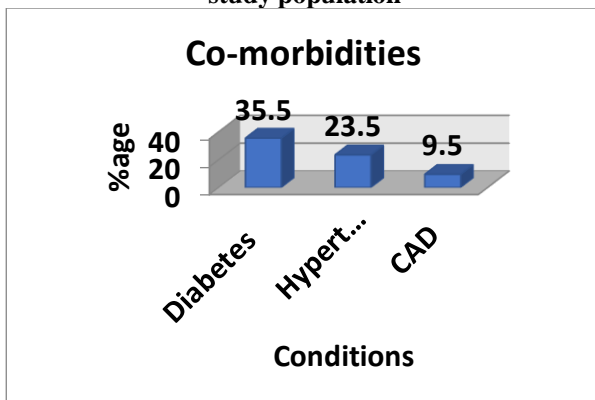


**Table 4: Distribution of various co-morbidities in the study population**

Co-morbidities	Frequency	Percent
Diabetes	71	35.5
Hypertension	47	23.5
CAD	19	9.5
Total	137	100.0

Under co-morbidities majority were diabetic (35.5%) followed by hypertensive (23.5%) and CAD (9.5%).

**Graph 4: distribution of various co-morbidities in the study population**

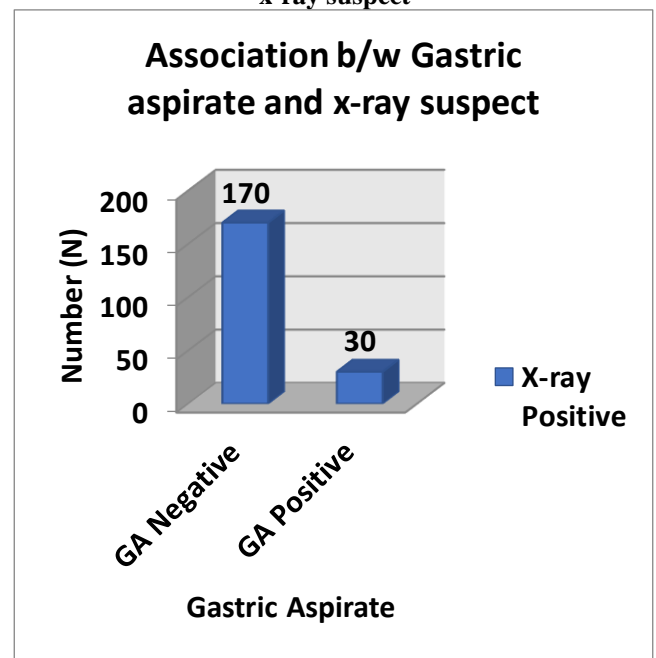


**Table 5: Association between gastric aspirate yield and x-ray suspect**

X-ray		Gastric aspirate		Total
		Negative	Positive	
Positive		170	30	200
		85.0%	15.0%	100.0%
Total		170	30	200
		85.0%	15.0%	100.0%

Out of 200 X-ray suspected patients gastric aspirate was found positive for TB in 30(15%) of the patients and 170 (85%) found negative on gastric aspiration.

**Graph 5: association between gastric aspirate yield and x-ray suspect**

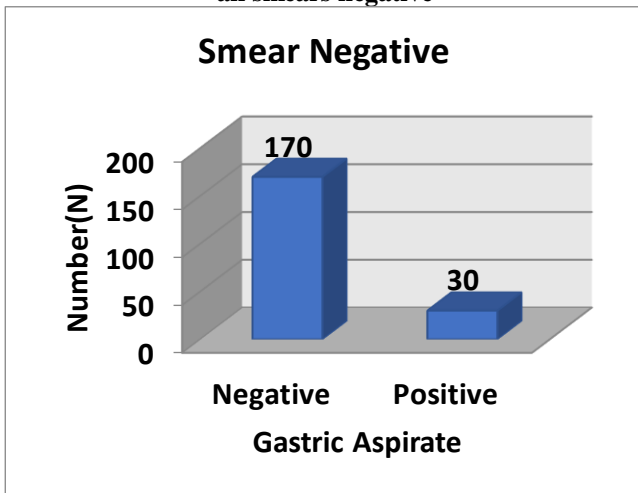


**Table 6: Association between gastric aspirate yield and all smear negative**

Smear negative		Gastric aspirate		Total
		Negative	Positive	
Negative		170	30	200
		85.0%	15.0%	100.0%
Total		170	30	200
		85.0%	15.0%	100.0%

Out of total 200 smear negative patients 170 (85%) were found negative for TB on gastric aspirate and rest 30 (15%) found positive for TB.

**Graph 6: Association between gastric aspirate yield and all smears negative**



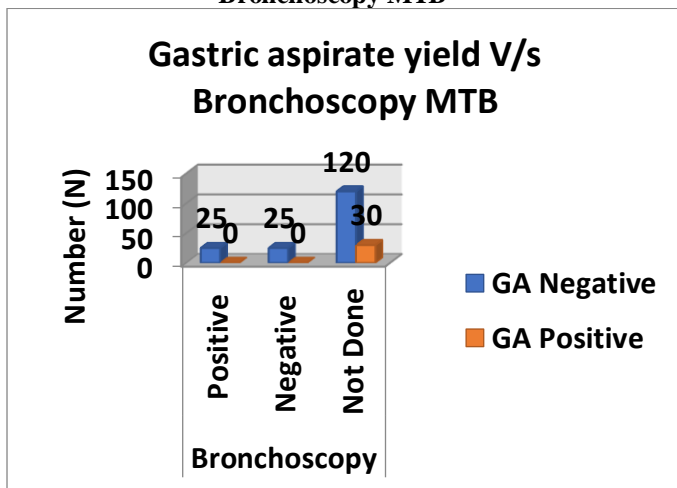
**Table 7: Association between gastric aspirate yield and Bronchoscopy MTB**

Gastric aspirate		Bronchoscopy MTB			Total
		Positive	Negative	Not Done	
Negative		25	25	120	170
		14.7%	14.7%	70.6%	100.0%
Positive		0	0	30	30
		0%	0%	100.0%	100.0%
Total		25	25	150	200
		12.5%	12.5%	75.0%	100.0%
p-value		0.003(Sig.)			

Test applied: chi-square test. (Sig.) indicates: statistically significant ( $p \leq 0.05$ )

Out of 170 gastric aspirates negative suspected TB patients, only 50 agreed for bronchoscopy. Among those 50 patients 25 (50%) patients found positive for MTB and 25 (50%) found negative for TB. Bronchoscopy was to be carried out among 170 of the gastric aspirate negative patient, but only 50 agreed. Among those who agreed additional yield of 14.7% was observed with bronchoscopy.

**Graph 7: association between gastric aspirate yield and Bronchoscopy MTB**

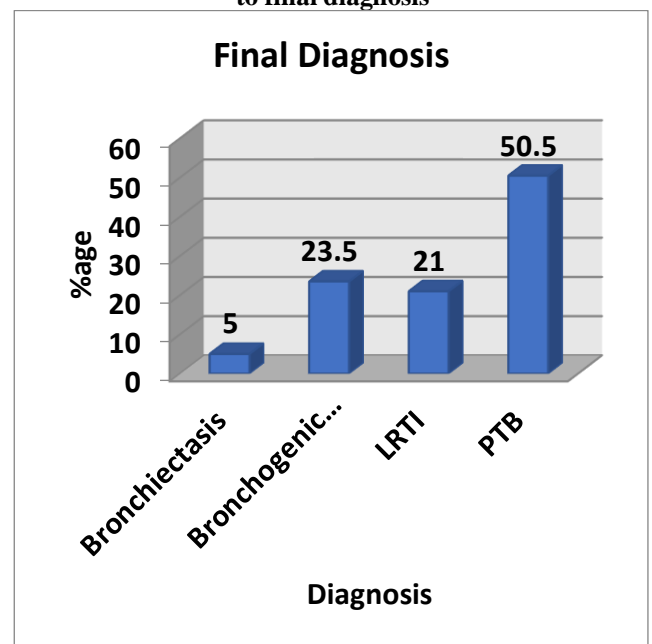


**Table 8: Distribution of the study population according to final diagnosis**

Final Diagnosis	Frequency	Percent
Bronchiectasis	10	5.0
Bronchogenic Carcinoma	47	23.5
LRTI	42	21.0
PTB	101	50.5
Total	200	100.0

Majority (50.5%) of the patients were diagnosed with Pulmonary tuberculosis (PTB) followed by Bronchogenic Carcinoma (23.5%), Lower Respiratory Tract Infection (LRTI) (21.0%) and Bronchiectasis (5.0%).

**Graph 8: distribution of the study population according to final diagnosis**



**Table 9: Distribution of final diagnosis according to past TB history reported by the study population**

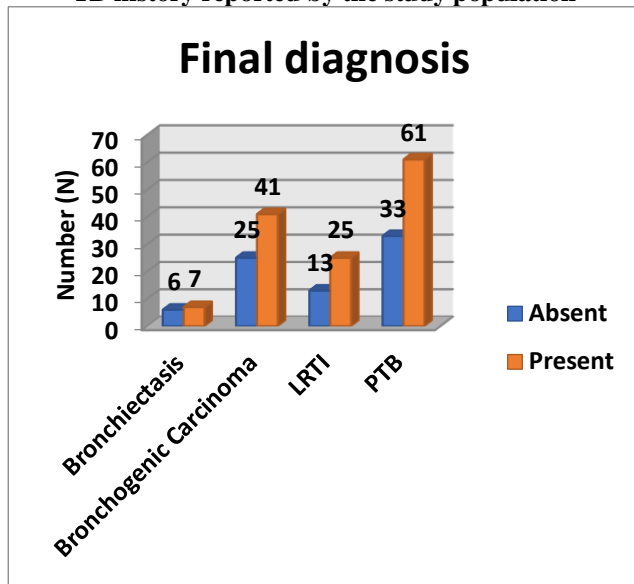
Past TB History		Final diagnosis				Total
		Bronchiectas is	Bronchogeni cCarcinoma	LRTI	PTB	
Absen t		2	37	33	85	157
		20.0%	78.7%	78.6%	84.2%	78.5%
Presen t		8	10	9	16	43
		80.0%	21.3%	21.4%	15.8%	21.5%
Total		10	47	42	101	200
		100.0%	100.0%	100.0 %	100.0 %	100.0 %
p-value		0.001 (Sig.)				

Test applied: chi-square test

Past TB history was found to be associated with Bronchiectasis followed Bronchogenic Carcinoma, LRTI and PTB

**Graph 9: distribution of final diagnosis according to past TB history reported by the study population**

**IV. DISCUSSION**



TB is able to sustain itself since ancient times despite of adequate tools of diagnosis and treatment. Early diagnosis and treatment of Tb is to eliminate Tb. Algorithmic approach to diagnosis as current NTEP guidelines of India is to suspect Tb in all cases having cough ,fever, loss of weight and night sweats and suspect them to smear examination for AFB. A diagnostic approach to an AFB smear-negative patient with possible TB includes, a detailed medical history and clinical examination as well as radiological, microbiological, molecular, and histological investigations.<sup>7,8</sup> In patients suspected of having TB with smear-negative, culturing M.tb remains essential for diagnostic testing and should be included when evaluating patients suspected of having TB with negative sputum smears. When performed correctly, culture increases diagnostic sensitivity, which ideally results in earlier case detection. The state- of-the-art diagnostic path often uses the tests mentioned above in combination, and additional diagnostic tools/procedures such as induced sputum<sup>9</sup>, chest CT imaging<sup>10</sup>, bronchoscopy with lavage<sup>11</sup>, and lung tissue biopsy<sup>12</sup>.

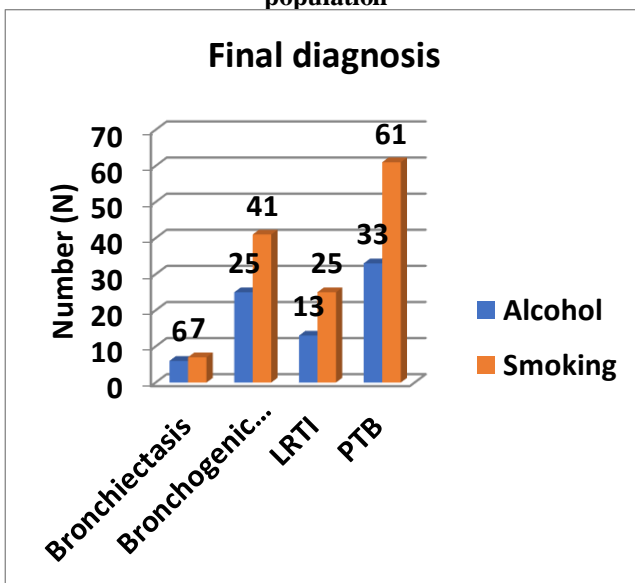
**Table 10: Distribution of final diagnosis according to deleterious habits/substance abuse reported by the study population**

Habits	Final diagnosis				Total	p-value
	Bronchiectasis	Bronchogenic Carcinoma	LRTI	PTB		
Alcohol	6 60.0%	25 53.2%	13 31.0%	33 32.7%	77 38.5%	0.034 (Sig.)
Smoking	7 70.0%	41 87.2%	25 59.5%	61 60.4%	134 67.0%	0.008 (Sig.)

Test applied: chi-square test

Majority patients with PTB, Bronchogenic Carcinoma, Bronchiectasis and LRTI reported smoking as one of the most prevalent deleterious habit followed by alcohol intake.

**Graph 10: distribution of final diagnosis according to deleterious habits/Substance abuse reported by the study population**



In the present study during the selection of patients both male and female were selected. Majority of the patients were male (59.5%) and rest (40.5%) were female. This confirms the fact that the disease is more common among men perhaps due to contact from external source, deleterious habits like smoking, alcoholism. From the study, it is inferred that female patients were more reluctant to undergo any invasive procedure whether gastric aspiration or bronchoscopy.

Our study reported major co-morbidity was diabetes (35.5%) followed by hypertension (23.5%) and CAD (9.5%). In our study 29.5% were found to be smokers ,1% were alcoholics and 37.5% were both smoker and alcoholic.

In our study out of 200 X-ray suspected patients gastric aspirate was found positive for TB in 30 (15%) of the patients and 170 (85%) found negative on gastric aspiration. There are few studies showing a higher positivity rate in the gastric smear of 52-59% which is comparatively more than our study.<sup>13,14</sup> This may be due to the fact that more number of samples were taken and false positive atypical mycobacteria could have added onto their positivity rate. In our study we had performed only one gastric aspirate.

In the present investigation out of 170 gastric aspirates negative TB patient’s bronchoscopy was carried out among 50 patients only. Among them those 50 patients 25 (50%) patients found positive for MTB and 25 (50%) found negative for TB. Bronchoscopy was not carried out among any of the gastric aspirate positive patient. On application of chi-square analysis this difference between them was found statistically significant (p=0.003). Additional yield of 14.7% was observed with bronchoscopy out of 170 patients.

Bronchoscopy is an invasive procedure needing technical expertise. We need to prepare the patient, constant monitoring during the procedure and chance of equipment related contamination is possible when performing a

bronchoscopy. The patient's acceptance and cooperation to undergo bronchoscopy also was less among our study population because all who underwent gastric aspiration were not ready to undergo bronchoscopy.

Moreover gastric aspirate can be performed by staff nurses and paramedics as compared to bronchoscopy which demands technical expertise. There is an occupational hazard for the health care professional engaged in bronchoscopy suite as bronchoscopy is a cough inducing procedure and there is a chance of occupational hazard of nosocomial infection.

## V. CONCLUSION

Gastric aspiration and bronchoscopy can be used as a tool in diagnosis of pulmonary tuberculosis in adult patients who could not produce sputum or in patients who are smear negative but having X ray suggestive of TB.

Under NTEP only smear examination and CBNAAT testing of sputum for diagnosis and UDST is used. Gastric aspirate is recommended only in children. Gastric aspirate when used in adults as well could improve the bacteriological confirmation rates by 15%.

Gastric aspirate is simple procedure and can be performed in peripheral health institutes by medical officers or trained paramedical staff and staff nurses.

FOB can further improve the yield but has high attrition rate as majority of patients refused to undergo bronchoscopy despite of counselling them.

- Gastric aspiration can be carried out in PHI's. Paramedical staff can be trained for gastric aspiration.
- Additional yield can be obtained by FOB in gastric aspirate negative patients.
- FOB can confirm additional etiological causes like Bronchogenic carcinoma, LRTI etc. thus avoiding unnecessary giving of ATT and worsening of other causes leading to higher morbidity & mortality.

Before starting Empirical anti TB drugs in smear negative , X ray positive suspects of TB patient and exhaustive attempt should be made to arrive at alternative diagnosis in order to save the patients of giving anti TB treatment unnecessarily.

## REFERENCES

[1]. Kasper DL, Fauci AS, Hauser S, Longo D, Jameson JL, Loscalzo J. Harrison's Principles of Internal Medicine 19/E (Vol.1 & Vol.2): McGraw-Hill Education; 2015.

[2]. Daniel TM. The history of tuberculosis. *Respir Med.* 2006; 100 (11):1862-70.

[3]. World Health Organization, editor. Global tuberculosis report 2021. World Health Organization; 2021.

[4]. Kumar V, Abbas AK, Aster JC. Robbins & Cotran Pathologic Basis of Disease: Elsevier Health Sciences; 2014.

[5]. Mondoni M, Repossi A, Carlucci P, Centanni S, Sotgiu G. Bronchoscopic techniques in the management of patients with tuberculosis. *Int J Infect Dis.* 2017 Nov;64:27-37.

[6]. Charoenratanakul S, Dejsomritrutai W, Chairprasert A. Diagnostic role of fiberoptic bronchoscopy in suspected smear negative pulmonary tuberculosis. *Respir Med.* 1995 Oct;89(9):621-3.

[7]. Colebunders R, Bastian I. A review of the diagnosis and treatment of smear-negative pulmonary tuberculosis. *Int J Tuberc Lung Dis.* 2000;4:97-107

[8]. Siddiqi K, Lambert ML, Walley J. Clinical diagnosis of smear-negative pulmonary tuberculosis in low-income countries: the current evidence. *Lancet Infect Dis.* 2003 May;3(5):288-96.

[9]. Seong GM, Lee J, Lee JH, Kim JH, Kim M. Usefulness of sputum induction with hypertonic saline in a real clinical practice for bacteriological yields of active pulmonary tuberculosis. *Tuberc Respir Dis (Seoul).* 2014 Apr;76(4):163-8.

[10]. Lee KS, Song KS, Lim TH, Kim PN, Kim IY, Lee BH. Adult-onset pulmonary tuberculosis: findings on chest radiographs and CT scans. *AJR Am J Roentgenol.* 1993 Apr;160(4):753-8.

[11]. Chawla R, Pant K, Jaggi OP, Chandrashekhara S, Thukral SS. Fiberoptic bronchoscopy in smear-negative pulmonary tuberculosis. *Eur Respir J.* 1988 Oct;1(9):804-6.

[12]. Lee HS, Park KU, Park JO, Chang HE, Song J, Choe G. Rapid, sensitive, and specific detection of Mycobacterium tuberculosis complex by real-time PCR on paraffin-embedded human tissues. *J Mol Diagn.* 2011 Jul;13(4):390-4.

[13]. Baig S, Qayyum S, Saifullah N, Ahmed N. Detection of TB by smear microscopy and GeneXpert MTB/RIF assay in non expectorating pulmonary TB suspects and pleural TB in high prevalent low income setting. *Eur Respir J.* 2014;44:P2626.

[14]. Ikutan O, Kartaloglu Z, Kilic E, Bozkanatm E, Ilvan A. Diagnostic Contribution of Gastric and Bronchial Lavage Examinations in Cases Suggestive of Pulmonary Tuberculosis. *Yonsei Med J.* 2003;44(2):242-8.