

## Original Research Article

**Etiological Diagnosis of Pleural Effusion by Pleural Fluid Examination**Babu Lal Bansiwali<sup>1</sup>, Anil Saxena<sup>2</sup>, Maneesha Jelia<sup>3</sup>, Surendra Kumar<sup>4</sup>, Mukesh Kalera<sup>5</sup><sup>1</sup>Assistant professor, Department of respiratory medicine Govt. Medical College, Kota, Rajasthan, India<sup>2</sup>Professor and head, Department of Respiratory Medicine, Govt. Medical College, Kota, Rajasthan, India<sup>3</sup>Tutor, Department of Physiology, Govt. Medical College, Kota, Rajasthan, India<sup>4</sup>Medical officer, Govt. Y.N hospital Kishan Garh, Ajmer, Rajasthan, India<sup>5</sup>Post graduate student, Department of Respiratory Medicine, Govt. Medical College, Kota, Rajasthan, India**\*Corresponding author**

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**Abstract:** The etiological distribution of pleural effusions in various series depends on the geographical area, patient's age, and advances in the diagnostic methods and treatment of the underlying causes. The difficulty in determining the cause of pleural effusion is shown by the fact that in many series "unknown etiology" constitutes nearly 15%. In the west the most common cause is parapneumonic effusions followed by malignancy, while in India it is tubercular effusion followed by malignant effusion and a very few due to parapneumonic. This is an analytical interventional and prospective study done in the department of respiratory medicine, Government medical college hospital, Kota during period Oct. 2013 to Sept. 2014. On the basis of history, clinical examination and various investigation 100 study cases suggestive of pleural effusion were taken from Respiratory medicine ward. The aim of study to make etiological diagnosis of pleural effusion by pleural fluid examination. In our study, we were able to diagnose that tuberculosis was the most common cause of pleural effusion in 73%, followed by synpneumonic effusion in 9% of our study cases. Most common presenting symptoms were cough 81%, fever 74% and chest pain 61%. The appearance of tubercular pleural fluid was straw colour in 61 (87%), while in non-tubercular fluid colour was light yellow and yellow turbid in 11(42.30%). In tubercular pleural effusion definitive etiological diagnosis was established in 9 out of 70 cases by the presence of AFB in the sputum or pleural fluid or FNAC pleura suggestive of tuberculosis.**Keywords:** Pleural effusion, parapneumonic, Tuberculosis, malignant effusion

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**INTRODUCTION**

Pleural effusion is excess fluid that accumulates between the two pleural layers, the fluid-filled space that surrounds the lungs [1]. Pleural effusions are a common diagnostic problem in clinical practice, as the list of causes is quite exhaustive [2]. The etiological distribution of pleural effusions in various series depends on the geographical area, patient's age, and advances in the diagnostic methods and treatment of the underlying causes. The difficulty in determining the cause of pleural effusion is shown by the fact that in many series "unknown etiology" constitutes nearly 15% [3]. Exudative effusions require to be separated into infectious causes, non-infectious causes and malignancy. In the west the most common cause is parapneumonic effusions followed by malignancy [1], while in India it is tubercular effusion followed by malignant effusion [3] and a very few due to parapneumonic effusion. India has the highest

prevalence of tuberculosis in the world with 2/3rds of all TB patients being in India [3]. Pleural tuberculosis is second in frequency after TB lymphadenitis.

The clinical, biochemical and cytological parameters of tubercular effusion are shared by malignancy, both being exudates and predominantly lymphocytic effusions. This can pose a significant diagnostic dilemma. Adenosine deaminase enzyme activity, gamma interferon, polymerase chain reaction, lysozyme measurement pleural fluid tuberculous protein antibodies and various tumor markers like CA15-3, squamous cell carcinoma antigen, etc have been used to differentiate TB from non TB [4].

As etiological diagnosis can change the therapeutic dilemma so, this study was planned to assess various etiological factors by pleural fluid examination in Kota (hadoti region).

## COMMON ETIOLOGY OF PLEURAL EFFUSION [6]

### Tubercular pleural effusion:

The tubercular pleural effusion is from rupture of a sub pleural caseous focus in the lung in to the pleural space. It is probable that delayed hypersensitivity, also plays a large role in the development effusion.

### PARAPNEUMONIC EFFUSIONS:

Any pleural effusion associated with bacterial pneumonia, lung abscess (or) bronchiectasis is parapneumonic effusion.

### MALIGNANT PLEURAL EFFUSION:

Decreased clearance of protein from the pleural space is probably the mechanism responsible for pleural effusion in the majority of patients. This decreased lymphatic drainage can occur by metastases to parietal pleura that obstruct the stomas in lymphatic vessels can decrease the protein clearance.

### MATERIAL AND METHOD:-

This was an analytical, Interventional and prospective study carried out on 100 patients with signs and symptoms suggestive of pleural effusion above 18 yrs of age of either sex admitted in department of respiratory medicine, Government medical college and hospital Kota, during a period of one year Oct. 2013 to Sept. 2014.

### Method of data Collection

The diagnosis was established by a detailed history, clinical examination followed by chest X- ray and chest ultrasonography.

### Inclusion criteria:

- Patient with age more than 18 years presenting with clinical features of pleural effusion admitted in Respiratory ward.
- Patients who had given valid consent.

### Exclusion Criteria:

- Patients who had not given valid consent.
- Hemodynamically unstable patients.

### Ethical consideration:

The study was approved by ethics committee of the Government medical college, Kota. The approval number is F3 ( ) /Acad/Ethical comm./MCK/2014/1087.

### Methods:

A detailed clinical history and general physical examination was done on all the patients. A chest radiograph poster anterior view was done and the size of the effusion was estimated. An informed consent was taken from all the patients regarding pleurocentesis and pleural biopsy.

### Needle Puncture:

In each patient a needle puncture was performed. The localization of fluid and site for needle puncture was determined by ultrasonic method in cases where thoracocentesis was unsuccessful with chest x-ray. The amount of fluid removed was carefully measured and send for biochemistry, pathological and microbiological analysis to find out etiology of effusion.

Pleural fluid ADA was determined by using spectrophotometric method described by Galanti and Giusti. The ADA activity in units/L is defined as the quantity of ammonia produced in micromol/min/L at 37°C.

### Reference values:

Normal	<30 U/L
Suspect	30 U/L to 40 U/L
Strong suspect	> 40 U/L to 60 U/L
Positive	> 60 U/L

### Cytology:

Total cell count of pleural fluid performed after dilution using WBC diluting fluid and mounted on Neuber's chamber and cells counted; differential counts ( pleural fluid centrifuged, slides prepared from the sediment and stained with Fields sustain) for neutrophils, lymphocyte and mesothelial cells. Smears stained with Giemsa or modified Papanicolaou stains were looked for any atypical cells including malignant cells.

**Sputum AFB:** Smear by Ziehl-Neelsen staining. All the cases were finally grouped as tuberculous or non tuberculous. Patients under tuberculous group were put on anti-tubercular drugs. Follow-up was done at 15days, 1and2 months and clinical and radiological improvement noted. Those with diagnosed as parapneumonic were put on appropriate antibiotics

### TUBERCULOUS

#### Absolute criteria:

- Pleural fluid/sputum smear revealed mycobacterium tuberculosis on Ziehl-Neelsen staining.
- Pleural fluid/ pleural biopsy, specimen/ sputum grew mycobacterium tuberculosis on L.J.culture.
- Histopathological evidence suggestive of tuberculosis in pleural biopsy specimen/ palpable lymph nodes or other tissue sites.

#### Suggestive criteria:

- History of fever, pleuritic chest pain, malaise, anorexia, weight loss and feature of toxemia consistent with the clinical presentation of TPE.
- Good response to ATT.

- Tuberculous pleural effusion was diagnosed if any of the absolute criteria or both of the suggestive criteria were present.

**RESULTS:**

**Table 1: Pleural Etiology of Study Cases**

Etiology	Tubercular pl. effusion		Non tubercular Pl. effusion		NTB with Thickened pleura		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
Number of patients	55	15	21	5	3	1	79	21
Total	70		26		4		100 (100%)	

The table-1 shows: – In our study cases, the most common pleural pathology was tubercular in 70 cases (55 males and 15 females) and 26 were non

tubercular (21 males and 5 females) pleural effusion. Also among non-tubercular, 4 cases (including 3 males and 1 female) have thickened pleura.

**Table 2: Symptoms of Patients in Tubercular V/S Non Tubercular Pleural Effusion in the Study**

S N	Symptoms	Tubercular effusion (n=70)	Non Tubercular effusion				Total (n=30)	Grand total (n=100)
			Synpneumo nic	Maligna ncy	CHF	Empye ma		
1	Cough	56	8	4	3	10	25	81
2	Fever	52	9	2	3	8	22	74
3	Chest pain	43	5	5	2	6	18	61
4	Dyspnoea	19	2	3	3	7	15	34
5	Hemoptysis	4	0	2	0	1	3	7
6	Weight loss	21	0	3	0	6	9	30

The Table-2 shows the most common symptoms were cough 81%, fever 74% and chest pain 61%, less common symptoms are dyspnoea 34%, hemoptysis 7% and weight loss 30% in study cases. In

malignant pleural effusion most common symptoms are chest pain 100%, cough 80%, followed by dyspnoea & weight loss in 60% cases.

**Table 3: Various Etiologies of Pleural Effusion**

S.N	Etiology of pleural effusion	Male (%)	Female (%)	Total (%)
1	Tubercular effusion	55 (78.57)	15 (21.42)	70 (100%)
2	Non tubercular effusion	21 (80.77)	5 (19.23)	26 (100%)
(a).	Synpneumonic effusion	7 (26.93)	2 (19.23)	9
(b).	Malignant effusion	5	0	5
(c).	CHF with effusions	4	0	4
(d).	Empyema	5	3	8
3.	NTB with Thickened pleura	3 (75)	1 (25)	4 (100%)
Total		79	21	100

Most common etiology of pleural effusion was tuberculosis in 70 patients, including males 55 (79%) and females 15 (21%). In non-tubercular effusion 26

patients, most common cause was pneumonia in 9 patients, including males 7 (27%) and females 2(19%) (Table-3).

**Table 4: Appearance Of Pleural Fluid In Tubercular V/S Non Tubercular Etiology:-**

S. N.	Colour of fluid	Tubercular effusion	%age	Non tubercular effusion	%age	Grant Total
1	Straw colour	61	87.15%	2	7.70%	63
2	Hemorrhagic	5	7.15%	5	19.23%	10
3	Light yellow	4	5.71%	7	26.93%	11
4	Yellow & turbid	0	0	4	16%	04
5	Thick pus like	0	0	8	30.77%	08
6	No fluid	0	0	4	—	04
	Total	70 (100%)		26 (100%)		100

On gross examination of pleural fluid we found that the most common observation was straw colour in 61 (87%) and hemorrhagic in 5 (7%) study case of tubercular etiology effusion. While in non-

tubercular etiology light yellow and yellow turbid was in 11(43%) cases, pus like in 8 (31%) cases because of empyema and hemorrhagic in 5(20%) cases mainly due to malignant cause(Table-4).

**Table 5:- Methods for Confirmation of diagnosis in Tubercular effusion cases**

S.N	Investigation used for TB diagnosis	Number	%age
1	Sputum for AFB positive	6	8.58%
2	Pleural fluid AFB positive	1	1.43%
3	FNAC of pleura suggestive of TB	2	2.86%
4	Clinical+Radiological+Fluid biochemistry s/o TB	61	87.15%
	Total tubercular effusion cases	70	

A definitive diagnosis of tubercular effusion could be established in 9(13%) out of 70 study cases, by demonstrating presence of AFB in sputum or fluid or histopathological examination. Remaining all the patients 61(87%) out of 70 were diagnosed as tubercular effusion by clinical, radiological and fluid biochemistry satisfying the suggestive criteria (Table-5).

#### DISCUSSION:

We observed that the most common cause of pleural effusion was tuberculosis in 70 cases {including 55 (79%) males and 15 (21%) females} followed by non-TB pleural effusion in 26 cases {including 21(81%) males and 5(19%) females}.The majority of cases were males 79% as compared to females 21% in tubercular pleural effusion. We also observed that M: F ratio in tubercular pleural effusion was 3.6:1.The similar observation made by Sharma SK, *et al.*; [7] in their study of M: F ratio being 3.1:1 among tubercular pleural effusion.

In our study, the cough was the most common symptom in 81% mainly dry in nature, fever in 74%, and chest pain in 61% patients along with less common symptoms, including dyspnea 34%, weight loss 30% and hemoptysis in 7% of pleural effusion patients. Similar observations were also made by Dinesh Kumar *et al.*; [8] in their study, in which cough was commonest symptom in 76% patients followed by chest pain in 64% and fever in 60% tubercular pleural effusion patients.

In our study, we observed that the most common cause of pleural effusion was TB in 70 cases {male 55 (78%) and female 15 (21%)} and 26 cases had non-tubercular etiology. Similar results observed by Jindal SK *et al.*; [9], Mandell [10], and Bennelt [11] that tuberculosis is the most common cause of effusion followed by synpneumonic effusion.

In non-TB patients out of 26, effusion was due to pneumonia in 9, congestive heart failure caused in 4, malignant in 5 and empyema in 8 patients as cause of fluid in the pleural space. Similar results had observed by Light W. *et al.*; [12] that malignant diseases involving pleura is the second leading cause of exudative pleural effusion after the synpneumonic effusion (after tuberculosis in India because its prevalence is high).

We also diagnosed 4 cases of thickened pleura Some Studies also suggest that these had infective or exudative effusion in past history. Pleural thickening greater than 1cm also suggestive of malignancy with sensitivity of 35% and specificity of 87% observation made by Yilmaz U *et al.*; [13].

On gross examination of pleural fluid after thoracocentesis it was found that, most of the patients with tubercular etiology have pleural fluid of straw colour in 61 (87%), while in non-tubercular etiology fluid was light yellow and the yellow turbid colour in 11 (43%). Similarly S k Jindal *et al.*; [14] concluded that TB pleural fluid is usually clear or straw coloured. Turbid and turbid to purulent fluid was because of high

pleural fluid cell counts more than 1000 and 2000 - 10000 cells/cmm respectively. Other causes may be of acute infections, high protein more than 3gm/dl and glucose less than 60 mg/dl.

In our study, a definitive diagnosis of tubercular pleural effusion could be established in 9 (13%) out of 70 cases, by demonstrating presence of acid fast bacilli INS sputum, pleural fluid or fine needle aspiration cytology of pleura. We observed that sputum for AFB was positive in 6 cases (8.58%), pleural fluid culture was AFB positive in one case (1.43%) and FNAC of pleura suggestive of tubercular etiology was in 2 cases (2.86%). Sharma SK, Mohan A *et al.*; [15] concluded that Pleura involve in 5% of all TB patients and lymph node is second most common in extra pulmonary site of tuberculosis after pleura.

Low positivity of AFB in the present study can be justified as, because sputum smear is rarely positive in primary tubercular effusion cases, studies show it is positive in 4-10% and sputum culture positive in 25-30% as observed by Siebert AF, Haynes J, Middleton R, *et al.*; [16] and Epstein DM *et al.*; [17] and Ghosal AG *et al.*; [18].

Presence of tubercular bacilli in pleural fluid is also low it is usually less than 10% observed by Epstein DM, *et al.*; Berger HW, *et al.*; [19], Valdes L *et al.*; [20], Aggarwal AN *et al.*;[21].

On FNAC of pleura caseating granulomas may be seen in tubercular patients, it is positive in 50% of patients with TB pleural effusion observed by Epstein DM *et al.*; [17], Berger HW *et al.*; [22], Valdes L *et al.*; [20] & Aggarwal AN *et al.*;[21].

Remaining all the patients 61 (87%) out of 70 were diagnosed as tubercular effusion by clinical, radiological and fluid biochemistry satisfying the suggested criteria as proposed by Light W. We used a combination criteria of ADA > 40 U/L and a lymphocyte percentage >50% in study cases with sensitivity 92% and specificity more than 90% observations made by Light W. *et al.*;[12], Porcel JM *et al.*;[23], Liang QL *et al.*;[24], and Valdes L *et al.*;[20].

Oliveria *et al.*; [25] also used similar criteria to diagnose cases of tubercular effusion on 276 patients of suspected tubercular effusion and found 54 as tubercular etiology, also shows sensitivity of 90.7% and specificity of 97.7%.

## CONCLUSION

Tuberculosis was the most common cause of pleural effusion in 73%, followed by synpneumonic effusion in 9% of our study cases. In our study the most common presenting symptoms were cough 81%, fever

74% and chest pain 61 %, while the less common were dysponea 34%, weight loss 30% and hemoptysis 7%.

On radiological examination 65% cases show evidence of pleural effusion while USG could diagnose 100% cases of effusion. The appearance of tubercular pleural fluid was straw colour in 61 (87%), while in non-tubercular fluid colour was light yellow and yellow turbid in 11(42.30%).

In tubercular pleural effusion definitive etiological diagnosis was established in 9 out of 70 cases by the presence of AFB in the sputum or pleural fluid or FNAC pleura suggestive of tuberculosis.

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