



A cross sectional study on clinical presentation various causes of Pleural effusion and evaluation of Cytological profile of Pleural Fluid

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ABSTRACT The diagnosis of pleural effusion is very difficult, even though the patients often complain of typical symptoms indicating of pleural diseases. Pleural effusion is characterized by the pleural cavity filled with transudative or exudative pleural fluids, and it is developed by various etiologies. The presence of pleural effusion can be confirmed by radiological studies including simple chest radiography, ultrasonography, or computed tomography. Identifying the causes of pleural effusions by pleural fluid analysis is essential for proper treatments.

KEYWORDS : Pleural Effusion, cytology, clinical symptomatology

INTRODUCTION

Pleural effusion is an abnormal accumulation of fluid in the Pleural space. The pleural space lies between the lung and chest wall and normally contains a very thin layer of fluid, which serves as a coupling system. Excess fluid results from the disruption of the equilibrium that exists across pleural membranes. Pleural effusion is an indicator of a pathologic process that may be of primary pulmonary origin or of an origin related to another organ system or occasionally the first evidence of some other systemic disease.

It may occur in the setting of acute or chronic disease and is not a diagnosis in itself. The occurrence of pleural effusion [PE] is a common finding, with higher incidence of effusions secondary to non infective pathology in the western studies and infective pathology in India. Diagnosing the etiology of pleural effusions clinically with certainty is a challenging task for physicians.

The advancements in the field of medicine and with the advent of various diagnostic aids like pleural fluid analysis, pleural fluid cytology, pleural biopsy, ultrasonography, bronchoscopy, thoracoscopy, serological tests like Antinuclear antibody, ADA, Rheumatoid factor, CT thorax help the physician to arrive at the diagnosis at an earlier course of the disease.

Determining the aetiological & clinical profile of PE helps in adoption of regionally optimized diagnosis & therapeutic approach.

AIMS OF STUDY

- To study about the clinical presentation of various causes of pleural effusion.
- To evaluate the cytological profile of pleural effusion.

MATERIALS AND METHODS

- SAMPLE SIZE:** 100 Patients of pleural effusion.
- STUDY DESIGN:** Cross-sectional study

INCLUSION CRITERIA:

- Any case of Pleural effusion.
- Age 18-85 years.

EXCLUSION CRITERIA:

- Age < 18 years.
- Hemodynamically unstable patients.
- Pregnant women.
- Patients with bleeding disorders or diathesis

METHODS:

Patients admitted in ASRAM Medical College with pleural effusion fulfilling the inclusion and exclusion criteria were taken into study after obtaining written informed consent. In all these patients, detailed clinical history regarding their presenting complaints, other symptoms like breathlessness, chest pain, cough with sputum production, fever, weight loss, loss of appetite were enquired. Other symptoms of cardiac, liver or renal failure like swelling of feet, abdominal distension, oliguria were also enquired. Past history of any pulmonary tuberculosis, any history of previous intake of anti tuberculosis treatment, history of diabetes or any other significant illnesses, contact history with tuberculosis patients were obtained. Detailed clinical examination was carried out and routine investigations were done for all patients.

Chest X ray PA view, Lateral decubitus view were also taken.

All the patients were subjected to Diagnostic Thoracentesis. Under aseptic precautions about 50 ml of fluid was aspirated and subjected to pleural fluid analysis – Biochemical, Microbiological, Pathological analysis were done. Pleural fluid cell count, cell type, Sugar, Protein, ADA, LDH and AFB stain and sputum AFB were done for all patients. Pleural fluid gram staining and Culture were carried in necessary patients.

RESULTS

1. Etiology

In this study patients with pleural effusion were classified as transudative and exudative pleural effusion based on Lights criteria. These were further classified based on etiology and clinical profile as,

Transudative pleural effusions:

Among transudative pleural effusion majority were due to CCF (80%), followed by effusion due to Renal failure (20%).

Exudative pleural effusions:

The majority were tubercular in origin (66.7%), followed by empyema (13.3%), parapneumonic effusion (12.2%) and malignant effusion (7.8%).

Table - 1 : Classification of transudative and exudative pleural effusion

Etiology	No. of cases (n=100)	Percentage
Transudative effusion	10	10
Exudative effusion	90	90
Total	100	100

Graph -1 : Classification of Transudative and Exudative Pleural Effusion

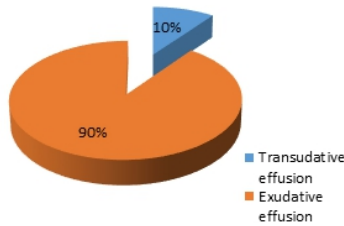
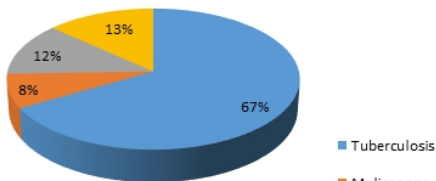


Table 2 - Etiological Classification of Exudative Effusion

Etiology	No. of cases (n = 90)	Percentage
Tuberculosis	60	66.7
Malignancy	7	7.8
Parapneumonic Effusion	11	12.2
Empyema	12	13.3
Total	90	100

Graph 2 : -Etiological Classification of Exudative Effusion



2. Presenting symptoms:

Patients with tubercular effusion presented with cough as the predominant symptom (91.6%) more of dry cough(73.3%) than cough with expectoration(18.3%) followed by fever (70%) ,breathlessness (66.7%),chest pain (35%) and hemoptysis (1.7%).

In empyema patients cough was the predominant symptom (83.3%), followed by chest pain (75%),fever (66.7%), breathlessness (58.3%) and hemoptysis(8.3%).

Parapneumonic effusion cough (100%) followed by fever (90.9%) and in transudative effusion cough (100%) and breathlessness (100%) were major symptoms respectively.

In malignant pleural effusion cough (100%) and breathlessness (100%) followed by chest pain (28.6%) and fever (14.3%) respectively were the presenting symptoms.

Table 3:Frequency of symptoms in different etiology

Symptoms	Etiology					Total
	TB	MAL	PPE	EMP	Transudates	
Cough	55(91.6%)	7(100%)	11(100%)	10(83.3%)	10(100%)	93
Dry	44(73.3%)	6(85.7%)	3(27.3%)	2(16.7%)	7(70%)	62
Sputum	11(18.3%)	1(14.3%)	8(72.7%)	8(66.7%)	3(30%)	31
Fever	42(70%)	1(14.3%)	10(90.9%)	8(66.7%)	1(10%)	62
Chest pain	21(35%)	2(28.6%)	7(63.6%)	9(75%)	5(50%)	44
Breathlessness	40(66.7%)	7(100%)	6(54.5%)	7(58.3%)	10(100%)	70
Hemoptysis	1(1.7%)	0	0	1(8.3%)	0	2

3. Pleural fluid appearance:

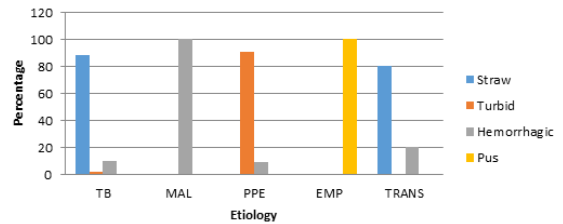
Majority of the effusions were straw colored especially tubercular

(88.3%) and transudative effusion(80%). Hemorrhagic effusions were seen most commonly in malignant pleural effusions (100%). Parapneumonic effusion were associated with turbid (90.9 %) and all patients with pus (100%) were characterised as Empyema.

Table 4:Appearance of pleural fluid in different etiologies

Colour	Etiology				Total	
	TB	MAL	PPE	EMP		
Straw	53(88.3%)				8(80%)	61
Turbid	1(1.7%)		10(90.9%)			11
Hemorrhagic	6(10%)	7(100%)	1(9.1%)		2(20%)	16
Pus	-			12(100%)		12

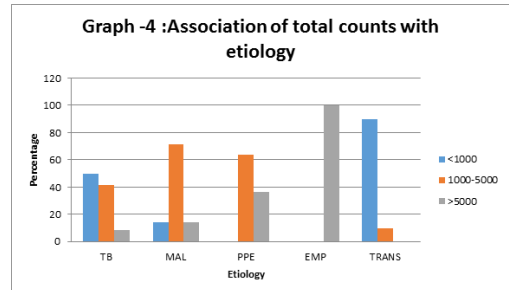
Graph -3 :Appearance of pleural fluid in different etiologies



4. Pleural fluid total cell count:

Most effusions had a total cell count < 1000 cells /mm3. Counts greater than 5,000 cells /mm3 were seen predominantly in empyema (100 %) and in parapneumonic effusion counts were predominantly between 1000-5000(63.6%).

Table 5:Association of total counts with etiology



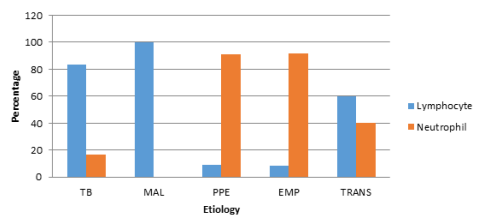
5. Pleural fluid differential count:

50 effusions out of 60 effusions (83.3%) were lymphocyte predominant in tubercular effusion. Parapneumonic effusion (90.9%)and empyema(91.7%) were neutrophil predominant. Malignant effusion (100%) were lymphocyte predominant.

Table 6: Association of Lymphocyte or Neutrophil predominance with Etiology

Predominance	Etiology					Total
	TB	MAL	PPE	EMP	TRANS	
Lymphocyte	50(83.3%)	7(100%)	1(9.1%)	1(8.3%)	6(60%)	64
Neutrophil	10(16.7%)	0	10(90.9%)	11(91.7%)	4(40%)	36

Graph -5 :Association of Lymphocyte or Neutrophil predominance with etiology



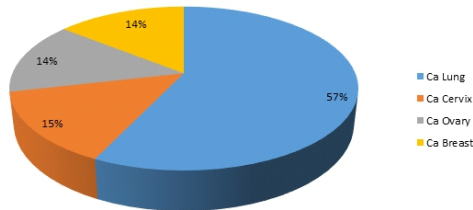
6. Pleural Fluid cytology in Malignant pleural effusion:

Among 7 patients of malignant pleural effusion, 4 cases were due to carcinoma lung (57.1%) of which 2 cases were adenocarcinoma and other 2 was due to squamous cell carcinoma. Out of remaining 3 cases, 1 case each was due to carcinoma cervix (14.3%), carcinoma ovary (14.3%) and carcinoma breast (14.3%) respectively.

Table - 7: Etiology of Malignant effusion

Etiology	No. of cases	Percentage
Carcinoma Lung	4	57.1
Carcinoma cervix	1	14.3
Carcinoma ovary	1	14.3
Carcinoma breast	1	14.3

Graph - 6 : Etiology of Malignant effusion

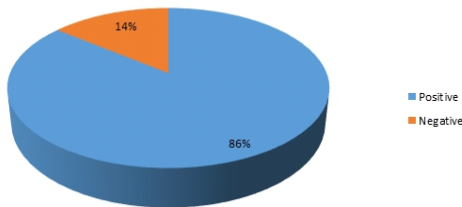


Among the patients with malignant pleural effusions diagnosed, 85.7% had positive malignant cytology and 14.3% had negative malignant cytology in pleural fluid.

Table -8: Malignant cytology

	Positive		Negative	
	No.	Percentage	No.	Percentage
Malignant cytology	6	85.7	1	14.3

Graph -7 : Malignant cytology



In carcinoma lung patient where pleural fluid malignant cytology was negative it was further investigated for sputum malignant cytology (which was negative in that patient) and further subjected to Bronchoalveolar lavage (BAL) fluid / endobronchial biopsy which was positive for malignant cells. Thus signifying the importance of role of BAL fluid / endobronchial biopsy in patients with negative malignant cytology.

**DISCUSSION
SYMPTOMATOLOGY**

The most common symptom encountered by TB patients were dry cough (73.3%), followed by fever (70%), breathlessness (66.7%) and chest pain (35%) in comparison with the study done earlier by Arun Gopi et al⁵⁴ in which most common symptom were chest pain (75%) and dry cough (70%).

Patients with malignant effusion had cough (100%) and dyspnea (100%) as predominant symptoms followed by chest pain (28.6%) which was similar to a study by Chernov B et al,⁵⁵ where breathlessness (57%) and cough (43%) are predominant symptoms followed by chest pain (23%).

Table 9: Common symptomatology in TB effusion in our study and other reference studies

Studies	Symptomatology
Our study	dry cough (73.3%) fever (70%) breathlessness (66.7%) chest pain (35%)
Arun Gopi et al ⁵⁴	chest pain (75%) dry cough (70%).

Table 10: Common symptomatology in malignant effusion in our study and other reference studies

Studies	Symptomatology
Our study	cough (100%) dyspnea (100%) chest pain (28.6%)
Chernov B et al, ⁵⁵	breathlessness (57%) cough (43%) chest pain (23%) .

In empyema patients cough was the predominant symptom (83.3%), followed by chest pain (75%), fever (66.7%), breathlessness (58.3%) and hemoptysis (8.3%). In Parapneumonic effusion cough (100%) followed by fever (90.9%) were the predominant symptoms. Most of the patients with synpneumonic effusion, had complaints of a short duration with an acute onset, whereas those with tuberculous effusion and malignancy had complaints of a longer duration.

Among the transudative pleural effusion, Congestive heart failure was the most common cause in our study. Cough (100%) and breathlessness (100%) were major symptoms respectively which was nearly consistent with the Lights description of Congestive heart failure.

APPEARANCE OF PLEURAL FLUID:

The majority of effusions were straw colored (61%) in which TB effusion was the most common cause (88.3%), hemorrhagic effusions were encountered predominantly in malignant effusions (100%), Parapneumonic effusions were turbid (90.9%) in comparison with the study Victoria villena et al⁵⁶ majority of effusions were straw coloured of which Tuberculosis (74%) and transudates (67%) were predominant and 34% of malignant effusions were hemorrhagic.

Table 11: Comparison of pleural fluid appearance in our study and reference study

Appearance of fluid	Our study	Victoria villena et al ⁵⁶
Straw	61%	53%
Turbid	11%	7%
Hemorrhagic	16%	8%
Pus	12%	1%

PLEURAL FLUID CELL TYPE AND CELL COUNT:

The majority of effusions had total leukocyte count less than 1000 cells/ mm³ of which Tuberculosis constitutes 50%. All patients of empyema had cell count greater than 5,000 mm³ (100%) followed by parapneumonic effusions (36.4%), consistent with Light's observation et al⁵⁷. The low cell counts in tuberculous pleural effusion compared to empyema and parapneumonic effusion may be due to cell mediated immunity, lymphocyte predominance in tuberculous effusion whereas antibody mediated immunity and neutrophil predominance in empyema and parapneumonic effusion. 83.3% of TB effusions and 100% of malignant effusions had lymphocyte predominance. In comparison to other studies: Valdes L et al³⁶ where they have encountered neutrophil predominant tuberculous effusion in only 6.7% of patients and only one malignant effusion had neutrophil predominant effusion (3%). Follander⁵⁸ demonstrated predominance of lymphocytes and scarcity of mesothelial cells in tubercular effusion; Light RW⁵⁷ - large number of neutrophils indicate the presence of bacterial pneumonia. Lymphocytes predominant in tubercular pleural effusion

Table 12: cell cytology in our study and other reference studies

Studies	Predominant cells	Etiology of effusion
Our study	Lymphocytes	83.3% of TB effusion 100% of malignant effusion
Valdes L et al ³⁶	Lymphocytes	93.3% of TB effusion 97% of malignant effusion

SUMMARY AND CONCLUSIONS

- Tubercular effusion affects most commonly young and is associated with cough and fever as the most common presenting symptom.
- Malignant effusions were seen in older age group with cough and dyspnoea as predominant symptoms.
- Massive effusion with hemorrhagic pleural fluid is commonly associated with malignant effusion, while small to moderate effusions with straw colour pleural fluid is associated with Tubercular effusion whereas empyema cases presented with pus.
- Empyema was most commonly associated with high Leukocytes.
- Tubercular effusion was associated with lymphocytic predominant effusion whereas neutrophilic dominant effusion included empyema and parapneumonic effusion.

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