

## Etiology and Clinical Profile of Pleural Effusion in A Tertiary Care Center of India: A Descriptive Study

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Received: 20-03-2023 / Revised: 25-04-2023 / Accepted: 12-05-2023

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Conflict of interest: Nil

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### Abstract

**Background and Aim:** An abnormal or excessive fluid buildup in the pleural space is known as a pleural effusion. The aetiology of pleural effusions presents a challenge to the clinician because it varies based on the area and population being studied. The purpose of this study was to determine the aetiology and clinical characteristics of individuals who presented to tertiary care teaching hospitals with pleural effusion.

**Material and Methods:** The Department of Pulmonary Medicine at tertiary care teaching hospitals in India conducted this study. 100 patients in total were enrolled in the trial. A full history and the demographic information gathered were retrieved. The results of tests like a complete hemogram, random blood sugar, renal function tests, serum proteins, chest x-rays, and pleural fluid analyses as well as tests like abdominal and chest ultrasound, echocardiograms, computed tomography scans of the chest, fine needle aspiration cytology, and pleural biopsy reports (if performed) were gathered.

**Results:** Dyspnea (73%) was the most prevalent presenting symptom, followed by cough (57%), fever (51%), and chest discomfort (46%). In 36% and 42% of the patients, respectively, weight loss and appetite loss were present. Tuberculosis was the most common cause of exudative pleural effusion in 61% of patients. Pneumonia in 6% cases, Malignancy in 5% cases, Empyema in 4% cases and Rheumatic arthritis, Pancreatitis and Uremia 1% of each patients. The most frequent etiology of Transudative pleural effusion was CCF in 6%, Cirrhosis of liver in 3%, chronic renal failure in 3%, Hypothyroidism in 2% and Hypoalbuminemia in 1% patients.

**Conclusion:** In everyday clinical practise in India, pleural effusion is a prevalent clinical phenomenon. Exudative effusions are frequently brought on by tuberculosis, parapneumonic effusions, and cancer. When pleural fluid cytology results are negative, pleural biopsy should be performed.

**Keywords:** Dyspnea, Pleural effusion, Pneumonia, Tuberculosis.

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**Introduction**

Pleural effusion can develop as a side effect of certain illnesses. Based on Light's criterion, they are roughly divided into exudative and transudative effusion. Common causes of exudative PE include drug-induced, iatrogenic, hemothorax, and chylothorax, whereas congestive cardiac failure, cirrhosis, nephrotic syndrome, superior vena cava obstruction, peritoneal dialysis, glomerulonephritis, myxoedema, pulmonary emboli, and sarcoidosis are common causes of transudative PE.[1,2]

It is not a diagnosis in and of itself, but may take place alongside acute or chronic disease. It is difficult for doctors to make a clinically precise diagnosis of the cause of pleural effusions. The development of numerous diagnostic tools, including pleural fluid analysis, pleural fluid cytology, pleural biopsy, ultrasonography, bronchoscopy, scalene lymph node biopsy, serological tests like ANA, ADA, Rheumatoid factor, pleural fluid Amylase, and CT thorax, has advanced medical science and allowed doctors to diagnose patients earlier in the course of the disease.[3-5]

Light's criteria[4] are frequently used to distinguish between exudative effusion and transudative effusion, the two types of pleural effusions. If any one of the following conditions is met, the pleural fluid is exudative: pleural fluid protein/serum protein ratio  $>0.5$ ; pleural fluid lactate dehydrogenase/serum LDH ratio  $>0.6$ ; or pleural fluid LDH level  $>2/3$  the upper limit.[6]

Finding the cause of pleural effusion should be attempted, and it presents a challenge to the doctor. Transudative pleural effusions are quite simple to diagnose because the underlying reasons

are readily apparent from the history, physical examination, and a few routine laboratory tests. Contrarily, the majority of exudative pleural effusions are challenging to diagnose and necessitate initial thoracentesis, a series of biochemical, cytological, and microbiological investigations, and in some instances, the use of specialised diagnostic methods like computed tomography (CT) scan of the thorax, pleural biopsy, bronchoscopy, and thoracoscopy.[7,8]

On the basis of clinical characteristics and pleural fluid investigation, a provisional diagnosis is typically made in more than 90% of patients.[9] However, pleural biopsy, identification of a particular organism in pleural fluid, or the detection of cancer cells are typically used to make a certain diagnosis. All patients who have a CT scan, ultrasonography, or lateral chest radiograph that suggests an exudative pleural effusion with a thickness greater than 10 mm should have a thoracentesis. Making the distinction between transudative and exudative pleural effusions is the first step. Colour and smell should be assessed in all exudative effusions. Total leucocyte count, differential count, biochemical tests for proteins, glucose, LDH, and amylase, microbiological tests for AFB stain, Gramme stain, culture sensitivity, adenosine deaminase (ADA) levels, and cytopathology are among the laboratory tests used to analyse the pleural fluid. Depending on the clinical quandary, additional tests like triglycerides and chylomicrons are requested. If there is a suspicion of tuberculosis and the ADA levels were low, a closed pleural biopsy is advised. A particularly sensitive method for assessing undetected exudative pleural effusions is thoracoscopy.[10]

Tuberculosis and cancer are two diagnoses that are frequently made with thoracoscopic pleural biopsy.

The purpose of this study was to determine the aetiology and clinical characteristics of individuals who presented to tertiary care teaching hospitals with pleural effusion. The fact that "unknown aetiology" makes up nearly 15% of several series demonstrates how challenging it is to identify the source of pleural effusion.

### Material and Methods

The Department of Pulmonary Medicine at tertiary care teaching hospitals in India conducted this study. This study's primary goal was to evaluate the etiological and clinical characteristics of pleural effusion. The study comprised patients who were admitted with pleural effusion to the department of respiratory medicine.

### Inclusion Criteria

1. Any case of Pleural effusion
2. Age 13-85 years

### Exclusion Criteria

1. Age < 13 years
2. Hemodynamically unstable patients
3. Pregnant women

### 4. Patients with bleeding tendencies.

One hundred cases in all have been chosen for this investigation. The demographic information gathered includes address, sex, and age. A thorough history was acquired, including the main complaints, the history of the presenting illness, and noteworthy history, including comorbidities. Complete hemogram, random blood sugar, serum proteins, chest X-ray, pleural fluid analysis, ultrasound of the chest and abdomen, echocardiogram, chest CT scan, fine needle aspiration cytology, and pleural biopsy reports (if performed) were among the investigations obtained.

### Statistical analysis

The collected data was organised, inputted, and exported to the data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA) after being combined and entered into a spreadsheet programme (Microsoft Excel 2007). The level of significance and confidence level for each test were set at 5% and 95%, respectively.

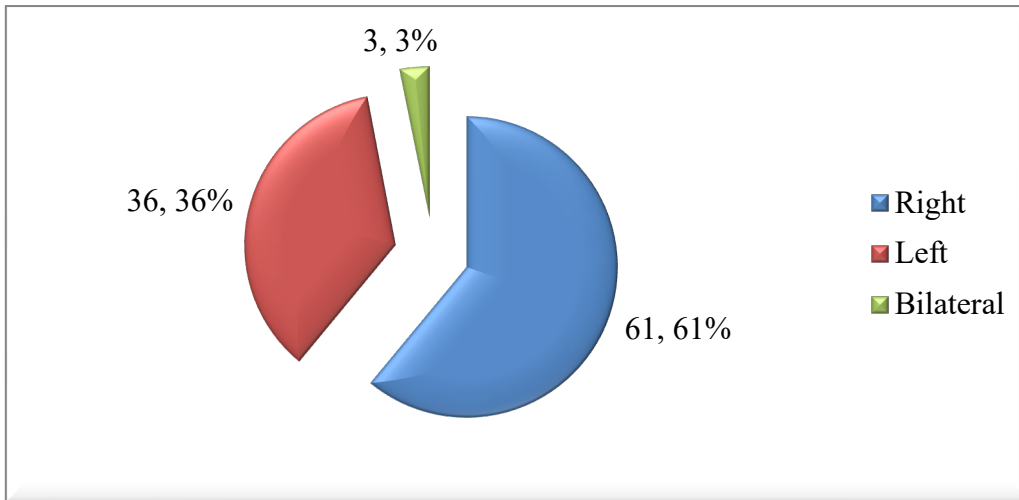
### Results

A total of 100 consecutive cases of pleural effusion had been included in this study.

**Table 1: Age and Gender wise distribution of patients**

Age group	No of cases	Percentage (%)
< 20	9	9.0%
21 to 30	27	27.0%
31 to 40	23	23.0%
41 to 50	20	20.0%
51 to 60	14	14.0%
> 60	7	7.0%
<b>Gender</b>		
Male	64	64.0%
Female	36	36.0%

64 male and 36 female patients out of the 100 analysed individuals were male. Nine of the patients were under the age of 20, 27 were in the 21–30 year range, 23 were in the 31–40 year range, 20 were in the 41–50 year range, and seven were over the age of 60. (Table 1)



**Figure 1: Site of involvement in cases of pleural effusion**

Pleural effusion was more common on the right side (61.61%) in our study. 3.3% Cases were bilateral. (Graph 1)

**Table 2: Distribution of patients according to symptoms**

Symptoms	No of cases	Percentage (%)
Dyspnoea	73	73.0%
Cough	57	57.0%
Fever	51	51.0%
Pleuritic chest pain	46	46.0%
Anorexia	42	42.0%
Weight Loss	36	36.0%
Pedal edema	18	18.0%
Hemoptysis	7	7.0%
Jaundice	1	1.0%

In our study, most common presenting symptom was Dyspnea (73%) followed by cough (57%), fever (51%), chest pain (46%). Loss of weight and loss of appetite was present in 36% and 42% of the patients respectively. Pedal edema, hemoptysis and jaundice was present in 18, 7 and 1 patient respectively. (Table 2)

**Table 3: Distribution of patients according to Appearance of pleural fluid**

Appearance of pleural fluid	No of cases	Percentage (%)
Straw coloured	49	49.0%
Clear	11	11.0%
High coloured	18	18.0%
Pus	6	6.0%
Turbid	14	14.0%
Hemorrhagic	2	2.0%

Straw coloured was most common pleural fluid (49%), followed by clear (21%), High coloured and Pus was present in 6% cases.

**Table 4: Distribution of cases according to aetiology**

<b>Aetiology</b>	<b>No of cases</b>	<b>Percentage (%)</b>
<b>Exudative</b>	<b>85</b>	<b>85.0%</b>
Tuberculosis	61	61.0%
Pneumonia	6	6.0%
Malignancy	5	7.0%
– Adenocarcinoma	2	3.0%
– Small cell	1	2.0%
– Squamous cell	1	1.0%
– Lymphoma	1	1.0%
Empyema	4	4.0%
Collagen vascular disease	2	2.0%
Rheumatic arthritis	1	1.0%
Pancreatitis	1	1.0%
Uremia	1	1.0%
Undiagnosed	4	4.0%
<b>Transudative</b>	<b>15</b>	<b>15%</b>
CCF	6	6.0%
Cirrhosis of liver	3	3.0%
Chronic renal failure	3	3.0%
Hypothyroidism	2	2.0%
Hypoalbuminemia (malabsorption)	1	1.0%

The most frequent etiology of Exudative pleural effusion was tuberculosis in 61% of patients, Pneumonia in 6% cases, Malignancy in 5% cases, Empyema in 4% cases and Rheumatic arthritis, Pancreatitis and Uremia 1% of each patients. The most

frequent etiology of Transudative pleural effusion was CCF in 6%, Cirrhosis of liver in 3%, Chronic renal failure in 3%, Hypothyroidism in 2% and Hypoalbuminemia in 1% patients.

**Table 5: Distribution of patients according to investigations**

<b>Investigations</b>	<b>No of cases</b>	<b>Percentage (%)</b>
Sputum for Acid-Fast Bacteria (AFB)	17	17.0%
Pleural fluid Analysis	49	49.0%
LN: Fine needle aspiration cytology (FNAC)	17	17.0%
Pleural biopsy	14	14.0%
CT- Fine needle aspiration cytology (FNAC)	9	9.0%
fiberoptic bronchoscopy (FOB)	3	3.0%
Echocardiogram (ECHO)	2	2.0%

According to investigations Pleural fluid study compromise 49% of the investigations followed by Sputum for AFB and LN: FNAC 17% each respectively. Pleural biopsy was performed in 14% of the study patients and CT FNAC was done in 9% of the study population.

### Discussion

64 of the 100 patients studied were men, and 36 were women. In our analysis, men made up the majority of pleural effusion cases compared to women. Males predominated among the pleural effusion cases that were studied in the past.[8] Sharma et al. made a comparable observation as well.[11] The ratio

fluctuates from research to study and is presumably influenced by how patients were chosen. Nine patients were under 20 years old, 27 were between 21 and 30 years old, 23 were between 31 and 40, 20 were between 41 and 50, and 7 were beyond 60 years old. In a prior study, the majority of the cases were found to be between the ages of 21 and 40.[12] According to a different survey, 29.6% of the cases were of people under the age of 20.8 According to a study conducted in Qatar by Khan et al.[13], the sample population had a 3:1 male-to-female ratio and a mean age of  $47.4 \pm 18.2$  years. Similar findings were found in a study by Arya Shashikant and Archana<sup>6</sup> from India, which revealed that the average age of their 100 study participants was 38.10 years, with the majority of them being between the ages of 21 and 60, and the male to female ratio was 2.3:1. A different study from India was conducted by Raghavan et al. [14] and comprised 100 patients, the majority of whom were men between the ages of 30 and 60, with a mean age of  $46.49 \pm 13.5$  years.

More often, effusions on the right side. The diagnosis of tubercular pleural effusion heavily relies on the estimation of pleural fluid ADA. Most cases of pleural effusion caused by malignancy can be diagnosed using closed pleural biopsy and pleural fluid cytology.

Worldwide, CCF is the most frequent factor contributing to pleural effusion[1], but in India, tuberculosis is the leading factor.[2] In our analysis, the most frequent aetiology for pleural effusion was tuberculosis. Our study's findings are consistent with those of Jindal[15] and Valdés.[7] The fact that we conducted our study at a teaching hospital's pulmonary medicine department, where most cases of CCF, cirrhosis, and nephrotic syndrome may be treated after being triaged from the general OPD or emergency department can be used to explain why there was a lower incidence of transudative effusion in our

study. Due to the failure to do a chest X-ray before to starting diuretic therapy, certain transudative cases of moderate effusion may go undetected.

Dyspnea (73%) was the most prevalent presenting symptom in our sample, followed by cough (57%), fever (51%), and chest discomfort (46%). In 36% and 42% of the patients, respectively, weight loss and appetite loss were present. Jaundice, hemoptysis, and pedal edoema were all observed in 18, 7, and 1 patients, respectively. Similar research was conducted by Al Alusi[16] with 100 patients. Of these, dyspnea (87%), cough (86%), fever (79%) and chest discomfort (67%), in that order, were the most prevalent symptoms. Similar research was conducted by Mbata Godwin et al.[17], who found that the most common symptoms in 156 patients (78.4%) were cough, chest discomfort, and dyspnea. Desalew et al[18] in their study of 110 patients, cough fever, and weight loss were present in 90%, 77.3%, and 77.3% of cases, respectively.

Color of effusion is of immense diagnostic importance. Tubercular effusion was predominantly straw colored whereas malignant effusion was hemorrhagic. Turbid pleural fluid is suggestive of PPE. Transudative pleural effusions are generally clear. Straw coloured was most common pleural fluid (49%), followed by clear (21%), High coloured and Pus was present in 6% cases.

61% of patients with exudative pleural effusion had tuberculosis as the cause, followed by 6% with pneumonia, 5% with cancer, 4% with empyema, and 1% with rheumatoid arthritis, pancreatitis, and 1% with uremia. The most common causes of transudative pleural effusion were CCF in 6% of cases, liver cirrhosis in 3%, chronic renal failure in 3% of cases, hypothyroidism in 2% of cases, and hypoalbuminemia in 1% of cases. In a related study by Adeoye et al.[19],

pneumonia (15%) and cancer (29.1%) were the most frequent causes of pleural effusion, respectively, accounting for 32.9% and 15.1% of patients, respectively. In a five-year retrospective analysis by Mbata Godwin et al.[17], the most frequent aetiology was tuberculosis, which affected 42.2% of patients. Parapneumonic effusion affected 14.07% of patients. According to a research from Qatar by Khan et al.[13], tuberculosis caused pleural effusion in 32.5% of patients, parapneumonic effusion in 19%, malignant effusion in 15.5%, and heart failure in 13%. Al-Alusi's study, which involved 100 patients, revealed that malignant illness accounted for 34% of pleural effusion cases whereas tuberculosis occurred in 38% of cases. The study's current limitations include its very small sample size and brief study length.

### Conclusion

In everyday clinical practise in India, pleural effusion is a prevalent clinical phenomenon. Exudative effusions are frequently brought on by tuberculosis, parapneumonic effusions, and cancer. When pleural fluid cytology results are negative, pleural biopsy should be performed. Knowing the aetiology helps design pertinent examinations in PE patients and shortens the time it takes to diagnose them.

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