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Study of Clinical Profile and Diagnostic Approach in Patients with Pleural Effusion

Dr. Harini Raman[1], Dr. C. Senthil[2]

[1]Post Graduate, Department of General Medicine, ACS Medical College and Hospital

[2]HOD, Department of General Medicine, ACS Medical College and Hospital

Abstract: ***Background: Pleural effusion, an abnormal accumulation of fluid in the pleural space, is a frequent clinical condition resulting from various pulmonary and extrapulmonary disorders. In India, tuberculosis remains a leading cause of exudative effusions, necessitating a detailed diagnostic approach to differentiate among etiologies. Objectives: To study the clinical profile and presenting symptoms of pleural effusion. To analyse radiological and laboratory findings. To determine the underlying etiological factors in patients with pleural effusion. Methods: A descriptive cross-sectional study was conducted over 12 months (June 2023–June 2024) at ACS Medical College and Hospital, Chennai. Fifty-one patients aged ≥14 years with clinically and biochemically confirmed pleural effusion were included. Data were collected through clinical examination, chest radiography, pleural fluid analysis (including ADA, cytology, CBNAAT), and relevant biochemical tests. Light's criteria were applied to classify effusions as exudative or transudative. Results: The mean age of participants was 50.21 years, with a male predominance (60.78%). Right-sided pleural effusion was more common (54.90%). The most frequent clinical presentations were breathlessness (84.31%), cough with expectoration (82.35%), and fever (70.58%). Tuberculosis accounted for 62.74% of pleural effusions, followed by synpneumonic effusions (11.76%), CCF (9.80%), and malignancy (7.84%). Exudative effusions were more prevalent (74.50%). High pleural fluid LDH and ADA levels were notable in tuberculosis-related effusions. CBNAAT was positive in 7.84% of patients, while malignant cells were detected in 4 cases. Conclusion: Tuberculosis remains the most common cause of pleural effusion in this population. Clinical symptoms and radiological findings, supported by pleural fluid ADA, LDH, cytology, and CBNAAT, are crucial for accurate diagnosis and effective management.***

Keywords: Pleural effusion, Tuberculosis, Exudate, Transudate, ADA, LDH, CBNAAT, Clinical profile, Chest radiograph

1. Introduction

- Pleural effusion is simply defined as an excess accumulation of fluid between the two pleural layers. (1) Rather than a disease, it is a complication of pulmonary or non - pulmonary diseases, and that leads to further consequences, if the things are not properly and timely managed. (2) There is a huge number of causes associated with the pleural effusion.
- On the Light's criteria, these can be broadly classified into two groups, exudative and transudative effusion. (2)
- There is an excessive accumulation of fluid in the pleural space.
- Worldwide, congestive cardiac failure (CCF) is considered the most common cause of transudate pleural effusion. (2) However, associated with the exudative pleural effusions, tuberculosis, malignancy, and pneumonia are the most common causes observed in India. (2, 3)

2. Objectives

- To study the clinical profile of pleural effusion
- To study the radiological manifestation of pleural effusion
- To study the laboratory diagnostic findings in pleural effusion
- To study the etiological factors of pleural effusion

3. Materials & Methods

- The present study, entitled "Clinical investigative profile of pleural effusion in patients admitted to ACS Medical College and Hospital", was a descriptive cross - sectional study carried out in the Department of Medicine, ACS Medical College and Hospital.
- **Design:** Descriptive cross - sectional study
- **Study period:** 12 months duration starting from JUNE 2023 to JUNE 2024
- **Study population:** The study was conducted in the ACS Medical College and Hospital; a tertiary care teaching hospital located in Chennai. In patients with clinical and biochemical evidence of pleural effusion
- **Sample Size:** A total of 51 samples were included in this study. This included all patients of pleural effusion aged ≥14 years admitted in the medicine wards of ACS Medical College and Hospital.

Inclusion criteria

- Patient age more than 12 years. Either male /female
- Patients with tapable pleural effusion
- Patients who are willing to give consent for the study and parental consent for patients less than 15 years.

Exclusion criteria

- Patients with loculated non - tapable pleural effusion.
- Patients with coagulopathies/bleeding tendencies
- Patients with any other contraindications to pleural tapping
- Non - consenting patients

4. Results

Table 1: Age - wise distribution of patients

Age range (Years)	Number of patients	Percentage
18 - 30	15	29.4
31 - 50	9	17.64
51 - 60	5	9.8
61	22	43.14
Total patients	51	100

In the present study mean age of patients was 50.21 years, while the maximum patients were above 61 years of age.

Table 2: Gender wise distribution of patients

Gender wise distribution	Number of patients	Percentage
Male	31	60.78
Female	20	39.21
Total number of patients	51	100

In the present study maximum patients were male (60.78%), while female patients were 39.21%.

Table 3: Etiology of pleural effusion – distribution of patients

Etiology of pleural effusion	Number of patients	Percentage
Tubercular pleural effusion	32	62.74
Synpneumonic	6	11.76
CCF	5	9.8
Malignancy	4	7.84
Liver cirrhosis	2	3.92
Septic shock	2	3.92

In the present study, 62.74 % of patients had tuberculosis, 11.76 % with synpneumonic, 9.80% with CCF, 7.84% with malignancy, 3.92 % with liver cirrhosis and 3.92 % with septic shock.

Table 4: Distribution of radiological features:

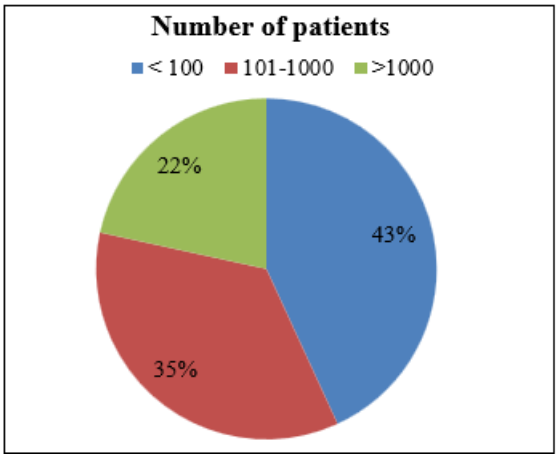
Radiological X ray features	Number of patients	Percentage
Right sided pleural effusion	28	54.9
Left sided pleural effusion	14	27.45
B/L Pleural effusion	5	9.8
Neoplastic mass with pleural effusion	4	7.84

In present study, in 28 patients (54.90 %) was observed right side pleural effusion, in 14 patients (27.45%) was observed left side pleural effusion.

Table 5: Distribution of patients according to presenting complaints:

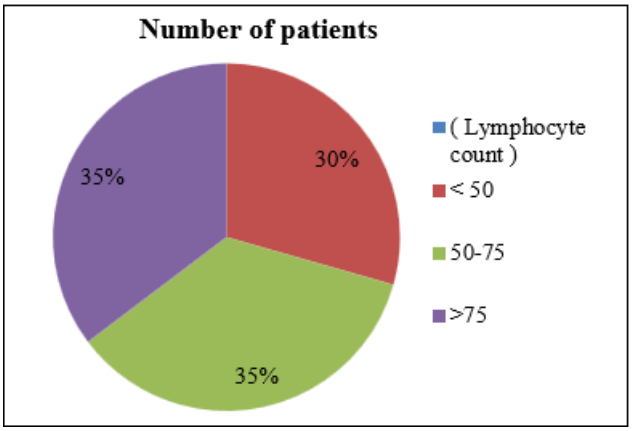
Clinical features	Number of patients	Percentage
Breathlessness	43	84.31
Cough with expectoration	42	82.35
Fever	36	70.58
Weight loss	21	41.18
Chest pain	18	35.29
Lower limb swelling	11	21.57
Dry cough	9	17.64
Abdominal distension	8	15.68
Loss of appetite	7	13.72
Giddiness	5	9.8

In the present study, 43 patients (84.31 %) with breathlessness, in 42 patients (82.35%) there was cough with expectoration, etc.



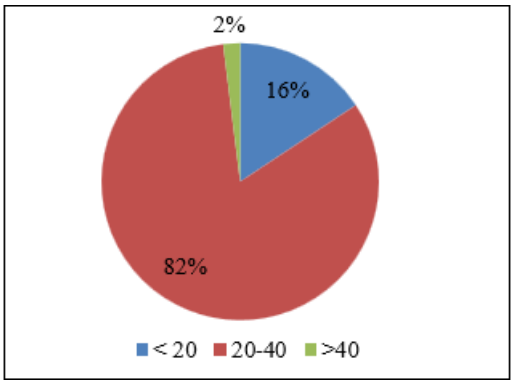
Graph 1: TLC Count – pleural fluid - examination in patients

In the present study, the TLC count was less than 100 in 22 (43.13%) patients, more than 1000 in 11 (21.56%) patients



Graph 2 (A): Lymphocyte Count – pleural fluid - examination in patients

In the present study, the Lymphocyte count was less than 50 in 15 (29.4%) patients, more than 75 in 18 (35.29%) patients, while it was in the range 50 - 75 in 18 patients (35.29%).



Graph 2 (B): Neutrophil Count –pleural fluid - examination in patients

In the present study, Neutrophil Count was less than 20 in 8 patients (15.68%), more than 40 in 1 (1.96%) patient, while it was in the range 20 - 40 in 42 patients (82.35%).

Table 6: Distribution of patients according to mean pleural fluid LDH levels

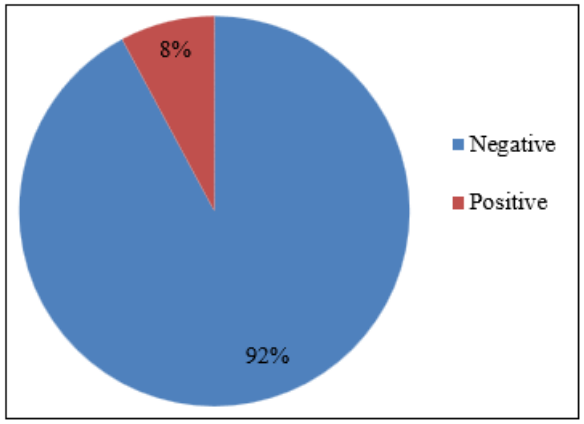
Etiology	Number of patients (N= 51)	MEAN (gm/dl)	Standard Deviation (SD)
TB	32	582.84	410.19
Synpneumonic	6	557.1	61.2
CCF	5	89.4	48.09
Malignancy	4	555.5	119.33
Cirrhosis	2	69.5	31.29
Septic shock	2	138.12	82.9

In the present study, the highest LDH levels were seen in TB patients.

Table 7: Malignant cells – pleural fluid - examination in patients

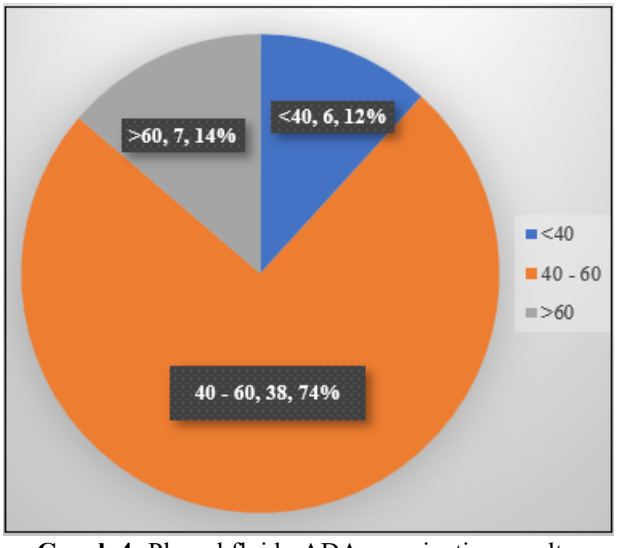
Malignant Cells	Number of Patients	Percentage
Negative	47	92.15
Positive	4	7.84

In the present study, Malignant cells were seen in 4 patients (7.84 %).



Graph 3: CBNAAT – pleural fluid - examination in patients

In the present study, CBNAAT was negative in 47 patients (92.15%) while positive in 4 (7.84%) patients.



Graph 4: Pleural fluid - ADA examination results:

In the present study, Pleural fluid - ADA was < 40 in 6 patients (11.76%) while it was in the range 40 - 60 in 38 patients (74.05%), >60 in 7 patients (13.72%).

In the present study, Transudate was present in 13 patients (25.49%) while exudate was present in 38 patients (74.50%).

5. Discussion

1) In the present study mean age of patients was 50.21 years, while the maximum patients were above 61 years of age. In study of Porcel JM et al[34] mean age was 58.02 years, In Biswas B et al [36]study the mean age was 51 years.
2) In the present study, 60.74% of patients were male, while female patients were 39.21%. Similar results were seen in studies of Porcel JM et al and Biswas B et al (34, 36) where they found male patients to be 64% and 66%, respectively.
3) In the present study, 62.74 % of patients were due to tuberculosis, 11.76 % had synpneumonic. Similar results were obtained by Maikap MK et al they concluded, the most common cause of pleural effusion in his study was tuberculosis (68.8%), followed by malignancy (14%)
4) In the present study, the presenting clinical features were 43 patients (84.31 %) with breathlessness, followed by 42 patients (82.35%) with cough with expectoration. In study of Biswas B et al, the most common presenting symptom was shortness of breath (95.4%), followed by chest pain (89.4%).
5) In our study right right - sided pleural effusion (54.90%) was more common. Similarly, Poongavanam Paranthaman[48] study also right sided pleural effusion was common (56%).
6) Pleural fluid TLC count was less than 100/cumm in 22 (43.13%) patients, more than 1000/cumm in 11 (21.56%) patients. Similar results were noted by Biswas B et al, Porcel JM et al., Khamar N D et al and Dhital KR (36, 34, 27, 50) who found that TLC count was respectively less than 100/cumm in 38 %
7) In the present study, mean pleural fluid LDH levels for etiology of tuberculosis were 582.84 IU/L, pneumonia 557.10 IU/L, etc.758.33 IU/L in Porcel JM et al study, 561.09 IU/L in Khamar et al study
8) In the present study, CBNAAT was negative in 47 patients (92.15%) while positive in 4 (7.84%) patients. In Porcel JM et al study CBNAT was positive in 4% patients (34).2% in Poongavanam Paranthaman et al study
9) In the present study, Pleural fluid - ADA was < 40 IU/L in 6 patients (11.76%) while it was in the range 40 - 60 IU/L in 38 patients (74.05%). While comparing with Biswas B et al study (36), Out of 36 cases of malignancy, 34 cases (94.4%) had ADA value <40 IU/L.

6. Conclusion

1) Dry cough (17.64%), abdominal distension (15.68%). The most common presenting complaint was breathlessness (84.31%), followed by cough with expectoration (82.35%), fever (70.58%), weight loss (41.18%), chest pain (35.29%), lower limb swelling (21.57appetite (13.72%) and giddiness (9.80%).
2) Based on clinical examination and chest X - ray findings, 54.90% of patients had right - sided pleural effusion, 27.45% of patients had left - sided pleural effusion, 9.80 % had bilateral pleural effusion, and 7.84% had malignant pleural effusion.

3) The lights criteria were used to diagnose exudative and transudative pleural effusion by simultaneous determination of pleural fluid to serum protein ratio and pleural fluid to serum LDH ratio. Exudative pleural effusion was present in 74.50% and transudative pleural effusion was present in 25.49%.
4) The commonest cause of pleural effusion was tuberculosis (62.74%), followed by synpneumonic pleural effusion (11.76%), CCF (9.80%), malignancy (7.84%), liver cirrhosis (3.92%) & septic shock (3.92%).

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