

A STUDY OF CLINCOETIOLOGICAL PROFILE OF PATIENTS WITH PLEURAL EFFUSION: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objectives: The objective of this study was to determine the clinical profile, etiology in patients presenting with plural effusion and correlation between etiology, clinical, and radiological findings.

Methods: It was a cross-sectional study carried out at the GRMC JAH Department of Medicine, Gwalior, from to July 2013 to October 2014 after getting the permission from the Institutional Ethical Committee. Inclusion criteria were all 100 patients above 14 years of age with clinical and radiological evidence of plural effusion. Patients with history of trauma chest and thoracocentesis were excluded from the study. The demographic variables were gender, age in years, sex, and address. The research variables were breathlessness, fever, cough, chest pain, generalized edema, abdominal pain, hemoptysis, and cause of pleural effusion. Investigations such as complete blood count, retained blood syndrome, renal function test, serum albumin, chest X-ray, pleural fluid analysis, ultrasonography chest and abdomen, echocardiogram, upper gastrointestinal endoscopy, blood culture, fine-needle aspiration cytology, and computed tomography scan. There were eight age groups between below 21 years and above 81 years. Nominal data were analyzed for frequency and (%) and the numeric data were analyzed by Chi-square test p-value.

Results: In the present study, maximum cases (66%) presented with exudative type of pleural effusion. Of these 43 cases (65.15%) had tuberculosis, 5 cases (7.5%) had malignancy and 4 cases (6.06%) had pneumonia. About 34% cases presented with transudative type of pleural effusion. Of these 10 cases (29.41%) had hepatic involvement, and 8 cases (23.52%) had congestive cardiac failure. Acute febrile illness 9 (9%), nephrotic syndrome 4 (16%), renal failure 5 (5%), hypoalbuminemia 5 (5%), pancreatitis (1%), and adult respiratory distress syndrome (1%) were other causes of pleural effusion in this study.

Keywords: Pleural effusion, Tuberculosis, Congestive cardiac failure, Adult respiratory distress syndrome.

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INTRODUCTION

A pleural effusion is an abnormal collection of fluid in the pleural space resulting from excess fluid production or decreased absorption or both. It reflects an abnormal pathophysiological state resulting from disequilibria between pleural fluid formation and removal. It is the most common manifestation of pleural disease, with etiologies ranging from cardiopulmonary disorders to symptomatic inflammatory or malignant diseases requiring urgent evaluation and treatment [1]. Pleural effusion is a common finding among patients presenting with cardiopulmonary symptoms. A systemic approach to the investigations is needed due to the extensive differential diagnosis. Pleural effusions can be transudative or exudative [2]. In cases with transudative pleural effusion, the diagnosis is usually made without much difficulties, but exudative pleural effusion requires careful differential diagnosis that includes parapneumonic effusion, tuberculosis (TB), and metastatic cancers which are found to be the cases in large number of patients [3,4]. Pleural cavity is a potential space lined by mesothelium containing about 0.1–0.2 mL/kg of clear colorless fluid which is an ultrafiltrate derived from the capillaries of the parietal pleura. It is reabsorbed through the lymphatic and venules of visceral pleura. Pleural fluid has a specific gravity of 1.010–1.026, pH of 6.8–7.6, protein of 1.5 g/dL with an albumin 50–70%, and globulin of 30–45%.

Objectives

The objectives of this study were as follows:

- To study the clinical profile of patients with pleural effusion
- To study the etiology of pleural effusion
- To study the correlation between etiology and clinical and radiological finding in patients with pleural effusion.

METHODS

This study was conducted after getting the permission from the Institutional Ethical Committee GRMC Gwalior. In this study, a total of 100 patients admitted to GRMC/JAH Tertiary Care Center, with varied admitting diagnosis whose length of stay exceeded over 24 h and satisfying the inclusion criteria and had pleural effusions at the time of diagnosis or those developing during the hospital stay were evaluated prospectively.

Inclusion criteria

All 100 patients (>14 years of age) with clinically or radiologically documented pleural effusion were included in present study after taking the informed consent.

Exclusion criteria

The following criteria were excluded from the study:

- Patients with hydropneumothorax and trauma chest will be excluded
- Past history of thoracocentesis

The demographic data collected included age, sex, and address. A detailed historical account was obtained with emphasis on chief complaint, history of presenting illness, and significant history including the drug history. A thorough physical examination was done. Investigations such as complete hemogram, random blood sugar, renal function tests, serum albumin, chest-X-ray, and pleural fluid analysis were carried out in all the cases. Investigations such as ultrasonogram of the chest and abdomen, echocardiogram, upper gastrointestinal tract endoscopy, blood culture, fine-needle aspiration cytology, and computed tomography scan of chest and abdomen of the lung were

carried out as optional investigations when relevant to supplement the diagnosis. The pleural fluid was quantified as small, moderate, and large based on the chest radiographic finding in the upright or semi-upright position: Small-If the fluid obliterates the lower lung zone, moderate-lower and middle lung zones, and large-all three-lung zones. On decubitus radiography, the widest measurement of pleural fluid from the inner wall of the chest to the free fluid edge was used for quantification of the effusion. The effusion were said to be: Small-width is <1.5 cm, moderate-1.5–4.5 cm, and large ->4.5 cm.

The pleural fluid analysis was routinely done in all the cases and if the effusion was small, it was carried out under ultrasonographic guidance. The pleural fluid analysis included the study of pH, protein, cell count and type, gram staining, acid fast staining, and culture. We classified the effusions into a transudate or exudates based on the Lights criteria, the effusion was said to be an exudates if they meet at least one of the following and transudates meet none of these criteria:

- Pleural fluid protein/serum protein >0.5
- Pleural fluid lactate dehydrogenase (LDH)/serum LDH >0.6
- Pleural fluid LDH more than two-thirds of normal upper limit for serum. When found to be an exudates further analysis to discern, the cause of the effusion such as pleural fluid cytology for malignant cells, pleural fluid adenosine deaminase (ADA), polymerase chain reaction, and amylase was carried out, as the case may need. In case of transudative effusions, no further analysis of the pleural fluid was done.

RESULTS

Out of 100 cases of pleural effusion, 70 (70%) were male and 30 (30%) female with male to female ratio 2.3 to 1. According to age, mean age was 38.10 years. Maximum number of cases was presented in 21–60 year of age because people are exposed to occupation hazards, smoking and infections, as the person is physically active. In the age group 21–60 years, 72% of cases fall in adult working group. According to history, 8 patients (36.40%) had come with history of pulmonary TB which was highest as compare to other diseases. According to symptoms, fever (53%) and breathlessness (45%) were most common symptoms, followed by, cough, chest pain, and abdominal pain. In our study, maximum patients (50%) presented with pallor which is a sign of chronic infection followed by pedal edema (23%). According to X-ray findings, small right-sided pleural effusion are most common. We found right side cases more than left side. $p < 0.00001$. The result is significant at $p < 0.05$.

Among cases of tubercular pleural effusion, there were 45 cases which showed greatly elevated ADA levels in pleural fluid ranging from 40 U/L to >70 U/L. In malignant effusion, all cases showed pleural fluid ADA value from 40 U to 70 U/L. All five cases of hypoproteinemia had value of pleural fluid ADA <40 U/L. As $p = 0.00013$, statistically the result is significant. ADA values >70 U/L are highly suggestive of tubercular etiology. The values of pleural fluid ADA levels in TB were significantly raised when compared with malignant pleural effusion ($p < 0.0001$) and hypoproteinemia ($p < 0.0001$).

In the present study, maximum cases (66%) presented with exudative type of pleural effusion. Of these 43 cases (65.15%) had TB, 5 cases (7.5%) had malignancy and 4 cases (6.06%) had pneumonia. About 34% cases presented with transudative type of pleural effusion. Of these 10 cases (29.41%) had hepatic involvement, 8 cases (23.52%) had congestive cardiac failure (CCF). Type of fluid shows a correlation with etiology of the effusion. Exudative pleural effusion is most common in TB 43/45 (95.5%) while transudative pleural effusion is most common in liver cirrhosis. $p < 0.00001$ thus, statistically result is significant at $p < 0.05$.

p-value laterality wise is 0.207. The result is not significant at $p < 0.05$, though it shows a correlation but statistically not significant.

p-value size wise is 0.009955 that the result is significant at $p < 0.05$.

Correlation of size with disease is statistically highly significant and shows a strong predilection for the size of the effusion being directly proportional to etiology.

DISCUSSION

In our study, maximum percentage of patients 70% were male and 30% were female and Male: Female ratio 2.3:1.

In Abumossalam *et al.* in their study, 72.3% were male and 27.7% were female and the male: Female ratio was 2.6:1.

In the present study, the mean age was 38.10 ± 16.21 . The maximum number of cases 26% were in the age group 21–30 year followed by 20% cases were in the age group 31–40 years, followed by 13% cases each for age group 41–50 and 51–60 age group. Hence, in total maximum number of cases, 72% were in the age group of 21–60 years.

In Desalew *et al.*, in 2002, the mean age was 37.0 ± 15.69 . The maximum number of cases 55% was in the age group of 21–60 years. In Abu Mossallam *et al.*, the mean age was 37.5 ± 15.25 . The maximum number of cases 62% was in the age group of 21–60 years.

In the present study, 36.4% of the cases had history of pulmonary tb followed by 27.6% had history of diabetes mellitus (DM) followed by 13.6% each had history of chronic liver disease (CLD) and coronary artery disease (CAD) and remain in 1% each had history of RHD and HIV. In Farrukh *et al.* maximum percentage of the patients 43.75% had history of pulmonary tb followed by 28.12% had CAD followed by 12.5% had history of DM and 6.25% had history of CLD.

In the present study, maximum number of cases 53% had fever followed by breathlessness, which were present in 45% cases, followed by cough in 31% cases and chest pain in 22% cases. In Rehan *et al.*, maximum number of the cases 82% had fever and breathlessness followed by 77% cases had cough and chest pain were present in 57% of the cases.

In the present study, maximum 50% had signs of pallor followed by 23% had edema followed by 14% had icterus then 13%, 7%, and 1% had hepatomegaly, splenomegaly, and cyanosis. In Madabhavi *et al.*, maximum percentage 68% had signs of pedal edema followed by 65% which had splenomegaly followed by 45%, 37%, 6%, and 4% had pallor, icterus, hepatomegaly, and cyanosis, respectively.

In the present study, maximum number of cases 66% had shown exudative type of pleural effusion, which followed by 34% had transudative type of pleural effusion. Results were similar to Aurangzeb *et al.* study that maximum number of cases 75% had shown exudative type of pleural effusion followed by 25% which had transudative type of pleural effusion.

In the present study, tubercular patients maximum 25 cases had ADA >70 12 cases had ADA level 40–70 and 8 cases had ADA <40 whereas in hypoproteinemia patients, all cases present had ADA level <40. RW Light *et al.* 1999, ADA level <70 IU/L observed only in cases of tubercular pleural effusion so from the study, we concluded that if ADA level of more than 70 IU/L is taken as cutoff point that it is exclusively seen in cases of tubercular pleural effusion. A proportion of ADA $p < 0.0001$ (statistically significant) is a good indicator of TB pleurisy, with an accuracy of 99%, a sensitivity of 100%, and a specificity of 98.6%.

In the present study, maximum cases 45% had right-sided pleural effusion followed by 34% had bilateral pleural effusion and remaining 21% had left-sided pleural effusion. In George *et al.*, in 2012, maximum number of patients 40% had right-sided pleural effusion followed by 35% had bilateral pleural effusion and remaining 25% had left-sided pleural effusion that the results were comparable with our study.

In the present study, maximum number of cases 45% had pulmonary TB followed by 13% of the cases were hepatic in etiology followed by

Table 1: Distribution of disease according to ADA level wise

Diagnosis	<40	40-70	>70	Total
TB	8	12	25	45
Malignancy	0	4	2	06
Hypoproteinemia	5	0	0	05

TB: Tuberculosis, ADA: Adenosine deaminase

Table 2: Distribution of study population according to type and etiology of pleural effusion

Etiology of pleural effusion	Transudative %		Exudative %	
TB	45	2	4.4	43
Hepatic	13	10	76.9	3
CCF	11	8	72.7	3
Acute febrile illness	9	6	66.6	3
Malignancy	6	1	16.7	5
Hypoalbuminemia	5	3	60	2
Renal	5	2	40	3
Pneumonia	4	0	0	4
Pancreatitis	1	1	100	0
ARDS	1	0	0	1
Total	100	34		66

ARDS: Adult respiratory distress syndrome, TB: Tuberculosis, CCF: Congestive cardiac failure

Table 3: Correlation of pleural effusion etiology with laterality

Etiology of pleural effusion	No of cases	Laterality		
		Bilateral	Right	Left
Tuberculosis	45	11	21	13
Liver cirrhosis	13	4	8	1
CCF	11	9	1	1
Acute febrile illness	9	2	4	3
Malignancy	6	2	2	2
Hypoalbuminemia	5	1	2	2
Renal	5	2	1	2
Pneumonia	4	0	3	1
Pancreatitis	1	1	0	0
ARDS	1	1	0	0

ARDS: Adult respiratory distress syndrome, CCF: Congestive cardiac failure

Table 4: Correlation of pleural effusion etiology with size

Etiology of pleural effusion	No of cases	Size		
		Small	Moderate	Large
Tuberculosis	45	26	19	0
Liver cirrhosis	13	5	5	3
CCF	11	9	1	0
Acute febrile illness	6	5	4	0
Malignancy	6	1	3	2
Hypoalbuminemia	5	3	-	2
Renal	5	4	1	-
Pneumonia	4	4	0	0
Pancreatitis	1	1	0	0
ARDS	1	1	0	0

ARDS: Adult respiratory distress syndrome, CCF: Congestive cardiac failure

11% cases had ccf. In pulmonary tb patients, out of 45 cases, 21 cases had right-sided pleural effusion whereas in ccf cases, out of 11 cases, nine developed bilateral pleural effusion.

Valdes *et al.* at a university hospital in Spain, they studied 642 patients with pleural effusion, revealed that the most frequent cause of the effusion was TB (25%), followed by neoplasia (22.9%) and ccf (17.9%). About 86% of these affected right side.

CONCLUSION

In our study, we found: The most common etiology of pleural effusion in patients is TB followed by hepatic diseases and CCF in the Department of Medicine GRMC/JAH Group of Hospital Gwalior. Most common cause of pleural effusion is pulmonary TB. Second most common cause of pleural effusion is hepatic diseases. Right-sided pleural effusion is most common in TB. In TB, most effusions are small sized 58%. Most common hepatic pleural effusion is right sided 61%. CCF is third most common cause of pleural effusion that 70% of effusion due to CCF are bilateral and 90% of all these effusions are small. About 9% of patients had pleural effusion due to acute febrile illness which resolved completely on treatment of underlying cause. Highest proportion of large size pleural effusion seen in malignancy 33%. Most cases are in 21-60 years age group. Most common presenting complaints are fever and breathlessness. Out of 100 cases, 70 male and 30 female patients have pleural effusion. Most common presentation in all 100 cases are right-sided and small pleural effusion. Most of the effusions resolve with treatment of the underlying cause. Determining the etiological and clinical pattern of pleural effusion helps in adoption of regionally optimized diagnostic and therapeutic attitudes

CONFLICTS OF INTEREST

None declared.

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