ANALYTICAL STUDY OF CLINICAL AND ETIOLOGICAL PROFILE OF PATIENTS PRESENTING WITH PLEURAL EFFUSIONS TO A TERTIARY HOSPITAL

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ABSTRACT: A Cross Sectional study was carried out on 100 patients with pleural effusion from December 2013 to July 2015 at ASRAM Medical College and Hospital Department of Pulmonary Medicine,Eluru. In our study, Exudative effusion remains most common cause of pleural effusion.Tubercular effusion remains the commonest etiology of all exudative effusions, where as Congestive cardiac failure remains commonest cause among transudative effusions.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 ubercular effusion where as empyema cases presented with pus. Right sided effusion was most common with male to female ratio of 3.54:1 ,with mean age of 40.5+11.3 years.Empyema was most commonly associated with high Leukocytes.Tubercular effusion was associated with lymphocytic predominant effusion where as neutophilic dominant effusion included empyema and parapneumonic effusion.Pleural fluid, with low glucose (<40 mg/dl) was seen predominantly in empyemas. Pleural LDH to serum LDH ratio >2 was seen predominantly in empyemas .A pleural fluid ADA more than 70 IU/L was associated with nearly half of Tubercular effusions , where as others with ADA levels between 30 to 70 IU/L along with clinicoradiological findings suggestive of tubercular effusion. Thus proving diagnostic importance of ADA in TB effusions.Early intiation Anitubercular drugs in TB pleural effusion, early intervention and treatment in cases of empyema and parapneumonic effusion showed improvement and signs of recovery.

KEYWORDS: ADA – Adenosine deaminase – PLEF – Pleural Effusions .

HOW TO CITE THIS ARTICLE: A. Lokeswara Reddy, G. Sundar Raj, Md. Badusha, C. Ramanjula Reddy, P. Yugandhar, S. K. Nilofer, S. Satya Sri. "Analytical Study of Clinical And Etiological Profile of Patients Presenting with Pleural Effusions to a Tertiary Hospital". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 88, November 02; Page: 15305-15312, DOI: 10.14260/jemds/2015/2176.

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.[1]

Diagnosing the etiology of pleural effusions clinically with certainty is a challenging task for physicians.

Financial or Other, Competing Interest: None.
Submission 08-10-2015, Peer Review 09-10-2015,
Acceptance 20-10-2015, Published 30-10-2015.
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DOI:10.14260/jemds/2015/2176.

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 ANA, 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. Here I have made an attempt to arrive at the etiological diagnosis of 100 cases of pleural effusion by collecting relevant clinical as well as laboratory data using the recent modalities avaliable in our hospital.

MATERIALS AND METHODS:

Study Place: ASRAM Medical College and Hospital, Department of Pulmonary Medicine.

Study Duration: Study was done from November 2013 to July 2015.

Study Population: The study was carried out on 100 patients with pleural effusion.

STUDY DESIGN: Cross-sectional study.

Inclusion Criteria:

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

Exclusion Criteria:

1. Age < 18 years.
2. Hemodynamically unstable patients.
3. Pregnant women.
4. 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. If the size of the effusion was less than 2/3rd it was considered as not large and if it was more than 2/3rds the size was considered as large effusion respectively in chest x-ray PA view. 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 analyses 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. For inconclusive cases and in some diagnosed cases for futher confirmation, Pleural biopsy was done and histopathological analysis was carried out.Prior informed consent was obtained for all the invasive procedures. Pleural Biopsy and Thoracoscopy was done for few patients only, due to practical difficulties and also many patients deferred to give the consent. In our series we used Abram's pleural biopsy needle for obtaining the pleural tissue. Chest ultrasound was used if the effusion was very small,loculated and difficult to aspirate. Patients with clinical suspicion of parenchymal lesions or other associated diseases of the lung,CT scan of thorax was taken for those who could afford the cost. Other Investigations like Echocardiography, Ultra sonogram abdomen were done in relevant cases only. All the patients were evaluated thoroughly and an appropriate etiological diagnosis was made out in a systematic way

RESULTS:

Demographic Data: 100 consecutive patients with pleural effusions were studied from December 2013 to July 2015. There were 78 males and 22 females. The mean age was 40.55±11.33 years. The mean age among men was 40.43± 10.76 years and in women was 40.95 ± 13.41 years. Majority of the patients were in the age group of 21-40 years (table 1). The male to female ratio was 3.54 :1.

Pleural fluid glucose : Level Majority of the empyemas had pleural fluid glucose level less than 40mg/dl (83.3 %). 100% of parapneumonic effusion, 95% of Tubercular effusion had pleural fluid glucose between than 40 - 100 mg/dl.

Pleural Fluid Adenosine Deaminase (ADA): Pleural fluid ADA was >70 IU/L in 27 patients which is definitive of tubercular effusion, 30-70 IU/L along with clinico-radiological findings in 33 patients of tubercular effusion. Only in 14.3%, 27.3%, 41.7 % of patients with malignant effusion, parapneumonic effusion and empyema respectively had ADA levels of 30-40 IU/L.

DISCUSSION:

Age Distribution: The present study comprised of patients aged from 18 years to 70 years (Mean age: 40.55 ±11.33 years). The mean age in case of tuberculous effusion was 36.33± 8.72 years consistent with Luis Valdes et al (34 years).[2] and S. K. Sharma et al (33 years).[3] and Subhakar. k et al (31 years). Earlier studies done in United States by Epstein et al and Aho K et al showed a mean age of 54 and 28 years respectively.

Patients in our study with malignant pleural effusion were older, around 60 years (mean 62 years) compared to study by Sharma et al.[3](mean age 47 years) and Subhakar et al.[4](mean age 51 years) but consistent with reports from the West (65 years).[2] It is how ever well known that Indian patients with malignancy are 15 years younger as compared to the West observed by Pathak et al.[5]

The mean age in case of Transudative effusions was 54±7.36 years in comparison to Subhakar et al.[4] (48.15+6.92).The mean ages in case of parapneumonic and empyema were 39.27±5.72 years, 38.83±9.07 years respectively in our study.

Sex Distribution: There were a greater number of male patients than female patients in this study with 78% males and 22 % females with a ratio of 3.54:1 which was consistent with Subhakar.K et al[4]– 77.5% males and 22.5% females with a ratio of 3.44:1. In comparison, the sex distributions in some of the previous studies are: ; Luis Valdes[2]- 62.5% males and 37.5% females with a ratio of 1.6:1; Al Quorian.[6]– of 201 cases 145 were males(72%) and 56 females(27.9%) with a ratio of 2.58:1.

Socioeconomic Status: Most of the patients in this study belonged to the lower socioeconomic class. This is consistent with the fact that tuberculosis is a disease more commonly seen among people living in crowded, unhygienic conditions of lower socioeconomic class.It is poverty related disease.

Etiology: Out of the 100 cases of pleural effusion, 60 cases were of tuberculous effusion (60%).This is similar to the observation in another study from India by Maldhure et al.[7] where they showed that the tubercular effusions constitute 76% of the effusions. General prevalance of TB is high in India and Southeast Asian countries than in the West. In India tubercular effusion is the commonest cause of all exudative effusions.

This observation is different from the Western studies, where the incidence of parapneumonic effusion and malignant effusion are much higher compared to tubercular effusion.

The remaining 40 cases were of Empyema (12 cases), Parapneumonic effusion (11 cases), Transudative effusion (10 cases) and malignant effusion (7 cases). CHF was most common cause of transudative pleural effusion in our study which is consistent with Lights description of transudative pleural effusion. In comparison with some of the previous studies are: Prabhu desai et al.[8] tubercular effusion comprises 22.4% and 64% were of malignancy.

Al Quarain et al.[6] common etiology was tubercular (37%) followed by neoplasm (18%), parapneumonic (14%) and congestive cardiac failure (14%); KZ mamum et al - also showed tubercular and malignancy were the major causes of pleural effusion;Luis Valdes et al [2] showed tubercular(25%), malignancy (22.9%) and transudative(17.9%) were commonest causes.

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 comparision with the study done earlier by Arun Gopi et al.[9] 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, where breathlessness (57%) and cough (43%) are predominant symptoms followed by 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 is 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 al majority of effusions were straw coloured of which Tuberculosis (74%) and transudates (67%) were predominant and 34% of malignant effusions were hemorrhagic.

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 al. 83.3% of TB effusions and 100% of malignant effusions had lymphocyte predominance. In comparison to other studies: Valdes L et al.[2]

where they have encountered neutrophil predominant tuberculous effusion in only 6.7% of patients and only one malignant effusion had neutrophil predominant effusion(3%). Follander.12 demonstrated predominance of lymphocytes and scarcity of mesothelial cells in tubercular effusion; Light RW – large number of neutrophils indicate the presence of bacterial pneumonia. Lymphocytes predominant in tubercular pleural effusion.

Pleural Fluid Glucose: The majority of pleural fluid glucose levels were between 40-100mg/dl in tubercular effusions (95%) while only 1.7% of tuberculosis effusions had sugars less than 40mg%. Majority of malignant pleural effusion (57.1%) had pleural fluid glucose levels >100mg/dl while 42.9% had glucose levels between 40-100 mg/dl. Low pleural fluid glucose (less than 40 mg/dl) was seen predominantly in patients with Empyema (83.3%) because of bacterial utilization of glucose. In comparison to other studies: Antony Seaton.[3]– showed glucose level <60mg% in parapneumonic, empyema, tubercular and malignancy and >60mg% in transudates; Richard W. Light – pleural fluid glucose level below 40mg% in Parapneumonic effusion and Empyema. Carr DT et al– low pleural fluid glucose value was seen in exudative pleural effusion and normal in cases of transudative effusion.

Adenosine Deaminase: In tubercular pleural effusion pleural fluid Adenosine deaminase level (ADA) has got a good diagnostic index after excluding other causes of raised ADA levels. Although a pleural fluid ADA above 70IU/L is diagnostic of tuberculosis it has to be considered if the pleural fluid ADA is between 40 IU/L and 70 IU/L. An ADA level less than 40IU/L very much unlikely of pleural tuberculosis. But different authors have used different cut off levels for pleural fluid ADA ranging between 33 IU/L to 50 IU/L.[61,62,63,64] In our study pleural fluid ADA >40U/l was taken as diagnostic cut off for tuberculous effusion and it yielded 96.36% sensitivity, 84.4% specificity ,80.3% positive predictive value,95%negative predictive value and p value<0.0001. In our study who were diagnosed as tubercular effusion 27 patients(45%) had ADA level more than 70IU/L, 26 patients (43.3%) with ADA level between 40-70IU/L and 7patients(11.7%) with ADA level between 30-40 IU/L. In comparison to other studies: Asmita A.Mehta et al pleural fluid ADA >40U/l was taken as diagnostic cut off for tuberculous effusion and it yielded 85.7% sensitivity, 80.8% specificity,75% positive predictive value and 89.5%negative predictive value . S.K.Verma et al pleural fluid ADA 36U/l was taken as diagnostic cut off for tuberculous effusion and it yielded 100% sensitivity,77.7% specificity.Kalpana K.Dave et al pleural fluid ADA >60U/l was taken as diagnostic cut off for tuberculous effusion and it yielded 69.2% sensitivity,92% specificity , 90% positive predictive value and 74%negative predictive value.Prabhakar et al pleural fluid ADA 50U/l was taken as diagnostic cut off for tuberculous effusion and it yielded 100% sensitivity and100% specificity.

All our malignant effusions had pleural fluid ADA less than 40 IU/L with a mean of 23.5 which in comparison to Mehta et al study the mean ADA in malignant effusion was 18 IU/l. In our study, out of 12 empyema cases, 2 cases (16.6%) had ADA values between 40- 70IU/L rest all had ADA <40 IU/L.

Studies done in the West demonstrate pleural fluid ADA more than 70 IU/L,by Valdes et aland Burgess et al when compared with our study which showed a mean of 52.82+28.45 IU/L. The mean ADA were high in the 2 Indian studies done by Rajendra Prasad et al, and Gilhotra et al with the mean ADA level ranging between 76.8±23.8 IU/L -95.8±57.5 IU/L.

Pleural LDH to Serum LDH Ratio: The ratio of pleural fluid LDH to serum LDH was more than 2 in 100%, 3.3% and 14.3%of patients with empyema, tubercular effusion and malignancy respectively. Majority of patients with

tubercular effusion (60%), malignancy (57.1%), parapneumonic effusion (72.7%) had a ratio of 1- 2. Pleural LDH to serum LDH ratio was less than 0.6 in all of transudative effusions (100%). The mean LDH value in tubercular effusion – 407.06±165.03, malignant - 381.71±165.4, transudative - 178.6±32.92, parapneumonic - 359.9±69.98 and empyema -879±120.42. The mean LDH in exudate effusion was higher as compared to transudative effusions which was highly significant.In our study all the transudates had a ratio of less than 0.6 while 83 cases of exudates had a ratio more than 0.6 and remaining 7 cases (6 cases of tuberculosis and 1 case of empyema) had ratio less than 0.6. Pleural fluid mean LDH levels in different etiologies in our study.

In comparison to other studies: Lakhotia– pleural fluid LDH >200 U/L and pleural fluid to serum ratio >0.6 helps to classify the effusion as exudates. The same view was held by Santiago Romero and Marina Costa. Burana Chavalittamrong et al -pleural fluid LDH was found increased in malignancy, tuberculosis, parapneumonic effusions and in empyema with a mean of 1470.68($p<0.05$).

CHEST X-RAY:

Site of Effusion: Out of the 100 patients with pleural effusion 59 cases were right sided of which 37 cases(61.7%) and 7 cases (63.6%) were of tuberculous and parapneumonic effusion respectively.35 patients had left sided effusion and only 6 patients had bilateral pleural effusion. In comparison to other studies: Al Quarain – pleural effusion was more common in right side (56%) than on the left (32%); In Follander – both right and left side effusion were of equal distribution.

Size of Effusion: In our study massive effusion were seen in 100% of malignant effusions, 10% of transudative effusions and 8.4% of Tuberculosis. In all other causes they were more commonly small to moderate in size.In comparison to a study by Grace G.Maher et al massive effusions were seen in 67% of malignant effusions and 33% of nonmalignant effusions.

In our study loculated pleural effusion were seen in 8 patients, among which 6 cases were loculated tubercular effusion which were treated with steroids and 2 cases were loculated empyema of which 1had minimal loculations removed by medical thoracoscopy while other had moderate loculations referred to higher centre for video assisted thoracoscopic surgery (VATS).

Sputum for AFB: In this study, out of the 60 cases of tuberculous effusion, in 7 cases acid fast bacilli could be demonstrated in the sputum by Ziehl Nielson's staining (11.6%). The detection of AFB in the sputum in the tuberculous depends upon the associated lung parenchymal lesion. In comparison to other study: Subhakar. K et al - 7 of the 62 patients with tuberculous pleural effusion showed sputum positivity for AFB (i.e. 11%).

Pleural Fluid Cytology: Pleural fluid cytology was performed in all the patients with malignant pleural effusions. Among them 6 cases (85.7%) of the effusions showed malignant cells on cytological examination.

In comparison to other studies Ong KC et al pleural fluid cytology was positive in 48.5% of malignant effusions, Salyer et al pleural fluid cytology was positive in 72.6 % of malignant effusions Prakash et al pleural fluid cytology was positive in 57.6% of malignant effusions Nancy et al pleural fluid cytology was positive in 71% of malignant effusions Hirsch pleural fluid cytology was positive in 53.8 % of malignant effusions. Hence pleural fluid cytology study is simple way of diagnosing malignant pleural effusion.

Pleural Biopsy: Pleural Biopsy and Thoracoscopy was done for 20 patients only, due to practical difficulties and many patients deferred to give the consent. In our series we used Abram's pleural biopsy needle for obtaining the pleural tissue for 12 cases and thoracoscopic biopsy for 8 cases. Out of 12 closed pleural biopsies, definitive diagnosis obtained in 6(50%) cases (5 patients with tubercular effusion and 1 patient with malignant effusion). Out of 8 thoracoscopic pleural biopsies, definitive diagnosis obtained in 6(50%) cases (4 patients with tubercular effusion and 2 patients with malignant effusion). Rest of the cases (8) biopsies were nondiagnostic. In comparison to study Abdullah A et al -out of 112 pleural biopsies performed specific diagnosis were obtained in 54 cases giving a diagnostic yield of 49.1%.

Treatment: Patients with TB pleural effusion were treated with Antitubercular treatment. Empyemas were treated with interventions like Intercostal drainage tube insertion and appropriate antibiotic treatment while for 2 cases Antitubercular treatment was also given along with antibiotics. Parapneumonic effusions were treated with appropriate antibiotic treatment based on pleural fluid culture and sensitivity. Transudative effusions showed improvement with appropriate conservative line of management especially congestive heart failure. In malignant effusions thoracocentasis and Pleurodesis were done for symptomatic betterment and referred to higher centre for further management. All patients received other supportive measures. Check x-ray were done as and when necessary.

Thus, the first step in the evaluation of a pleural effusion is to identify the cause of the effusion. This is achieved by a detailed history, clinical examination, relevant blood tests, radiological features and analysis of the pleural fluid for cytology, bacteriology and biochemical parameters like protein, glucose cholesterol, L.D.H. and ADA. This is important because in case of transudates, therapy is directed towards the underlying disease like congestive cardiac failure, nephrotic syndrome, liver cirrhosis or hypoproteinemia and usually therapeutic measures directed at the pleura are not necessary. But in case with exudate effusion, a definitive diagnosis has to be established, using further diagnostic procedures like pleural biopsy and specific therapy for the pleural disease must be instituted.

Limitations:

There were inadequate number of cases to comment the role of malignant cytology in diagnosing malignant effusion.Pleural Biopsy was done for few patients only, due to practical difficulties and also many patients refused to give the consent.

1. There were insufficient number of subjects with etiology other than TB to evaluate the utility of ADA in various etiologie.

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Age in years	Male		Female		Total	
	No.	%	No.	%	No.	%
18 - 20	1	1.3	3	13.6	4	4
21 - 40	44	56.4	11	50	55	55
41 - 60	29	37.2	5	22.8	34	34
>60	4	5.1	3	13.6	7	7
Total	78	100	22	100	100	100
Mean ± SD	40.43±10.76		40.95±13.41		40.55±11.33	

Table 1: Age and Sex wise Distribution

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

Table 2 : Classification of transudative and exudative pleural effusion

Etiology	No. of cases (n = 10)	Percentage
Congestive Cardiac Failure	8	80
Renal Failure	2	20

Table 3: Classification of Transudative 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**

Table 4: Etiological Classification of Exudative Effusion

Pleural fluid glucose	Etiology					Total
	Exudate					
	TB	MAL	PPE	EMP	TRANS	
<40	1(1.7%)	0	0	10(83.3%)	0	11
40-100	57(95%)	3(42.9%)	11(100%)	2(16.7%)	5(50%)	78
>100	2(3.3%)	4(57.1%)	0	0	5(50%)	11
Total	60(100%)	7(100%)	11(100%)	12(100%)	10(100%)	100

Table 5: Pleural fluid Glucose levels and Etiology

ADA	Etiology				
	Exudate				
	TB	MAL	PPE	EMP	TRANS
< 30	0	6(85.7%)	8(72.7%)	5(41.7%)	9(90%)
30-40	7(11.7%)	1(14.3%)	3(27.3%)	5(41.7%)	1(10%)
40-70	26(43.3%)	0	0	2(16.6%)	0
> 70	27(45%)	0	0	0	0
Total	60(100%)	7(100%)	11(100%)	12(100%)	10(100%)

Table 6: Association of ADA with Etiology

Mean age in tuberculous effusion in our study and other reference studies

Studies	Mean age(yrs) in tuberculous effusion
Our study	36
Luis Valdes et al	34
S.K.Sharma et al	33
Subhakar.k et al	31
Epstein et al	54
Aho K et al	28

Mean age in malignant effusion in our study and other reference studies

Studies	Mean age(yrs) in malignant effusion
Our study	62
Sharma et al	47
Subhakar et al	51

Sex distribution in our study and other reference studies

Studies	Sex distribution	Male :Female ratio
Our study	Males-78% Females -22%	3.54:1
Subhakar.K et al[4]	Males-77.5% Females -22.5%	3.44:1
Luis Valdes[2]	Males-62.5% Females -37.5%	1.6:1
Al Quorian[6]	Males-72% Females -28%	2.58 :1

Etiology of pleural effusion in our study and other reference studies

Studies	Common etiology
Our study	Tuberculosis -60% Empyema -12%
Maldhure et al[7]	Tuberculosis -60%
Prabhu desai et al [8]	Malignancy -64% Tuberculosis -22.4%
Al Qorain et al[6]	Tuberculosis -37% Malignancy -18%
Luis Valdes et al [2]	Tuberculosis -25% Malignancy -22.9%

Common symptomology in TB effusion in our study and other reference studies

Studies	Symptomology
Our study	Dry cough (73.3%) Fever (70%) Breathlessness (66.7%) Chest pain (35%)
Arun Gopi et al[9]	Chest pain (75%) Dry cough (70%).

Common symptomology in malignant effusion in our study and other reference studies

Studies	Symptomology
Our study	Cough (100%) Dyspnea (100%) Chest pain (28.6%)
Chernov B et al,[10]	Breathlessness (57%) Cough (43%) Chest pain (23%) .

Comparison of pleural fluid appearance in our study and reference study

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

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	Lymphocytes	93.3% of TB effusion 97% of malignant effusion

Utility of ADA in Tuberculous pleural effusion with cut off 40IU/L in our study and other refernce studies

Our study	Asmita A.Mehta et al[13] (Reference study)
Sensitivity -96.36%	Sensitivity-85.7%
Specificity -84.4%	Specificity-80.8%
Positive predictive value - 80.3%	Positive predictive value -75%
Negative predictive value - 95%	Negative predictive value - 89.5%

Pleural fluid ADA levels in different etiologies in our study

Etiology	No.of cases	ADA activity(IU/L) (X±SD)
Tuberculosis	60	69.7±23.78
Malignancy	7	23.5±7.06
Parapneumonic effusion	11	28.6±3.77
Empyema	12	34.4±12.01
Transudate	10	20.3±7.11
Total	**100**	**52.82±28.45**

Pleural fluid mean LDH levels in different etiologies in our study

Etiology	No.of cases	LDH(X±SD)
Tuberculosis	60	407.06±165.03
Malignancy	7	381.71±165.4
Parapneumonic effusion	11	359.9±69.98
Empyema	12	879±120.42
Transudates	10	178.6±32.92

Site of effusion in our study and other refernce studies

Site of effusion	Our study	AL Quarain[42](reference study)
Right	59%	56%
Left	35%	32%
Bilateral	6%	12%

Comparison of Sputum Positivity for Afb In Tuberculous Effusion In Our Study And Reference Study

Sputum for AFB	Our study	Subhakar. K et al
Positive	11.6%	11%

SENSITIVITY OF PLEURAL FLUID CYTOLOGY IN MALIGNANT PLEURAL EFFUSION:

Studies	No. of total Patients	No. of cases of malignancy	% diagnosed by Cytology
Ong KC et al	103	103	48.5
Salyer et al	271	95	72.6
Prakash et al	414	162	57.6
Nancy et al	385	109	71
Hirsch	300	117	53.8
Our study	100	7	85.7

Comparison of diagnostic efficacy of pleural biosy in our study and reference study

Pleural Biopsy	Our Study	Abdullah A et al (reference study)
Definite diagnosis obtained	50%	49.1%