## **Original Research Article**

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# Profile of children with pleural effusion in an urban tertiary care hospital

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#### **ABSTRACT**

**Background:** Management of pleural effusions depends on their origin whether exudates or transudates, simple or complicated with septations and pneumonia. A complicated effusion requires longer treatment. This study was carried out to find out types of effusion and their etiology.

**Methods:** A Prospective study of 34 patients was analyzed for clinical and laboratory profile, origin and type of fluid, etiology of pleural effusion in pediatric patients.

**Results:** Majority of the patients were in 6-11 years age group. Fever and cough were most common clinical symptoms in all type of effusion. Parapneumonic effusion was most common type of effusion followed by tuberculosis and empyema. Almost all exudates satisfied Lights criteria.

**Conclusions:** Pleural effusions are mostly exudative in origin in pediatric age and are associated with consolidation and septations especially in empyema. In tubercular Pleural effusion, Sputum for AFB was positive in more number of patients as compared to CBNAAT in this study.

Keywords: Empyema, Exudate, Parapneumonic, Pleural effusion, Transudate, Tuberculosis

### INTRODUCTION

Pleural effusion primarily occurs because of imbalance in hydrostatic and oncotic pressure, increased capillary permeability and impaired lymphatic drainage. Pleural fluid accumulates when too much fluid either enters or too little fluid exits, out of plural space. Though Pleural effusion occurs less frequently than adults they also differ significantly in etiology from adults.<sup>1</sup>

It is important to classify pleural fluids into exudates and transudates because this is indicative of underlying pathophysiological process involved, such a distinction allows appropriate investigations to be instigated enabling better patient management.<sup>2</sup> Light et al has established criteria for demonstrating high degree of

diagnostic accuracy for differentiating transudates and exudates.<sup>3</sup> Most common cause of Pleural effusion in children is bacterial pneumonia, other causes are tuberculosis, dengue, heart failure, nephrotic syndrome, diaphragmatic abscess, rheumatic and rheumatoid diseases, uremia and pancreatitis..

#### **METHODS**

A prospective cross sectional study of 34 patients diagnosed provisionally as pleural effusion and admitted in the department of pediatrics was carried out from December 2015 to November 2016.

A written consent was obtained and the study was approved by the college ethical committee. Patients of

age from 1 year to 17 years of age of either sex were included in the study in whom thoracocentesis can yield minimum amount of pleural fluid required for diagnosis and culture, those in whom required fluid could not be aspirated were excluded from the study. Detailed history, general physical, systemic examination and investigations were performed. Patients were explained about the procedure in detail. With all aseptic precautions ultrasonography guided pleural fluid aspiration was done with a 20 c.c. syringe, care was taken to protect neuro-vascular bundle and for any complication that could occur.

Punctured site was sealed after procedure and patients were observed for vitals and any complications for further four hours. Investigations such as hemoglobin, total and differential counts, ESR, Blood culture, SGOT, SGPT, Serum Proteins, Blood urea and creatinine, Serum (Lactic dehydrogenase), X-ray Ultrasonography of thorax, Mountoux test and other investigations as required were performed. Aspirated Pleural fluid was examined for physical appearance, and was sent to institutional laboratory for microscopic examination gram staining, AFB staining, biochemical analysis such as LDH, ADA and CBNAAT (Cartridge based nucleic acid amplification test), culture and sensitivity. Data were statistically analyzed using SPSS 20 and open EPI software, p value <0.05 was taken as test for significance, student t-test for comparison of two groups and ANOVA for comparison of more than two groups.

### **RESULTS**

Total 34 patients were included in the study. Male (56%) to female (44%) ratio was 1.26:1. Age group comprised of 6-10 years (32%) followed by 11-15 years (26.5%) and 1-5 years (23.5%) and >15 (18%). Out of 34 patients of pleural effusion, parapneumonic (13), empyema (9), tubercular (8), dengue fever (2), pancreatitis (1) and undiagnosed (1) (Table 1).

Table 1: Etiological diagnosis of pleural effusion.

Diagnasia	No. of Cases		Total	0/	
Diagnosis	Male	Female	Total	<b>%</b>	
Tuberculosis	4	4	8	23.50	
Parapneumonic	8	5	13	38.23	
Empyema	3	6	9	26.47	
Dengue Fever	2	0	2	05.88	
Pancreatitis	1	0	1	02.94	
Undiagnosed	1	0	1	02.94	

Maximum no. of patients had parapneumonic effusion (38.23%) followed by empyema (26.47%) and tubercular (23.50%). On comparing mean age in tubercular and non-tubercular pleural effusion it was statistically insignificant (p>0.05).

Cough and fever were the most common symptoms in all categories followed by chest pain in parapneumonic effusion and empyema, whereas loss of weight was commonest in tubercular effusion. Mean total leukocyte count was 13320 cells/cumm, it was highest in empyema (18144cells/cumm), followed by tubercular (11222cells/cumm) and parapneumonic (11423cells/cumm) effusions.

Mean ESR was 50 mm/hour, highest in tubercular effusion (82mm/hr) followed by empyema (48mm/hr) and parapneumonic (39mm/hr) effusions. Right sided effusion (50%) was more common than left side (35.29%). Out of Statistical Comparison of hemoglobin, total W.B.C. count and ESR with different types of effusions (tubercular, parapneumonic, empyema and dengue). ESR was only significant IN ESR (p<0.05).

Majority of patients had free fluid type of effusion (70.59%) than septated effusion (29.41%). Septations were most common in empyema (56%) followed by parapneumonic (31%) and tubercular (12%) effusion. Maximum patients had mild effusion (47.05%) followed by moderate (41.18%) and severe (11.77%) effusion. Synpneumonic effusion was present in (58.8%). Pleural fluid was exudative in origin in (91.2%) and transudative in (8.8%) patients (Table 2).

Table 2: Transudates and exudates in various etiology.

Diagnosis (No. of Cases)	Transudate	Exudate
Tuberculosis (8)	0	8
Paraneumonic (13)	0	13
Empyema (9)	0	9
Dengue fever (2)	2	0
Pancreatitis (1)	0	1
Undiagnosed (1)	1	0
Total	3	31
Percentage	8.8%	91.2%

Exudates were observed in majority of cases (82.35%), it was (100%) in tubercular and empyema, whereas (77%) in parapneumonic effusion. Pleural fluid protein / serum protein ratio was >0.5 in 88.23% of all patients, it was 100% in tubercular effusion and empyema and 92.3% in parapneumonic effusion whereas, it was <0.5 in dengue and an undiagnose patient.

Pleural fluid LDH /Serum LDH ratio was >0.6 in 85.29% of patients and 100% in empyema 87.5% tubercular effusion and 92.3% in parapneumonic effusion. Thus, in majority of patients Lights criteria for exudates were satisfied. The sensitivity of pleural fluid/serum protein ratio, pleural fluid / serum LDH, pleural fluid LDH and was 96.77%, 93.54% and 96.77% respectively whereas Specificity was 100% in all Table 3.

Diagnosis	Pleural fluid protein /serum protein		Pleural fluid LDH /serum LDH		Pleural fluid glucose (mg/dl)		Pleural fluid ADA (I.U./L)	
	<0.5	>0.5	< 0.6	>0.6	< 60	> 60	<40	>40
Tuberculosis	0	8	1	7	5	3	1	7
Parapneumonic	1	12	1	12	5	8	10	3
Empyema	0	9	0	9	9	0	0	9
Dengue fever	2	0	2	0	0	2	2	0
Pancreatitis	0	1	0	1	1	0	1	0
Undiagnosed	1	0	1	0	1	0	1	0

Table 3: Comparison of biochemical parameters in different types of pleural effusions.

Positive predictive value was 100% in all three parameters, negative predictive value was 75% in pleural fluid/Serum protein and pleural fluid LDH, whereas it was 60% in pleural fluid /Serum LDH. In 61.76% of patients pleural fluid glucose was<60mg/dl of which maximum number of patients were of tuberculosis (62.5%).

In 55.88% of patients pleural fluid ADA was >40 I.U. majority of patients in this category was of tuberculosis (87.5%). The sensitivity, specificity, positive predictive value and negative predictive value of ADA (>40 I.U.) in tuberculosis were 87.50%, 82.35, 70% and 93.33% respectively. Statistical comparison of mean pleural fluid levels of protein, Glucose and LDH in tuberculosis, empyema and parapneumonic origin revealed to be significant in pleural fluid Glucose and LDH (<0.05) whereas it was insignificant in protein (>0.05) (Table 4).

Table 4: Comparison of protein, glucose, LDH levels in various types of pleural effusions.

Diagnosis (no. of cases)	Mean	SD	P value	
<b>Pleural Fluid Protein</b>				
Tuberculosis (8)	4.35	0.7425		
Parapneumonic (13)	4.33	1.5953	m> 0.05	
Empyema (9)	4.41	0.9287	p>0.05	
Dengue fever (2)	2.10	0.2828		
Pleural Fluid Glucose	!			
Tuberculosis (8)	43.29	21.89		
Parapneumonic (13)	62.46	24.46	m <0.05	
Empyema (9)	10.89	04.91	p<0.05	
Dengue fever (2)	93.00	31.11		
Pleural Fluid LDH				
Tuberculosis (8)	751.25	238.94		
Parapneumonic (13)	1099.23	553.14	m <0.05	
Empyema (9)	4695.49	2370.99	p<0.05	
Dengue fever (2)	069.50	06.36		

History of contact of tuberculosis was positive in 2 patients out of a total of 8 patients of tubercular pleural effusion and sputum for AFB was positive in 5 patients, whereas CBNAAT was positive only in 1 patient. Monteux test was positive (>10mm) in 5 patients of

tubercular effusion. B.C.G. was not administered in 2 patients of tubercular effusion. Pleural fluid culture was positive in only in 4 (11.76%) out of 34 patients. The organisms isolated were streptococcus, acenatobacter, coagulase negative staphylococcus, Providentia. However, blood culture and culture for tubercular bacilli was negative in all patients.

#### **DISCUSSION**

Pediatric pleural effusion is most commonly seen in males and younger children.4 Male patients were more than females and most common age group in this study was also 6 to 10 years (32%) followed by 11 to 15 years (26.5%) whereas in Hasan et al 65% of patients were within 4 years and in Memon et al median age was 5-8 years.<sup>5,6</sup> Males were (56%) and females (44%) male predominance was also seen in Hasan et al and Memon et al study.6 On comparing different types of pleural effusion in this study parapneumonic effusion (38.23%) was more common than tubercular pleural effusion (23.50%) a similar finding as in Maher et al study. Mean age for tubercular effusion was 11.62 years which is comparable to Merino et al having mean age of 13.52 years.8 Mean age for parapneumonic effusion was 9.76 years while it was 9 years in Devota et al.9 In present study in tubercular pleural effusion fever, cough and chest pain were most common symptoms similar to Memon et al and Merino et al.<sup>6,8</sup> In parapneumonic effusion fever and cough were most common symptoms a finding similar to Memon et al study.6 In empyema symptoms out of cough, fever, fast breathing, chest pain, anorexia and abdominal pain in present study cough (100%), fever (89%) and fast breathing (55%) were the most common symptoms whereas in Satpathy et al fast breathing (88.6%), fever (77.3%) and cough (71.6%) were common symptoms, in Lingayat et al study also fever, cough and fast breathing were the most common presenting symptoms. 10,11 Consolidation was present with pleural effusion in (81.64%) parapneumonic effusion followed by (44.45%) of empyema in this study whereas in Devota G et al only (4.16%) of parapneumonic effusion and (34.40%) of empyema patients had associated consolidation. Septations were more common in empyema patients (55.5%) in present study, whereas it was (27.58%) in Devota study. This might be due to inadequate treatment or starting treatment at late stage of the disease Majority of the patients satisfied Lights criteria for transudate and exudates in this study. Family history of tuberculosis was positive in 25% of patients of tubercular effusion as in Merino et al study (25.7%), whereas it was 55.5% in Boloursaz et al, 46% in Chiu study and 68% of patients in Siddiqui et al.<sup>12-14</sup> The possible explanation for lower positive family in this study may be due to number of patients being of adolescent age group as the age increases, adolescents spend more time away from home and thus are more probable to have exposure of tuberculosis from people outside. Sensitivity and specificity of various parameters (ratios) were tested to differentiate between transudate and exudates it was found that ratios of Pleural fluid and serum protein, pleural fluid and serum LDH and pleural fluid LDH were sensitive (97%, 93% and 97% respectively). Sputum for AFB was positive in 62.5% patients of tuberculosis whereas CBNAAT was positive only in 1 (12.5%) patient in this study. Pleural fluid yield for bacterial culture was 11.76% whereas it was 40% in Narayanaapa et al study. 15

Total number of patients in this study was 34, studies with more number of patients may be more conclusive and beneficial.

#### **CONCLUSION**

Pleural effusion was most common in younger age. Parapneumonic effusion was most common cause among all types of effusion. Septations were most common in empyema and these patients require longer course of antibiotics. Many of the effusions had underlying consolidation along with effusion. Majority of effusion were exudative in origin than transudates and satisfied light's criteria. Sputum for AFB was positive in more number of patients as compared to CBNAAT in pediatric age.

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