

# Study on Clinico – Etiological Co-Relation and Management Modalities in Children with Pleural Effusion

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## ABSTRACT

**Introduction:** Pleural effusion, abnormal accumulation of fluid in pleural space, differ significantly in children from adults in relation to etiology, management and outcome. Objective of this study is to identify common causes of pediatric pleural effusions; to describe the clinic-etiological profile and its co-relation with radiological finding and management and early outcome of pleural effusion in children. Study Design: Prospective Hospital based Observational study.

**Material and Methods:** Patients with pleural effusion were evaluated by chest X-ray and USG in all cases and CT scan thorax in difficult cases. Pleural fluid samples were analyzed for glucose, protein, cytology and culture, CBNAAT (as and when required). Intercostal tube drainage was given in empyema cases VATS and decortications Was done in specific case.

**Results:** Commonest etiology of pleural effusion was empyema (52% cases), followed by tubercular pleural effusion (26% cases). Most common organism isolated from pleural effusion was Mycobacterium tuberculosis (21.79%) followed by staphylococcus aureus. There is significant correlation among age and etiology (p value 0.015), tuberculosis occurred more in older children and empyema occurred more in younger children. There is no significant correlation among weight and etiology (p value 0.200), between gender and etiology of pleural effusion (p value >.05) in our study. There is significant correlation of pleural fluid neutrophil count (p value 0.001), lymphocyte count (p value 0.002) with etiology, but no correlation was seen with protein (p value 0.060), LDH (p value 0.353), glucose (p value 0.799) in our study. The successful management of pleural effusion lines in intravenous administration of antibiotics along with intercostals drainage tube.

**Conclusion:** Regarding etiology of pleural effusion empyema and tuberculosis are very commonly encountered in clinical practice. Staphylococcus aureus is the most common pathogen. Regardless of which treatment is used in pleural effusion, the outcome for children is generally excellent.

**Keywords:** Pleural Effusion, Children, Etiology, Outcome.

## INTRODUCTION

Normal amount of pleural fluid is approximately 0.1-0.2 ml/kg of body weight on both side.<sup>1</sup> Pleural effusion and empyema are more common in boys than girls.<sup>2</sup> Empyema thoracis constitute approximately 5-10% of the cases seen by Pediatrician in India. The prevalence of pleural infection appears to be increasing in some industrialized countries. Out of the total admission in the pediatrics department in our tertiary care hospital 1.62% cases were having pleural effusion. Pleural effusion are very common and represents

the disruption of normal mechanism of formation and drainage of fluid from pleural space. Symptoms depends on the amount of fluid accumulated and underlying cause of effusion. Many patients have no symptoms at when effusion is discovered. Possible symptoms include pleuritic chest pain, dyspnea, and dry non-productive cough. A key question in evaluating an effusion is whether the excess pleural fluid is transudative or exudative differentiated by pleural fluid-to-serum protein ratio greater than 0.5; A pleural fluid LDH greater than 200 IU; and a pleural fluid-to-serum LDH ratio greater than 0.6.<sup>3,4</sup> Treatment depends on the severity and cause. Thoracocentesis is done to relieve symptoms, chest trauma complicating para pneumonic effusion or empyema or chylothorax. Most common organism associated with pleural effusion is mycobacterium tuberculosis followed by staphylococcus aureus.

Study aimed to identify incidence and common causes of pediatric pleural effusions, to describe the clinical features, radiological finding, and laboratory investigation parameters in pediatric pleural effusion, describe bacteriologic analysis of pleural fluid in different age groups in children, To evaluate the outcome of pleural effusion, To observe various management modalities required in patients with pleural effusion and correlation with etiology, and to observe clinic-etiological co-relation with radiological finding and management modalities.

## MATERIAL AND METHODS

This was a prospective observational study conducted in department of pediatrics at tertiary care centre from march 2018 to October 2018. Patient information including name, age, sex, weight, diagnosis, date and time of operation were recorded in predesigned proforma after prior informed consent from parents. The diagnostic criteria for pleural effusion was presence clinical and radiological examination and aspiration of pus from the thoracic cavity. A detailed history regarding complains, predisposing factors, immunization

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and nutritional status, family history of tuberculosis, history regarding previous illness was considered. 78 consecutive patients, diagnosed with pleural effusion on admission or during their stay in ward were further enrolled in study. Etiological diagnosis was established by sequential clinical history and findings on physical examination, laboratory test, chest radiograph, CECT/HRCT and pleural fluid analysis. Light's criteria and newer criteria are used for differentiation for exudates and transudate for pleural effusion.

## RESULTS

Out of the total admission in the pediatrics department which

Clinical presentation or symptoms	Total no of patients	Percentage (%)
Fever	68	88
Cough	65	84
Breathlessness	62	80
Chest pain	53	68
Weight loss	7	10
Hemoptysis	7	10
Pain abdomen	5	06
Lymphadenopathy	1	01
Asymptomatic	9	12

**Table-1: Symptomatology**

was around 4812 nearly 1.62% cases (78 patients) were having pleural effusion. In our study most number of patients were of 6 to 9 years of age of total 37 cases (47.43%), followed by 9-12 years of age of total 23 cases (29.48%). And for sex wise distribution males were outnumbered females with statistics of 52.78% are males and 47.22% are females. There is significant correlation among age and etiology (p value 0.015) of effusion in our study. Tuberculosis occurred more in older children and empyema occurred more in younger children. No significant correlation was found between weight and etiology of effusion (p value 0.200) and between gender and etiology of pleural effusion (p value >.05) in this study (table-1).

According to this table most common symptoms acquired by patients was fever which is around 88%, as it was infective etiology followed by cough around 84% and breathlessness was around 80%.

In our study pleural effusion were more common in malnutrition patients. Out of 78 cases total 51 cases were fall in category in protein energy malnutrition. Among that 51 cases 30 patients (58.82%) were fall in PEM grade 1. 18 patients were fall in PEM grade 2 and 3 patients were fall in PEM grade 3.

In the present study 34 cases were admitted during winter season from nov to feb comprising 44% during summer 29 cases (37.17%) were admitted and during rainy season 5 cases were admitted.

Treatment modalities	No of patients	Percentage	Successful (%)
Tube thoracostomy	77	99%	80%
Decortication + ICD	12	15%	85%
Video assisted thoracoscopic surgery + ICD	4	05%	100%
Pneumonectomy + ICD	1	01%	100%

**Table-2: Treatment modalities**

Variety of leukocytosis	No of patients	% of patients
Lymphocytosis	60	77%
Neutrophilia	18	23%
Basophilia	7	9%
Monocytosis	1	1%

Pus culture	Total number of patients	Percentage (%)
Myco.tuberculosis	17	21.79
Staph aureus	13	16.66
Pseudomonas	8	10.25
Pneumococci	7	8.97
Klebsiella	3	3.84
E coli	3	3.84
No growth	27	34.61

	Antibiotic + ICD (n=77)	Decortication + ICD (n=12)	VATS + ICD (n=4)	Pneumonectomy + ICD (n=1)	P value
Tubercular	10	5	2	0	.002
Staphylococcal	9	2	1	1	>.05
Klebsiella	2	1	0	0	>.05
Pseudomonas	6	1	1	0	.001
E coli	3	0	0	0	.001

Out of 78 cases 48 cases were having pleural effusion on right side and 30 patients were having pleural -effusion on left side. Among the involvement of right side of lung, most common causative agent was staphylococcus aureus. Right sided middle lobes were involved most commonly. That was followed by right sided upper lobe with causative agent most commonly associated with tubercular etiology.

Various laboratory investigations were done in this patients like complete blood count and blood culture and sensitivity. Among those patients 44 patients were anaemic involved 30 patients having mild anaemia, 12 patients having moderate anaemia, 2 patients having severe anaemia. 61 patients having leukocytosis and 5 patients having leucopenia.

Among that 78% of patients were having leukocytosis which comprises 61 patients.

For diagnostic approach blood culture and sensitivity were sent in leukocytosis patients which was seen in 61 patients. Among that 28 blood culture were no growth, 14 suggestive of staphylococcus aureus, 10 having coagulase negative staphylococci, 7 were e coli, 2 suggestive of pseudomonas. There was significant correlation of pleural fluid neutrophil count (p value 0.001), lymphocyte count (p value 0.002) with etiology.

#### Bacterial etiology

Among total 78 patients 77 patients required tube thoracostomy with 80% success rate, decortications in 12 patients with 85% success rate, and VATS and pneumonectomy respectively 4 and 1 patient with 100% success rate.

Among 78 patients 60 patients having exudative and 18 patients having transudative pleural effusion. And this differentiation was done by modified light's criteria (table-2). For the correlation of etiology and management modalities, among 17 tubercular pleural empyema 10 was treated by antibiotics and tube thoracostomy while 5 required decortications 2 required VATS.

13 staphylococcus pleural effusion manage by 11 by tube thoracostomy, 1 with VATS, 1 with pneumonectomy. So, pneumonectomy only required in staphylococcus pleural effusion which had 100% success rate.

VATS was required with 2 patients of tubercular effusion, 1 with staphylococcus aureus and 1 with klebsiella.

As we have consider significant p value for co-relation is 0.05, as per following the tubercular empyema patients were managed well with anti-tubercular drugs along with ICD insertion and there was no such correlation found in patients with pleural effusion among other etiologies except e.coli.

#### DISCUSSION

The study period was 8 months with total 78 patients were involved. Peak age group was 8-10 years. Least affected age group was below 2 years. Male are predominantly affected with M:F ratio 1.6:1. Incidence of pleural effusion in pediatrics is 1.64% and malnourished child.<sup>6</sup> Most of the patients belongs to middle-lower socio economic group. Involvement of right chest is comparatively more than left chest. In our study most common presentation was found fever

and respiratory distress. Isolated most common organism was tuberculosis followed by staphylococcus. Higher incidence was seen in winter season. Staph aureus is the most common etiological agent.<sup>7</sup> followed by tuberculosis.<sup>8</sup> For proper diagnostic approach blood culture were helpful for management purpose.<sup>9</sup> The successful management<sup>10</sup> of pleural effusion lines in intravenous administration of antibiotics along with intercostals drainage tube. tubercular empyema patients were managed well with anti-tubercular drugs along with ICD insertion and there was no such correlation found in patients with pleural effusion among other etiologies except e.coli.<sup>11</sup> Pneumonectomy with 100% success rate. Transudates are more common than exudates. Blood profile are suggestive with anaemia and leukocytosis. For diagnostic purpose the sonographic measurement method presented is preferable to radiographic measurement.<sup>12</sup> Of most commonly used procedure, decortication had the best success rates. Staphylococcus aureus is the most common organism isolated in non tubercular pleural effusion followed by streptococcus pneumoniae. Most of the patients were undergo the first intervention as tube thoracostomy.<sup>13</sup> The number of tube thoracostomy done in subsequent year are in decreasing trends as pleural effusion patients are managed conservatively by better antibiotics and early diagnosis. Among all 78 patients 60 patients were successfully discharge 17 patients were transferred to pediatric surgery for further surgical management and 1 patient went DAMA.

#### CONCLUSION

With more preference to male malnourished child pleural effusion is economically and financially burden in developing country like india. As tuberculosis is more prevalent in india it is the most common cause followed by staphylococcus. With help of radiological imaging and availability of antibiotics it is early diagnosed and morbidity and mortality are significantly reduced in recent years. As we are using better antibiotics and timely surgical intervention morbidity and mortality are significantly reduced. As we are seeing malnourished status are significantly associated with pleural effusion, we can reduce incidence of pleural effusion by managing status of health in children. As most common etiology is mycobacterium tuberculosis, with nutritional status vaccination will also improves prognosis, so major risk factor are winter season, male child, un-immunised, mal-nourished, middle-lower socio-economic group as per the study.

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