

# A Study of Pediatric Empyema Thoracis in a Tertiary Care Hospital

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## ABSTRACT

**Introduction:** Pediatric empyema thoracis is a complication of bacterial pneumonia, prevalence of empyema is predominant inspite of advent newer antibiotics still resulting in significant morbidity and mortality which attributes to the poverty, ignorance, illiteracy, and poor compliance to therapy. Aims and objectives: The aim is to find out the prevalence, age and gender difference, lung affected, seasonal variation, etiological agents, associated lesions and outcome of therapy.

**Material and methods:** A prospective study on 58 patients admitted in government hospital, the study period was 26 months, in all the cases routine investigations like chest X-Ray, blood analysis, pleural fluid analysis, ultra sound scan chest, and culture sensitivity were performed.

**Results:** In most of the cases etiological agent was found to be Staph.aureus followed by Strep. Pneumonia, Pseudomonas, Klebsiella and E.coli. In about 13.79% cases pleural fluid cytology suggested tuberculosis etiology.

**Conclusion:** Key for the successful management lies in effective pleural evacuation and re-expansion of lungs. Early diagnosis and effective treatment of pneumonia will lower the incidence, morbidity and mortality in children.

**Keywords:** Empyema thoracis, Pneumonia, morbidity, mortality, pleural fluid cytology, inter costal tube drainage.

## INTRODUCTION

Empyema thoracis, accumulation or suppuration of pus in the pleural cavity known for centuries, is a dreaded complication of pneumonia and chest injuries prior to antibiotic era.<sup>1-3</sup>

Common causative organisms of empyema are Streptococcus pneumoniae and Staphylococcus aureus, Escherichia coli, Haemophilus influenza and Klebsiella pneumonia streptococcus pyogenes and uncommon causative organisms are Mycobacterium tuberculosis and cryptococcus neoformans. Immediately after infection proteinaceous fluid starts to fill the pleural cavity.<sup>4,5</sup>

The clinical manifestations of empyema are high grade fever with chills and rigors, cough, breathlessness, chest pain. Bronchopleural fistula, pyopneumothorax, purulent pericarditis, pulmonary abscess, osteomyelitis of ribs are the local complications of empyema. Non-invasive investigations to rule out empyema are X-Ray chest, ultrasound chest, CT-chest, MRI, sonography and invasive procedures include thoracentesis, pleural biopsy, thoracoscopy. Pleural biopsy has great value in diagnosis of tuberculosis.<sup>5</sup>

In Management of empyema, there are two basic principles for management of empyema, one is to control the infection by choosing appropriate antibiotics, usual duration of antibiotic therapy is 3-6 weeks and other is to drain the accumulated pus from the pleural cavity.

The main aim was to study the epidemiological aspects of the disease, etiological agents, clinical features and associated lesions in diagnosis of empyema, outcome of therapy, morbidity

and mortality in relation to age and sex and to evaluate the measures to eradicate or to reduce the incidence of empyema.

**Materials and Methods:**

A prospective study, 58 empyema cases were studied, which were admitted to pediatric department, of Government General Hospital, Guntur with clinical features of empyema during a period of 26 months (Jan 2011 to Feb 2013) after obtaining informed consent from parents. All cases were studied in detail by performing the physical examination, routine investigations of blood and urine, chest X-Ray and ultrasonogram. All the cases were subjected to thoracentesis, pleural fluid analysis, culture and sensitivity.

## STATISTICAL ANALYSIS

All the results collected were subjected to descriptive statistics like mean and percentages. Microsoft excel 2007 was used for making tables, graphs and calculations.

## RESULTS

**Incidence of empyema in hospital admissions:** Out of the total 4613 cases admitted in the pediatrics department, 1.26% (58 cases) were having empyema.

**Age and sex wise distribution of empyema cases:** As per above analysis, the incidence of empyema was less below the age of one year and as the age advances the incidence of the cases gradually increased and maximum incidence of cases (51.72%) were noted in 6-12 year age group. Male children were more affected below the age of one year and female children were more affected above the age of 3 years.

**Incidence of empyema in relation to malnutrition:** Graph-1 shows that 65.52% (38 cases) were malnourished.

**Seasonal Incidence of empyema:** In our study 31 cases were admitted during the winter season, from Nov to Feb comprising of 53.45%. The remaining total period of 8 months had incidence of 27 cases comprising of 46.55%.

**Analysis of symptomatology:** In our study Fever, cough, breathlessness were present in all cases of empyema. Other symptoms like chest pain was present in 39.66% (n=23) cases.

**Associated lesions of empyema:** In our study 13.79% (n=8) cases were having associated consolidation and 86.21% (n=50) cases were admitted with only empyema.

**Side of Accumulation of empyema:** Out of 58 cases, 33

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(56.90%) were having empyema on right side and 24 (41.38%) cases were having empyema on left side and remaining one case had empyema on both sides.

**Etiological agents causing empyema:** The Graph-2 shows that pus culture was positive for empyema only in 39.66% (n= 23) cases. Culture was negative in majority of cases (n=35). Among the culture positive cases (n=23) staphylococcus aureus was the major organism that was isolated in 13.79% (n=8) cases.

**Etiological agents in relation to age:** It shows that staphylococcal empyema was more common below 3 years age group. Analysis of blood showed that in about of 81% (n=47) cases WBC count was elevated more than 10,000 cells/cumm<sup>3</sup>, ESR elevated above 30 mm/1<sup>st</sup> hour in all the cases. In cytological examination lymphocyte predominance was seen in 13.79% (n=8) cases indicating tuberculosis etiology.

**Mode of treatment of empyema:** Regarding the mode of treatment of empyema, 51.72% (n=30) cases were treated by intercostals tube drainage, antibiotics and 22.41% (n=13) cases were treated by ICT drainage and decortication and only 1 cases was treated by aspiration due to the presence of small amount of pus. The mean length of hospital stay was 18 days and the mean length of ICT drainage was 14.8 days (Table-1). Empyema before and after evacuation is shown in figures 1 and 2.

**Mortality pattern of empyema in relation to age:** Highest mortality was noted in less than 3 years age group as compared to 3-5 years and 6-12 years age group.

**DISCUSSION**

Empyema thoracis is a disease that, despite centuries of study, still causes significant morbidity and mortality. Empyema is a dreaded complication of pneumonia and chest injuries prior to antibiotic era.<sup>1,5</sup> Immediately after infection proteinaceous fluid starts to fill the pleural cavity.<sup>2,4</sup> In our study we have endeavored to identify various factors responsible for causing empyema, and mode of treatment. In the present study the incidence of empyema was found to be 1.26% (n=58) out of all total hospital admissions (n=4613) in pediatric department during study period of 26 months. Sex wise distribution of empyema cases showed that both male and female children were equally affected.

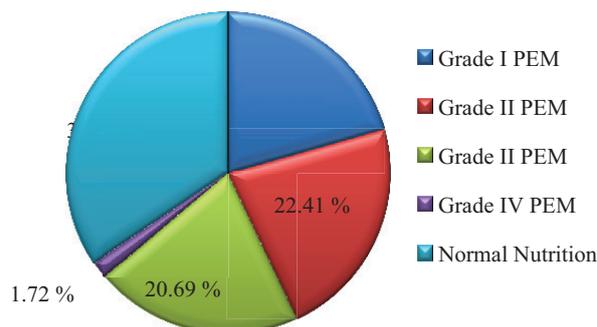
In several studies of pediatric empyema thoracis revealed that there was no sex preference, some studies showed that males were predominantly effected (65.9% - 70%).<sup>7-11</sup>

In our study empyema incidence was low below 1 year of age (20.69%), raise was seen in 3-5 years of age group (22.41%) and maximum cases were observed in 6-12 years age group( 51.72%).Majority of empyema cases (65.2%) were associated with malnutrition, anemia.

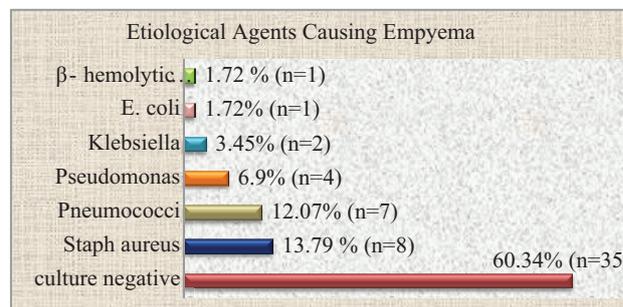
In a study of empyema large majority of cases were victims of malnutrition (73.2%), anemia (53.7%), measles and gastroenteritis.<sup>9</sup>

In the present study hospital admissions of empyema cases showed seasonal prevalence during winter months of November to February (53.45%). The main clinical features present in all patients of empyema were fever, cough, breathlessness. Chest pain was seen in 23 cases due to poor localization of pain and communication. Many empyema case studies stated that fever, cough, breathlessness and chest pain were present in 94.8%, 72.4%, 91%, 3.7% respectively.<sup>2,6,8</sup>

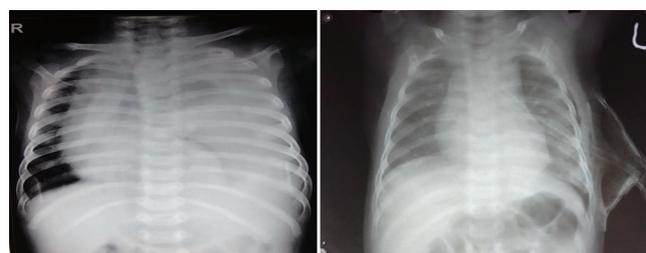
In our study, consolidation was observed in 13.79% of patients.56.9% (n=33) patients were having right sided empyema, left lung empyema in 41.3% (n= 24) and both sided empyema in one patient. In many studies right pleura is



**Graph-1:** Incidence of empyema in relation to malnutrition (IAP) Grading



**Graph-2:** Etiological Agents Causing Empyema



**Figure-1:** Left sided Empyema; **Figure-2:** Empyema with ICTD

Treatment	No. of cases (n=58)	Percentage (%)	Outcome
By Aspiration only	1	1.72	Improved
By ICT Drainage	30	51.72	Improved
By ICTD + Decortication	13	22.41	Improved
By ICT drainage	5	8.62	Not Improved referred to higher center
By ICTD	2	3.45%	Not Improved discharged against medical advise
By ICTD	2	3.45	Not Improved discharged at request
By ICTD	5	8.62	Expired

**Table-1:** Mode of treatment of empyema

more commonly effected than left pleura.<sup>7</sup> In our study right sided preference was mainly involved due to right main stem bronchus is more vertical and in direct line with trachea than in the left. As a consequence foreign materials are aspirated more into right lung rather than the left. Pure empyema, cervical lymphadenopathy, asthma, anemia cases required blood transfusion and sepsis were observed in percentages of 86%, 3.2%, 1.62%, 8%, and 7% cases.

In the present study 39% cases were shown to be pus culture test positive, blood culture positive tests cases were of 5.17% among them major organism causing empyema was *S. aureus* (13.79%) followed by *Pneumococci* (12.07%), *Pseudomonas* (6.9%), *Klebsiella* (3.45%),  $\beta$ -hemolytic streptococci (1.72%) and *E.coli* (1.72%). Pleural fluid cultures were positive for *S. aureus* (48%), *S. pneumonia* (7%), no growth was seen in 42% of cases of a study.<sup>10</sup> While performing blood analysis, in 81% of cases WBC count was elevated in more than 10,000 cells/cumm, ESR above 30 mm/1<sup>st</sup> hr, pleural fluid cytological examination lymphocyte predominance was observed in 14% cases of empyema. Pleural biopsy has great value in diagnosis of tuberculosis.<sup>3,4,11-14</sup> Out of 58 cases, 4 cases were of HIV positive, 3 of them were of tuberculous etiology, one case was isolated of *E. coli* and other was found to be coagulative -ve Staph.

The key to successful management lies in effective pleural evacuation and re- expansion of the lung. Most of the cases (30 cases) were treated with combination of IV antibiotics and intercostal tube drainage (ICTD), usual duration of antibiotic therapy is 3-6 weeks and other is to drain the accumulated pus from the pleural cavity.<sup>6,7,12,13</sup> and mean length of ICTD was 14.8 days. 13 cases needed both ICT drainage and decortications. Bronchoscopy and CT- scan chest were advised in 5 cases who has no improvement with ICTD and antibiotics and were referred to higher centers for investigation and surgical management. Only 1 case was treated by only repeated aspiration due to presence of small amount of pus. Among all the treatments ICT drainage was found to be effective, 30 cases showed adequate lung expansion. By ICTD + decortications 13 cases showed improvement any only one case was improved with aspiration.

## CONCLUSION

From the study we conclude that, incidence of empyema thoracis in pediatrics was 1.26%, more in female and malnourished children. Higher incidence was seen in winter season. Right sided empyema was more common and rare on both sides. *Staphylococcus aureus* is the most prevalent etiological agent. The successful management of empyema thoracis lies in intravenous administration of antibiotics along with intercostal tube drainage.

Early diagnosis, prompt and effective treatment of respiratory infections, particularly pneumonia will reduce the morbidity and mortality among pediatric population.

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