



## A CLINICAL STUDY OF EMPYEMA THORACIS IN CHILDREN

**Dr G. Chinna Rao** Assistant Professor Of Pedaitrics, Andhra Medical College, KGH, Visakhapatnam

**Dr K. Dinendraram\*** Assistant Professor Of Paediatrics, RIMS, Srikakulam \*Corresponding Author

**ABSTRACT** **Introduction:** 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:** To study the age-sex profile, clinical presentation, etiologic agents, management and the overall treatment outcome of empyema thoracis in children.

**Material and methods:** A total of 35 patients of both the sexes aged 0-12 years diagnosed to have empyema thoracis and who underwent tube thoracostomy from July 2017 to September 2018 were studied. Detailed clinical history, physical examination, relevant routine and specific investigation were done.

**Results:** Majority of patients (45.71%) were seen in age group of 3-5 years. Fever, breathlessness (100%), and cough, chest pain were the commonest presenting features. Bacteriological examination revealed staphylococcus aureus as the commonest etiologic agent (17.4%) isolated from pleural fluid culture. All cases were treated with antibiotics and intercostal tube drainage. 3 cases which did not improve with intercostal tube drainage and had loculations, had undergone Decortication. There was 3 cases expired out of 35 cases

**CONCLUSION:** Empyema is not rare in our practice. Early diagnosis and proper treatment of pneumonia prevent the development of empyema. Antibiotics and tube thoracostomy is an effective method of treating pyogenic empyema thoracis in children.

**KEYWORDS :** Empyema thoracis, pleural fluid cytology, inter costal tube drainage.

#### INTRODUCTION :

Hippocrates in 600 B.C. defined empyema thoracis as a collection of pus in the pleural cavity and advocated open drainage as its treatment.<sup>1</sup> Empyema thoracis, a common condition in childhood<sup>2</sup>, and has significant morbidity and mortality. Empyema thoracis constitutes approximately 5- 10% of cases seen by pediatrician in India.<sup>3</sup>

Common causative organisms of empyema are Streptococcus pneumoniae and Staphylococcus aureus, Escherichia coli, Haemophilus influenza and Klebsiella pneumonia and uncommon causative organisms are Mycobacterium tuberculosis and cryptococcus neoformans. Immediately after infection proteinaceous fluid starts to fill the pleural cavity.<sup>5,6</sup>

The clinical manifestations of empyema are high grade fever with 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>6</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.

#### MATERIAL AND METHODS

A prospective study, 35 empyema cases were studied, which were admitted to pediatric department, of King George Hospital, Visakhapatnam with clinical features of empyema during a period of 26 months (July 2017 to sep 2018) 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.

#### RESULTS

**Incidence of empyema in hospital admissions:** Out of the total 5725 cases PICU admitted in the pediatrics department, 0.6% (35 cases) were having empyema.

**Age and sex wise distribution of empyema cases:** As table 1 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 (47.71%) were noted in 3-5 year age group. Male children were more affected 60% (20 CASES)

**Incidence of empyema in relation to malnutrition:** 24 cases were associated with malnutrition comprising of 68.57%.

**Seasonal Incidence of empyema:** 13 cases were admitted during the winter season from Nov to Feb comprising of 37.14%.

**Analysis of symptomatology:** In our study (table 3) Fever, cough, breathlessness were present in all cases of empyema. Other symptoms like chest pain was present in 42.85% (n=15) cases.

**Side of Accumulation of empyema:** Out of 35 cases, (table 4) 20 (57.15%) were having empyema on right side and 14 (40%) cases were having empyema on left side and remaining one case had empyema on both sides.

**Etiological agents causing empyema:** The pus culture was positive for empyema only in 17 cases comprising of 48.57%. Culture was negative in majority, i.e. 18 cases comprising of 51.42%, probable reason might be prior initiation of antibiotics. In table 2 Among the culture positive cases (n=17) staphylococcus aureus was the major organism that was isolated in 17.14% (n=6) cases.

**Mode of treatment of empyema:** Regarding the mode of treatment of empyema, (table 3) All cases were treated with antibiotics and intercostal tube drainage. 3 cases (8.57%) which did not improve with intercostal tube drainage and had loculations, had undergone Decortication. Poor response to intercostal tube drainage may be due to late presentation and delayed intercostal tube insertion. The mean length of hospital stay was 24.2 days and the mean length of ICT drainage was 11 days.

**Mortality pattern of empyema in relation to age:** In our study, out of 21 males, 2 cases expired (9.52%) and out of 14 females, 1 case expired (7.14%).

#### DISCUSSION:

Though the incidence of empyema thoracis has declined in the west due to effective use of broad spectrum antibiotics, but it still remains a significant health problem in developing countries due to low socioeconomic status, malnutrition and delay in diagnosis of

pneumonia, delayed referral to higher centre.

Therapy for thoracic empyema requires appropriate antibiotics, prompt drainage of the infected pleural space and lung expansion. However there is no clear consensus on the best way to obtain these objectives.<sup>7,8,9</sup>

The age of presentation and male preponderance was consistent with similar other studies.<sup>10,11,12</sup> The higher prevalence in under-fives (79.99%) and the slight male preponderance (1.5 :1) is in general agreement with the established pattern of acute lower respiratory infections in children.<sup>13</sup>

In our study empyema in relation to nutrition, 11 cases were of normal weight comprising of 31.42%. Remaining 24 cases were associated with malnutrition comprising of 68.57%.

A higher incidence of empyema cases were seen more often in malnourished children as seen in this study, similar to other studies conducted in developing countries.<sup>14,15,16,17</sup> Predisposition of malnourished children to recurrent, severe and complicated infection is a known factor.

Fever, breathlessness and cough were the most common (100%) manifestations found at admission similar to many other studies.<sup>11,12</sup>

In our study, pleural fluid culture (table 2) showed bacterial growth in 48.57% of patients and no growth in 51.42%, probable reason might be prior initiation of antibiotics.<sup>11</sup> The present study culture reports were similar to other reports. Most common organism isolated was staphylococcus aureus which is comparable to previous studies from other developing countries.<sup>11,12</sup> Other causes are streptococcus pneumoniae, pseudomonas and Klebsiella pneumoniae. The sterile sample might be due to high rate of antibiotics pre-treatment or lack of better facilities for culturing fastidious organism like anaerobes. Pneumococcus is the major pathogen in developed countries.<sup>10</sup>

The median duration of hospital stay was comparable to other studies on conservative management.<sup>18,19,20</sup> In the present study, all patients responded to conservative management and 3 patient required decortication. Previous studies suggest a success rate of 61-100% with chest tube drainage and antibiotics.<sup>21,22</sup> These treatment outcome were similar to other studies<sup>7</sup>

A meta-analysis comparing operative and non-operative procedures has also concluded that conservative management leads to recovery in more than 76% of the patients. Average duration of antibiotics used in this study was longer than the previously reported studies from developed countries.<sup>19,20</sup> The choice of antibiotics was governed by the culture and sensitivity pattern prevalent in that particular region.

The key to successful management lies in effective pleural evacuation and re-expansion of the lung. Most of the cases (32 cases) were treated with combination of IV antibiotics and intercostal tube drainage, usual duration of antibiotic therapy is 3-6 weeks and other is to drain the accumulated pus from the pleural cavity and mean length of ICTD was 11 days. 3 cases needed both ICT drainage and decortications. Among all the treatments ICT drainage was found to be effective, 32 cases showed adequate lung expansion. By ICTD + decortications 3 cases showed improvement.

## CONCLUSION

From the study we conclude that, incidence of empyema thoracis in pediatrics was 0.6% in PICU admissions, more in male 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.

**Table 1: Age and sex wise distribution of empyema cases**

Age groups (in years)	Males	Females	Total	Percentage
<1	1	1	2	5.71
1-2	6	4	10	28.57
3-5	10	6	16	45.71
6-12	4	3	7	20
Total	21	14	35	100

**Table 2: Etiological agents causing empyema**

MICROORGANISM	<3 yr	3 – 5 yr	6 – 12 yr	TOTAL
Staphylococcus aureus	3	2	1	6 (17.14%)
Streptococcus pneumonia	0	4	0	4 (11.42%)
Streptococcus pyogenes	0	1	0	1 (2.85%)
Pseudomonas	2	1	0	3 (8.57%)
Klebsiella	1	1	0	2 (5.71%)
Escherichia coli	1	0	0	1 (2.85%)
Culture sterile	5	7	6	18 (51.42%)

**Table 3: MODE OF TREATMENT**

MODES OF TREATMENT	NO. OF CASES
ICT + ANTIBIOTICS	32
ICT + ANTIBIOTICS + DECORTICATION	3

## REFERENCES:

- Adams F. The genuine works of Hippocrates, Baltimore: William and Wilkins Company; 1939;51-2.
- Eastham KM, Freeman R, Kearns AM, Eltringham G, Clark J, Leeming J, et al. Clinical features, aetiology and outcome of empyema in children in the North East of England. *Thorax*. 2004;59:522-5.
- Roxburg CSD, Young Son GG, Towend JA, et al. Trends in pneumonia and empyema in Scottish children in the past 25 years. *Arch Dis Child*. 2008;93:316-8.
- YC 5. Jeffery M Bender, Krow Ampofo, Xiaoming Sheng, Andrew T Pavia, Lisa Cannon-Albright and Carrie L Byington. Parapneumonic empyema deaths during past century. *Utah Emerg Infect Dis*. January 2009;15(1):44-48.
- N, Jain Sonali, Banavali J. Bacteriological analysis of pleural fluid from the largest chest hospital in Delhi. *Journal of Empyema thoracis*. 2013;3:6-10.
- Empyema. Medline plus medical encyclopedia, Available from <http://www.nlm.nih.gov/medlineplus/ency/article/000123.htm>
- Tiryaki T, Abbasoglu L, Bulut M. Management of thoracic empyema in childhood: A study of 160 cases. *Pediatr Surg Int*. 1995;10:534-6.
- Cham C, Haq SM, Rahamim J. Empyema thoracis: a problem with late referral? *Thorax*. 1993;48:925-7.
- Vikas G, Ajay K, Monika G, et al. Empyema thoracis in children: Still a challenge in developing countries. *Afr J pediatr surg*. 2014;11:206-210.
- Estham KM, Freeman R, Kearns AM, Eltringham G, Clark J, Leeming J. Clinical features, aetiology of empyema in children in the North East of England. *Thorax*. 2004;59:522-5.
- Zel SK, Kazeza, Kilic M, Koseogullaric AA, Yelmaza, Aygun AD. Conservative treatment of post parapneumonic thoracic empyema in children. *Surg Today*. 2004;34(12):1002-5.
- Singh V. IAP Textbook of Paediatrics, 5th edn, Jaypee Publishers, 2013;478-80.
- Light RW. Management of parapneumonic effusions, J Empyema thoracis during a 10-year period (1952-67). *Arch Ins Med* 1981;141:1771-1776.
- Yilmaz E, Dugan Y, Aydinoglu AH, et al. Parapneumonic empyema in children: conservative approach. *Turk J Pediatr*. 2002;44:134-8.
- Menon P, Rao KL, Singh M, Venkatesh MA, Kanojia RP, Samuih R, et al. Surgical management and outcome analysis of stage III pediatric empyema thoracis. *J Indian Assoc Pediatr Surg*. 2010;15:9-14.
- Ekpee EE, Akpan MU. Poorly treated bronchopneumonia with progression to empyema thoracis in Nigerian children. *TAF Prev Med Bull*. 2010;9:181-6.
- Shah K, Shaikh F, Poddutoor PK, et al. Clinical profile of empyema in tertiary health care centre. *Indian J Child Health*. 2015;2(1):5-8.
- Satish B, Bunker M, Seddon P. Management of thoracic empyema in childhood: does pleural thickening matter? *Arch Dis Child*. 2003;88:918-21.
- McLaughlin JF, Goldman DA, Rosenbaum DM. Empyema in children: clinical course and long-term followup. *Pediatrics*. 1984;73:587-89.
- Chan PWK, Crawford O, Wallis C, et al. Treatment of pleural empyema. *J Paediatr Child Health*. 2000;36:375-7.
- Adam Jaffe, Ian M. Management of empyema in children. *Pediatric Pulmonology*. 2005;40:148-56.
- Baranwal AK, Singh M, Maratha RK, et al. Empyema thoracis: a 10-year comparative review of hospitalized children from South Asia. *Ach Dis Child*. 2003 Nov;88(11):1009-14.