

Original Research Article

A study of paediatric empyema thoracis presentation in a tertiary care hospital in Visakhapatnam, India

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ABSTRACT

Background: Empyema thoracis is an accumulation of pus in the pleural space. The incidence of empyema in children is increasing. Adequate knowledge of treatment modalities is therefore essential for every pediatrician. 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. The objective of this study was to study the age-sex profile, clinical presentation, etiologic agents, management and the overall treatment outcome of empyema thoracis in children.

Methods: This was a prospective observational study, conducted in the Department of Pediatrics, King George Hospital, Visakhapatnam, from November 2014 to December 2016. All children in age group of 0 to 12 years diagnosed pyogenic empyema during the study period were included in the present study. In the present study 72 children was found to be having empyema.

Results: Majority of patients (58.32%) were seen in age group of 1-5 years. Fever (100%), breathlessness (94.44%), and cough (97.22%) were the commonest presenting features. Bacteriological examination revealed *staphylococcus aureus* as the commonest etiologic agent (16.66%) isolated from pleural fluid culture. All patients were treated with antibiotics, and drainage of the empyema was affected by closed thoracostomy in (80.55%) of the 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 in resource poor settings.

Keywords: Empyema thoracis, Pleural fluid cytology, Tube thoracostomy

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.¹ Empyema thoracis, a common condition in childhood has significant morbidity and mortality.^{3,4} Empyema thoracis constitutes approximately 5-10% of cases seen by paediatrician in India.^{4,5} Acute respiratory infections are the most common illness of childhood accounting 50% of all illness in under-fives

and 30% in the 5-12 years age groups, largely involving the upper respiratory. However, about 5% involve the lower respiratory tract resulting in serious diseases, especially the bacterial pneumonia.⁶

Common causative organisms of empyema are *Streptococcus pneumoniae* and *Staphylococcus aureus*, *Escherichia coli*, *Haemophilus influenza* and *Klebsiella pneumoniae*, *streptococcus pyogenes* and uncommon causative organisms are *Mycobacterium tuberculosis* and

cryptococcus neoformans. Immediately after infection proteinaceous fluid starts to fill the pleural cavity.^{7,8}

The clinical manifestations of empyema are high grade fever with chills and rigors, cough, breathlessness, chest pain. Bronchopleural fistula, pyopneumo thorax, 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.⁸

The proper management of empyema thoracis in children continues to be a source of debate. It continues to have a high mortality rate 10-16%.⁹ Pleural effusion and empyema are known complications of bacterial pneumonia. Effusion occur in at least 40% of bacterial pneumonia with up to 60% of effusions resulting in the formation of empyema in all age groups.^{10,11} The American Thoracic Society has described three stages of empyema namely exudative, fibrinopurulent and organized.¹² It is postulated that most appropriate therapy depends on stage of disease at presentation.

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.

METHODS

This was a prospective observational study, conducted in the Department of Pediatrics, King George Hospital, Visakhapatnam, from November 2014 to December 2016. The study was approved by the Institute's Ethical Committee and written informed consent was obtained from all patients. All children in age group of 0 to 12 years diagnosed pyogenic empyema during the study period were included in the present study. In the present study 72 children was found to be having empyema out of 5407 admissions in the Department of Paediatrics, King George Hospital, Visakhapatnam.

The diagnostic criteria for empyema thoracis was presence of pleural effusion, clinical and radiological examination and aspiration of pus from the thoracic cavity. A detailed history was taken regarding complaints, predisposing factors, immunization and communications.

Detailed general and systemic examination done. Routine and relevant specific examinations were done. These include hemoglobin estimation, total leukocyte count, ESR, HIV. All patients suspected of pleural effusion clinically were subjected to chest X-ray, USG and (if required) CT thorax.

Other investigations include pleural tap fluid was studied for gram staining, microscopy cytology biochemical analysis including protein estimation, pleural culture and antibiotic sensitivity pattern. A chest radiograph (PA or AP) and a lateral view if indicated were done after chest tube insertion.

RESULTS

Incidence of empyema in hospital admissions

Out of the total 5407 cases admitted in the pediatrics department 72 (1.44%) cases were having empyema.

Age and sex wise distribution of empyema cases

As per above analysis, the incidence of empyema was more common in 58.32% (42 cases) 1-5 years age group and 11.11% (8 cases) <1 year and 30.55% (22 cases) 6-12 years. In the present study male children were more affected 52.78% (38 cases) and female children 47.22% (34 cases).

Table 1: Sex distribution of empyema thorax.

Sex	No. of cases	% in present study
Male	38	52.78%
Female	34	47.22%
Total	72	100%

Table 2: Age wise distribution of empyema.

Age group (in years)	No. of cases	% in present study
<1 year	8	11.11%
1 to 5 years	42	58.32%
5 to 12 years	22	30.55%

Incidence of empyema in relation to malnutrition

In the present study 65.28% (47 cases) were malnourished.

Table 3: Incidence of empyema in relation with malnutrition.

Nutritional status	No. of cases	% in present study
Malnourished	47	65.28%
Normal nourishment	25	34.72%

Seasonal incidence of empyema

In the present study 32 cases were admitted during the winter season, from Nov to Feb comprising of 44.44%. during summer 27 cases were admitted and during rainy season 13 cases were admitted.

Table 4: Seasonal incidence of empyema.

Season	No. of cases	% in present study
Winter	32	44.44%
Summer	27	37.50%
Rainy	13	18.05%

Analysis of symptomatology

In the present study fever, cough, breathlessness was present in all cases of empyema. Other symptoms like chest pain was present in 57.77% (n=42) cases.

Table 5: Analysis of symptomatology.

Symptoms	No. of cases	% in present study
Fever	72	100%
Cough	70	97.22%
Breathlessness	68	94.44%
Chest pain	42	57.77%

Side of accumulation of empyema

Out of 72 cases, 45 (62.50%) were having empyema on right side and 27 (37.50%) cases were having empyema on left side.

Table 6: Side of accumulation of empyema.

Side	No:cases	% in present study
Right	45	62.5%
Left	27	37.5%

Etiological agents causing empyema

Out of 72 cases pus culture was positive for empyema only in 37.5% (n = 27) cases. Culture was negative in majority of cases 62.5% (n = 45). Among the culture positive cases (n = 27) *staphylococcus aureus* was the major organism that was isolated in 16.66% (n = 12) cases.

Radiological profile for empyema

Out of 72 cases massive plural effusion in chest X ray 41.66% (30 cases).

Mode of treatment of empyema

Regarding the mode of treatment of empyema, 80.55% (n = 58) cases were treated by intercostals tube drainage,

antibiotics and 9.72% (n = 7) cases were treated by ICT drainage and decortication and 8 cases was treated by aspiration due to the presence of small amount of pus.

Table 7: Etiological agents causing empyema.

Type of organism	No. of cases	% in present study
<i>Staph aureus</i>	12	16.66%
<i>Pneumococci</i>	6	8.33%
<i>Pseudomonas</i>	5	6.94%
<i>Klebsiella</i>	2	2.77%
<i>E. coli</i>	2	2.77%
No growth	45	62.5%

Table 8: Mode of treatment of empyema.

Treatment	No. of cases	% in present study
Aspiration +antibiotics	7	9.72%
ICT drainage + antibiotics	58	80.55%
ICT drainage + decortication + antibiotics	7	9.72%

Mortality pattern of empyema

Out of 72 cases 4 cases died due to empyema.

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.

The age of presentation and male preponderance was consistent with similar other studies.^{13,14} The higher prevalence in under-fives (69.43%) and the slight male preponderance (1.12:1) is in general agreement with the established pattern of acute lower respiratory infections in children.⁶ In the present study, 65.28% of the children were malnourished as per IAP classification.¹⁶ Fever, breathlessness and cough were the most common (100%) manifestations found at admission similar to many other studies.^{14,15} Other associated manifestations were chest pain and weight loss.

A higher incidence of empyema cases was seen more often in malnourished children as seen in this study, similar to other studies conducted in developing countries.¹⁷ Predisposition of malnourished children to recurrent, severe and complicated infection is a known

factor. In the present study, pleural fluid culture showed bacterial growth in 37.5% of patients and no growth in 62.5% of patients.¹⁴ 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.^{14,15} 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.

The key to successful management lies in effective pleural evacuation and re- expansion of the lung. Most of the cases 80.55% (58 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. and mean length of ICTD was 11.87 days. 7 cases needed both ICT drainage and decortications. Only 7 cases were treated by only repeated aspiration due to presence of small amount of pus. Mean duration of hospital stay 22.6 days. Among all the treatments ICT drainage was found to be effective, 58 cases showed adequate lung expansion. By ICTD + decortications 7 cases showed improvement any only 7 case was improved with aspiration.

CONCLUSION

From the study we conclude that, incidence of empyema thoracis in pediatrics was 1.44%, more in male and malnourished children. Higher incidence was seen in winter season. Right sided empyema was more common. *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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