ABSTRACT: Empyema has been described since ancient time and incidence is increasing worldwide and has substantial morbidity and mortality. We evaluated the clinical, surgical and microbiological features, management outcomes of empyema. METHODS: A retrospective observational study over 5 years (2010 to 2014) was carried out at Gauhati Medical College and Hospital, Guwahati, India. RESULTS: Patients (n=133) were predominantly male and ratio of male to female is 1.7: 1. Main clinical presentation was fever with cough. The infective organism was Staph aureus in majority. Tube thoracostomy was done in 133 and decortication in 23.Two underwent VATS. Mean hospital stay was 12 days for tube thoracostomy and 24 days for thoracotomy procedures. CONCLUSION: Empyema remains an important cause of morbidity and hospital admissions. Multiple therapeutic options exist for the treatment of empyema thoracis.

KEYWORDS: Empyema thoracis, Tube thoracostomy, Thoracotomy, VATS.
The management of empyema thoracis involves three core principles: prompt initiation of appropriate antibiotics, the complete evacuation of suppurative pleural fluid and the preservation or restoration of lung expansion.4

**PATIENTS AND METHODS:** This study was a retrospective analysis of all cases of empyema thoracis admitted to the Pediatric Surgery ward or referred from other departments of Gauhati Medical College & Hospital, Guwahati Assam from January 2010 to December 2014. 133 patients below 12 years of age, diagnosed on the basis of history, examination and investigations, including chest X-ray. Ultrasonography (USG) and computed tomography (CT) were done in selected cases only. All cases having empyema thoracis (Pus on aspiration from the pleural cavity) were included. Patients diagnosed to be having concurrent and severe underlying lung disease were excluded. Written informed consent was taken and the respective procedures were well–explained to patient’s parents or guardians. The demographic characteristics of patients were noted.

All patients underwent closed intercostal chest tube drainage with 16-24 Fr. Under strict aseptic precaution chest tube was inserted under local anesthesia in minor operating room.5 Chest tubes were usually put by residents under the guidance of consultants. As a routine, empirical intravenous antibiotics and supportive treatment mainly maintenance of hydration, oxygenation, nutrition, blood transfusion and nursing care were given to all patients.

The chest tube was removed after clinical improvement, that is when no or below 30ml drain output was documented for more than 24 hrs. and the radiological lung re-expansion. Antibiotics were changed based on culture and sensitivity reports.

Decortication was subjected for patients who did not recovered after tube thoracostomy, thick peel encasing collapsed lung, multiple septations.6 the procedure was conducted by the consultants.

The thick peel was carefully removed from the surface of the entire lung releasing encased lung through posterolateral thoracotomy. All significant air leaks were closed and necrotic lung tissue if found were debrided. A chest tube was connected to the water sealed chest tube drainage bag. Two patients underwent VATS procedure. It was done with three trochar sites and positioned according to the site and extent of the pathology.

Descriptive statistics were used to calculate mean, median and standard deviation for variable such as lung re-expansion and hospital stay. Frequency was used to calculate bacteriological profile, sex, symptoms etc.

**RESULTS AND OBSERVATIONS:** Total numbers of patients with the diagnosis of empyema thoracis admitted or referred in the department of Pediatric Surgery, Gauhati Medical College & Hospital between January 2010 and December 2014 was 133 children.

| AGE                  | NO. OF CASES | PERCENTAGE |
|----------------------|--------------|------------|
| 0 DAYS – 1 YEAR      | 20           | 15.03      |
| 1.1 YEARS – 3 YEARS | 39           | 29.32      |
| 3.1 YEARS – 6 YEARS | 39           | 29.32      |
| 6.1 YEARS – 12 YEARS| 35           | 26.31      |
| **TOTAL**            | **133**      | **100**    |

*Table 1: Showing Age At Presentation*

The gender distribution of the study subjects were 83 (Males) and 50 (Females). Ratio is 1.7: 1.
Table 2: Showing Sex Incidence

| GENDER | NUMBER | PERCENTAGE |
|--------|--------|------------|
| MALE   | 83     | 62.41      |
| FEMALE | 50     | 37.59      |
| TOTAL  | 133    | 100        |

Table Showing Sex Incidence

Table 3: Showing Religion Distribution in Present Study

| RELIGION    | NUMBER OF CASES | PERCENTAGE |
|-------------|-----------------|------------|
| MUSLIM      | 80              | 60.15      |
| HINDU       | 52              | 39.09      |
| CHRISTIAN   | 01              | 0.751      |
| TOTAL       | 133             | 100        |

Table 4: Showing Presenting Symptoms

| PRESENTING COMPLAINTS | NO. OF CASES | PERCENTAGE |
|-----------------------|--------------|------------|
| FEVER                 | 120          | 90.22      |
| COUGH                 | 106          | 79.69      |
| BREATHLESSNESS        | 48           | 36.09      |
| PAIN ABDOMEN          | 10           | 7.51       |
| ABD.O.DISTENSION      | 04           | 3.0        |
| CHEST PAIN            | 16           | 12.03      |
| JOINT PAIN            | 01           | 0.75       |

Table 5: Showing Side of Empyema Thoracis

| SIDE       | NO.OF CASES | PERCENTAGE |
|------------|-------------|------------|
| LEFT       | 65          | 48.87      |
| RIGHT      | 64          | 48.12      |
| BILATERAL  | 04          | 03.00      |
| TOTAL      | 133         | 100        |
Table 6: Showing Microbiological Spectrum of Pleural Fluid

| ORGANISM         | NO. OF CASES | PERCENTAGE |
|------------------|--------------|------------|
| NO GROWTH        | 115          | 86.4       |
| STAPH. AUREUS    | 11           | 8.27       |
| ESCHERICHIA COLI | 05           | 3.75       |
| PSEUDOMONAS      | 02           | 1.50       |

Table 7: Showing Hospital Stay in Present Series

| HOSPITAL STAY (DAYS) | RANGE | MEAN  |
|----------------------|-------|-------|
| TUBE THORACOSTOMY    | 3-33  | 12.20 |
| THORACOSTOMY         | 10-60 | 24.37 |

DISCUSSION: Empyema thoracis is a life threatening emergency. Though the incidence of empyema thoracis has declined in the west due to the 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 center. Furthermore, the appropriate management of pediatric empyema thoracis remains controversial. There are varied findings in etiology, microorganism involved. Prognosis and management differ from series to series. Appropriate antibiotic therapy and drainage of the pleural space remain the first line of therapy.

The age and gender distribution of empyema in children in Asian countries are similar to the Western world. Empyema thoracis are more common in boys than girls. In our study male to female ratio was found to be 1.7:1. This observation was similar to findings in the other studies. In our study, the religious distribution was analyzed in a Hindu dominated geographical location. Muslim constituted the largest number with 80, Hindu 52 and a single Christian. Literature mentioning religious distribution had not been found. Empyema thoracis is usually unilateral with rare bilateral involvement. Our study differ from other series as left side involvement was marginally more.

The clinical manifestations of empyema are highly variable depending on the nature of the infecting organisms and the competence of the host response. In our study fever was the commonest symptom followed by cough which was comparable with other studies. Infection in lower lobe may present with abdominal complaints. In the recent multicentric UK study, only 17% of cases were culture positive and even using newer molecular techniques for example, pneumococcal or broad range polymerase chain reaction (PCR)--an etiological agent was only detected in 75% of culture negative cases. In our study too, only 14% of cases had organism growth which was similar to other studies. This was attributed to the prior antibiotic therapy before the referral to our hospital. Staph. Aureus was the commonest organism similar to other studies.
In our study, 133 cases fulfilled the criteria and were subjected to chest tube drainage. Out of which 108 (81.2%) recovered from the disease. This study suggested overall 60-80% of cases responds to conservative management but hospital stay may be prolonged. The rest 25 patients required further management by surgical intervention.

The hospital stay was longer for patients who underwent decortication as the patient’s general condition was very poor at presentation and thoracotomy was generally kept as second line of treatment after chest tube drainage failure.

**CONCLUSION:** Empyema thoracis remains a common problem that carries significant morbidity and potential mortality. They were more frequently encountered in the age group of 1-6 years of age and males were more commonly affected than females.

Fever and cough were the most common presenting symptoms. On culture of pleural fluid, staphylococcus aureus were the most commonly isolated organism. Eighty one percent (81%) of cases responded to chest tube drainage alone, highlighting the importance of the procedure in the management of the disease and the need of treating doctors to be well versed with this simple bedside procedure.

It is generally accepted that regardless of the method employed to treat the disease, prognosis of the disease in children is exceptionally good, unlike in adults. However timely performed procedure carries low morbidity, providing rapid resolution of symptoms with a shorter hospital stay. Resolution of fever, duration of chest tube in situ and duration of hospital stay is a reliable parameter to assess outcome.

Fig. 1: Chest Tube drainage

Fig. 2: Pus in chest tube drainage bag
Fig. 3: Showing Decortication Procedure

Fig. 4: extracted pus

Fig. 5: Chest X-Ray of a case of Empyema Thoracis
REFERENCES:
1. Adams F, LLD. The genuine works of Hippocrates translated from the Greek with a preliminary discourse and annotations: New York, W. Wood and Company: 1849.
2. S. Pramod, Puligandla and Laberge JM: Infections and diseases of the lungs, pleura and mediastinum: in Grosfeld JL, O’Neil JA Jr, Fonkalsrud EW, Coran AG, Pediatric Surgery, 6th edition 2006, Mosby.
3. Eastham KM, Freeman R, Kearns AM, Clark J, et al. Clinical features, aetiology and outcome of empyema in children in the North East of England. Thorax 2004; 59: 522-525.
4. Ghritlaharey RK, Budhwani KS. Shrivastava J. Tubethoracostomy: Primary management option for empyema thoracis in children. Afr J Paediatr Surg 2012; 9: 22-6.
5. Menon P, Kanojia RP, Rao KL. Empyema Thoracis: Surgical management in children. J Indian Assoc Pediatr Surg 2009; 14: 85-93.
6. Foglia RP, Randolph J. Current indications for decortication in the treatment of empyema in children. J Pediatr Surg 1987; 22: 28-33.
7. Wehr CJ, Adkins JR RB. Empyema thoracis: A ten year experience. Southern medical journal 1986; 79 (2):171-176.
8. Mishra OP, Das BK, Jain AK, Lahiri TK, Sen PC, Bhargava V. Clinicobacteriological study of empyema thoracis in Children. J Top Pediatr 1993; 39:380-1.
9. Narayanappa D, Rashmi N, Prasad NA, Kumar A. Clinicobacteriological profile and outcome of empyema. Indian Pediatr 2013; 50: 935-6.
10. Anstadt MP, Guill CK, Ferguson ER, Gordon HS, Soltero ER, Beall AC Jr, et al. Surgical versus nonsurgical treatment of empyema thoracis: An outcome analysis. Am J Med Sci 2003; 326:9-14.

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