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Clinico-Bacteriological Profile and Outcome of Empyema Thoracis in Children below 12 Years of Age

Authors
Shriya Akanksha[1*], Abhijeet Dutta[2], Aritra Guha[3]
[1,2,3]North Bengal Medical College, Darjeeling
*Corresponding Author
Shriya Akanksha
Email: *shriyakanksha06@gmail.com*

Abstract

Introduction: *Empyema thoracis is a condition where pus is collected in the pleural cavity. It is a significant cause of pediatric hospital admission and pediatric morbidity especially in developing countries. The objective of this study is to evaluate the clinico-bacteriological profile and outcome of empyema thoracis in children below 12 yrs of age.*

Method: *Patients below 12 yrs of age suffering from empyema thoracis were included in this study. After proper history taking and complete examination routine and specific investigations were done. The pleural fluid was studied for cytology, gram staining, microscopy, culture and sensitivity pattern. All the patients were treated with chest tube drainage and antibiotic therapy. Outcome and complications were noted.*

Result: *The most common age of presentation was 1-5 yrs (60%) with 64% patients being male. Pleural fluid study showed the culture was positive in 30% cases. Staphylococcus aureus was the most common organism isolated (53%) followed by mycobacterium species, Streptococcus pneumonie, Klebsiella and E coli. Intercostal drainage and antibiotic was the mainstay of treatment.. Majority patients responded to the treatment, however 22% cases were referred to higher centres for surgical interventions. Pyothorax and pleural thickening were the most common complications and majority patients survived (94%).*

Conclusion: *Early diagnosis and intervention significantly reduces morbidity in a case of empyema thoracis. Antibiotics and chest drainage is an effective method of treating empyema thoracis in resource poor settings. In this region of Shushrutanagar, Staphylococcus aureus was the most common organism isolated from pleural fluid. Thus prophylactic administration of appropriate antibiotics even prior to c/s report may lead to a better outcome.*

Introduction

Empyema thoracis is defined as a condition in which pus is collected in the pleural cavity.(1) Pleural invasion commonly starts as a secondary process from underlying lung pathology, or gets extended from neighbouring regions, with pneumonia being the most common predisposing pulmonary disease. Other possible sources of primary infection include, rib osteomyelitis, lung abscess, post traumatic, post embolic, trachea-bronchial and oesophageal rupture.(2)

Inspite being a common cause of pediatric hospital admission with significant mortality and morbidity, only few reports are available

describing the various aspects of empyema thoracis in Indian children. Moreover, most of the data from our country are retrospective, indicating the need for a properly designed prospective study.

Moreover, the present study area, North Bengal Medical College & Hospital is a tertiary care centre in the north zone of West Bengal catering a high number of referred cases from the surrounding areas, and also from neighbouring states and countries.

Hence this prospective study was undertaken to find out the clinico-bacteriological profile and outcome of empyema thoracis in children below 12 years of age admitted in paediatric ward of this tertiary care centre.

Methods

This longitudinal prospective hospital based study was conducted from July 2016 to June 2017 and included all children below 12 years of age admitted with the diagnosis of empyema thoracis in pediatric ward of North Bengal Medical College during the above specified time period. After admission a detailed history regarding chief complaint, predisposing factor and immunization history was taken.

After detailed clinical examination, all children were subjected to baseline investigations like complete blood count, ESR, C-reactive protein, blood culture and sensitivity. The patients suspected of pleural effusion were subjected to a chest X-ray. In selected cases, where the diagnosis was doubtful an USG hemi-thorax was done.

Pleural fluid tap was done with aseptic precaution by thoracocentesis. The fluid was then examined for cytology; biochemical parameters such as sugar and protein; AFB, ADA, and gram staining as well as culture. Mantoux test, sputum for acid fast bacilli were done in required cases.

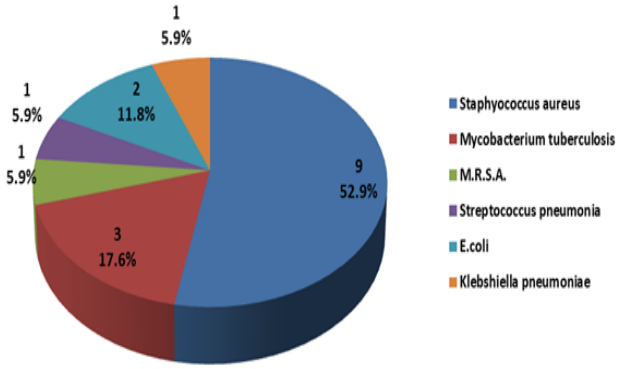
All patients were treated with antibiotics according to the sensitivity pattern and inter-costal tube was inserted in all cases. Patients requiring longer hospital stay or not responding to the conventional treatment were referred to pediatric surgeon for thoracoscopic decortications or video assisted thoracoscopic surgery (VATS).

The course of the disease and its immediate complications were noted. The subjects were followed up for a period of 3 months in pediatric out-patient department.

Results

Out of 52 patients studied, at admission 32 of them were in the age group of 1-5 years (61.5%), followed by 14 patients (27%) greater than 5 years of age. However, the proportion of infants admitted with empyema thoracis was comparatively less i.e. 6 patients (11.5%). The overall mean age was 3.89 years with a standard deviation (S.D.) of 2.63.The study showed a male predominance. Out of 52 patients admitted with a diagnosis of empyema thoracis 30 (57.7%) were male and 22 (42.3%) were females.

Among 52 patients pleural fluid culture was positive in 15 cases (28.8%). Majority of the cases (71.2%) showed no growth. The most common micro-organism isolated on culture of pleural fluid was Staphylococcus aureus that was present in 9 cases(52.9%) followed by Mycobacterium tuberculosis in 3 cases (17.6%), E.coli in 2 cases(11.8%) and M.R.S.A., Streptococcus pneumonae and Klebshiella pneumonia 1 case (5.9%) each.



The mean age in case of Staphylococcal infection was 3.3 years as compared to the non staphylococcal group where the mean age was 3.7 years. There was a strong and significant correlation (p=0.002), between the duration of fever and the micro-organism isolated. In case of

Staphylococcal infection the onset of fever (before admission) was acute with a shorter duration (mean=5.2 days) as compared to other cases (mean=16.2 days). Similarly there was a significant correlation between sugar level in pleural fluid (p=<0.001) in both groups.

The average duration of chest tube drainage was somewhat longer in case of Staphylococcal induced empyema eg. 7.8 days as compared to 6.1 days in non-staphylococcal cases. Similarly there was a delay in improvement of symptoms in Staphylococcal infection. Moreover, the total duration of hospital stay was longer (27.2 days) in Staphylococcal infection as compared to non-staphylococcal group (24.4 days).

The study showed that out of 52 patients, 32 patients (~73.1%) responded well to antibiotics and chest tube drainage whereas 11 patients (~21.2%) developed some complication and were referred to higher centre for further surgical interventions such as VATS, open thoracotomy and decortication. Three patients (~5.7%) died, two of them developed pneumothorax and one succumbed to septicaemia followed by septic shock respectively. Thus majority of patients have good prognosis if early diagnosis and appropriate management is done.

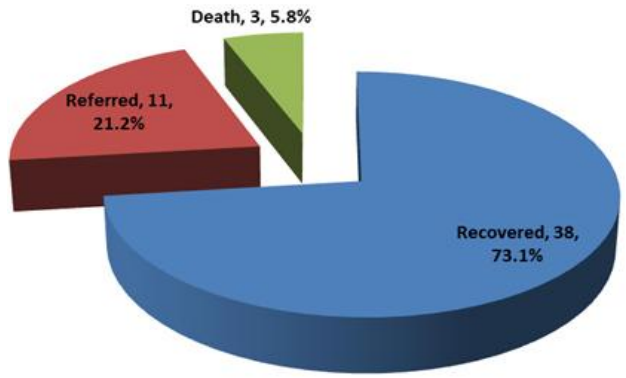


Fig. Distribution of Patients by Outcome

Discussion

Empyema thoracis is collection of pus in the pleural cavity.[1] It is a significant cause of childhood morbidity in our country. Though the incidence of empyema thoracis has declined in the west due to effective use of broad spectrum antibiotics but still it remains a significant health problem in developing countries due to scarcity of resources.[3] Thus this prospective study was carried out from July 2016 to June 2017 among 52 children below the age of 12 years admitted with the diagnosis of empyema thoracis in pediatric ward of North Bengal Medical College.

In this present study the common age of presentation of empyema thoracis was 1-5 years (61.5%) followed by 6-12 years (27%). This result was in concordance with a 10 year comparative study carried out by Barnawal AK et al,[4] and also with the study conducted by Laishram N et al.[5] where 64% patients were seen in the age group of 1-5 years.[5] Another study was carried out among 25 patients in 2008 by Kumar A et al,[6] at Maulana Azad Medical College, showed a median age of presentation at 3years (4 months to 11 years).

The present study shows that empyema thoracis occurs in both sexes with a male predominance (57.7%). The study correlated well with the studies done by Narayanappa D. et al,[7] Borade A.et al,[8] Saleem A.F. et al,[9] Laishram N.et al[10] Kumar A et al,[11] Lingayat AM et al,[12] Saliya MP et al,[13].

Pleural fluid culture positivity rate varies among various studies done at different times and at different centres. In our study the pleural fluid culture was positive in 32.6% cases, which was in concordance with the study conducted at Maulana Azad Medical College, where 24% cases had a positive culture.[11] Most of the patients were already on antibiotics prior to admission and thoracocentesis thus leading to low yield of culture reports. The other reasons for low culture positivity may be inaccurate method of collection and sampling, delay in examination of sample and low sensitivity of the technique itself. However various other studies carried out in other parts of country showed slightly increased culture positive rates. In the studies conducted by Barnawal AK et al,[14] and Goyal V et al,[15] the culture was found to be positive in 48% and 40% cases respectively.

However in the western world, the culture positivity rate is low. In the study conducted by

Eastham KM et al,[16] England, the culture was positive in only 12% cases. This was probably due to the fact that majority of children received antibiotics before admission. In the study conducted by Schulz KD et al,[17] at Texas Children's Hospital in Houston, also showed a low rate (32%) of culture positivity.

Among the culture positive cases, Staphylococcus aureus was the most common organism isolated (52.9%), with 5.9% being methicillin resistant Staphylococcus aureus. This result was in concordance with the study conducted by Borade A et al,[8] where Staphylococcus aureus was isolated in 28% cases. Similar outcome was also seen in several other studies carried out by Lingayat AM et al,[12] Kumar Anil et al,[11] Goyal V et al,[15] Barnawal AK et al,[4] and Narayanappa D et al,[7] where Staphlococcus aureus was the most common organism isolated from pleural fluid culture, and the percentage being 45%, 83%, 34%,77% and 30% respectively.

However, the scenario is somewhat different in the western world where Streptococcus pneumoniae is the most common organism. The reason might be, different study areas, population and study designs; influence of different risk factors and health service utilizations might also be different. The study conducted by Hardie William et al,[16] Eastham K.M. et al,[13] showed Stereptococcus pneumoniae as the most common micro-organism found in 40% and 65% cases respectively. However the descriptive study carried out by Saleem AF et al,[9] at The Aga Khan University, Karachi, showed Staphylococcus aureus as the major organism (42%) associated with pediatric empyema thoracis.

Among the other organism tubercular empyema constitutes 17.6% of culture positive cases followed by Streptococcus pneumoniae (6%). Similar results were seen in the prospective studies done by Ramireddy et al,[18] and Saliya MP et al,[13] where 13.79% and 11.76% cases were tubercular in etiology. However in the prospective studies undertaken by Dalavi SB et al,[19] and Borade A et al,[8] showed only 5% cases were tubercular in origin.

The incidence of gram negative rods has increased over the past few decades. The current study showed that, among the gram negative organisms E.coli and Klebshiella pneumoniae contributed for 11.8% and 5.9% respectively and all the cases occurred in early infancy. This was in concordance with the study conducted by Patwari AK et al.[20] Although anaerobes are recognised as important cause of childhood empyema in the west however Indian study has not specifically looked for these.[21,22,23,24,25,26].

This present study found that majority of patients (73.1%) responded well to antibiotics and chest tube drain. However, 21.2% cases developed complications and were referred to higher centres for further surgical interventions. Three patients died. Two of them developed pneumothorax while one succumbed to septicaemia leading to septic shock. Similar results were seen in the prospective study undertaken by Goyal V et al,[15] where 78.6% patients were treated successfully with antibiotics and chest tube drainage, 11.4% patients required decortications and 3 patients died. However in the western world, due to better availability of resources and as well as developed infrastructure a greater proportion of children underwent surgical intervention (other than ICD). In the study conducted by Eastham EM et al,[13] 68% patients required decortications. Likewise, in the study conducted by Hardie W et al,[16] 56% patients required thoracotomy with pleural decortications and 2% underwent a lobectomy.

Conclusion

Pleural effusion is a major health problem with parapneumonic effusion still being the most common aetiology. Our study showed that most of the children presented at the age of 1-5 years with a male predominance. Staphylococcus aureus (52.9%) was the major organism associated with pediatric empyema in this region. All the patients were treated with antibiotics and chest tube drain. Majority them (73.1%) responded well to the

above treatment while 21.2% developed some complication (pneumothorax being the most common one) for which they were referred to higher centre. Thus early identification and empirical antibiotic as per local data is essential to prevent short and long term complications. A high index of suspicion is required to avoid delay in early diagnosis that may influence treatment and outcome.

References

1. Balachandran A, Shivbalan, Thangavelu S, Vijayasekaram D, Subramnayam L. Empyema Thoracis. Indian Journal of Pediatrics.2003 October; 70:803-6.
2. Khanna SK. Empyema thoracis in children. Indian Journal of Pediatrics. 1984; 51(412):593-601.
3. Goyal Vikas, Kumar A, Gupta M, Sandhu SPH, Dhir S. Empyema in children: Still a challenge in developing countries.2014; 11(3):206-210.
4. Baranwal AK, Singh M, Marwaha RK, Kumar L. Empyema thoracis: a 10-year comparative review of hospitalised children from south Asia. Arch Dis Child.2003; 88:1009-1014.
5. Laishram N, Ngangom D. Empyema thoracids In Children: A Clinical Study. J Evolution Med Dent Sci. 2016 January; 5(1):46-49.
6. Kumar A, Sethi GR, Mantan M, Aggarwal SK, and Garg A. Indian Pediatrics. 2013 September; 50.
7. Narayanappa D, Rasmi N, Prasad NA, Kumar A. Clinico-bacterial profile and outcome of empyema. Indian Paediatrics. 2013; 50:783-5.
8. Borade A, Badbade K, Gulawani S, Agarkhedkar S, Dhongade R. Empyema Thoracus in Children: Experience from tertiary care hospital in Pune, India. Asian Journal of Clinical Pediatrics and Neonatology. 2014 Jan-March; 2(1):19-22.
9. Saleem AF, Shaikh AS, Khan RS, Khan F, Faruque AV, Khan MAM. Empyema Thoracis in Children: Clinical Presentation, Management and Complications. Journal of the College of Physicians and Surgeons Pakistan. 2014; 24(8):573-576.
10. Laishram N, Ngangom D. Empyema thoracids In Children: A Clinical Study. J Evolution Med Dent Sci. 2016 January; 5(1):46-49.
11. Kumar A, Sethi GR, Mantan M, Aggarwal SK, and Garg A. Indian Pediatrics. 2013 September; 50.
12. Lingayat AM, Wankhade PR. Study of clinical profile, etiological bacterial agents and outcome in pediatric patients of empyema. Indian Journal of Basic and Applied Medical Research. 2015 March; 4(2):502-509.
13. Eastham KM, Freeman R, Kearns AM, Eltringham G, Clark J, Leeming J, Spencer DA. Clinical features, aetiology and outcome of empyema in children in the north east of England. Thorax.2004; 59:522-525.
14. Baranwal AK, Singh M, Marwaha RK, Kumar L. Empyema thoracis: a 10-year comparative review of hospitalised children from south Asia. Arch Dis Child.2003; 88:1009-1014.
15. Goyal Vikas, Kumar A, Gupta M, Sandhu SPH, Dhir S. Empyema in children: Still a challenge in developing countries.2014; 11(3):206-210.
16. Hardie W, Bokulic R, Victor F, Garcia, Shirley F, Reising, Christe CDC. Pneumococcal Pleural Empyemas in Children. Clinical Infectious Diseases. 1996; 22:1057-63.
17. Schulz KD, Fann LL, Pinsky J, Ochoa L, Smith EO, Kaplan SL, and Brandt ML. The changing face of pleural empyemas in children: epidemiology and management. Paediatrics. 2004 June; 113(6):1735-40.

18. Ramireddy K, Krishna YSR. A Study of Pediatric Empyema Thoracis in a Tertiary Care Hospital. International Journal of Contemporary Medical Research. 2016 October; 3(6):2838-40.
19. Dalavi SB, Gurav PD and Dalavi VS. Empyema thoracis in children: A prospective study in rural India. International Journal Of Recent Trends in Science and Technology. 2016 February; 18(1):144-48.
20. Patwari AK, Bisht S, Srinivasan A, et al. Aetiology of pneumonia in hospitalized children. J Trop Pediatr.1996; 42(1):15-20.
21. Brook I. Microbiology of empyema in children and adolescents.Pediatrics.1990; 85:722-6.
22. Maziah W, Choo KE, Ray JG, et al. Empyema thoracis in hospitalised children in Kelantan, Malaysia. J Trop Pediatr. 1995; 41:185-8.
23. Mongeto EDO, Kombo BB, Legg-Jack TE. Thoracic empyema: a study 56 patients. Arch Dis Child.1993; 69:587-8.
24. Mishra OP, Das BK, Jain AK, et al. Clinico-bacteriological study of empyema thoracis in children. J Trop Pediatr.1993; 39:380-1.
25. Asindi AA, Efem SE, Asuquo ME. Clinical and bacteriological study on childhood empyema in south eastern Nigeria. East Afr Med J. 1992; 69:78-82.
26. Ghosh S, Chakraborty CK, Chatterjee BD. Clinico-bacteriological study of empyema thoracis in infants and children. J Indian Med Assoc. 1990; 88:189-90.