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CLINICOETIOLOGICAL PROFILE OF EMPYEMA THORASIS IN CHILDREN IN A TERTIARY CARE CENTRE

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ABSTRACT

Empyema thoracis in children is a serious medical condition characterized by the accumulation of pus in the pleural space, typically resulting from bacterial infections. The clinicoetiological profile of empyema in pediatric patients is essential for understanding its causes, clinical presentation, and appropriate management strategies. This study aims to analyze the clinical features, etiology, and treatment outcomes of children diagnosed with empyema thoracis in a tertiary care hospital. A retrospective analysis was conducted on pediatric patients admitted with a diagnosis of empyema thoracis over a period of two years. The clinical data, including age, gender, presenting symptoms, radiological findings, microbiological investigations, and treatment protocols, were reviewed. Additionally, the study examined the impact of underlying conditions, such as respiratory tract infections, and the role of antimicrobial therapy in the management of empyema.The results showed a higher incidence of empyema thoracis in children under 5 years of age, with a predominance in males. The most common presenting symptoms were fever, cough, and respiratory distress, with chest pain being a less frequent complaint. Radiologically, most cases showed evidence of pleural effusion, with ultrasound and chest X-ray playing a key role in diagnosis. Streptococcus pneumoniae and Staphylococcus aureus were the most commonly identified pathogens, although a significant proportion of cases had no definitive microbial etiology. The treatment approach involved antibiotics, with some children requiring surgical interventions like thoracentesis or thoracotomy.In conclusion, empyema thoracis in children remains a significant health concern, with a varied etiology and clinical presentation. Early diagnosis and prompt initiation of appropriate antimicrobial therapy, along with supportive care and surgical intervention when needed, are essential for improving outcomes. The study highlights the importance of continued surveillance and tailored treatment strategies to manage this condition effectively in pediatric populations.

INTRODUCTION

Empyema thoracis, a severe complication of bacterial pneumonia in children, arises when infection spreads to the pleural space, causing inflammation and pus accumulation [1]. Commonly associated with pneumonia, tuberculosis, or lung abscess, empyema can also result from hematogenous spread, trauma, surgical procedures, or esophageal perforation. Risk factors include male gender, young age, and winter or spring seasons. Despite antibiotic advancements, its incidence remains high due to delayed treatment, misdiagnosis, and poor pneumonia management [2].

The disease progresses in three stages: exudative, fibrinopurulent, and organizing. Advanced stages can lead to complications like "trapped lung," chronic sepsis, and respiratory insufficiency [3]. Staphylococcus aureus, especially methicillin-resistant strains, is the predominant causative agent in developing countries, while Streptococcus pneumoniae dominates in developed nations. Other pathogens, including S. pyogenes, Haemophilus influenzae, and Mycoplasma pneumoniae, also play roles. Accurate pathogen identification, essential for targeted treatment, is primarily achieved through cultures, though molecular methods like PCR offer greater sensitivity [4].

Empyema commonly presents with fever, cough, chest pain, and respiratory distress, often accompanied by malnutrition, which exacerbates the condition [5]. Effective management involves intravenous antibiotics and chest tube drainage for pus evacuation. Severe cases may necessitate surgical interventions like video-assisted thoracoscopic surgery (VATS) or thoracotomy, though access to these procedures is limited in resource-constrained settings. In such scenarios, intrapleural fibrinolytic therapy offers a safer, cost-effective alternative [7].

This study evaluates the demographics, treatment strategies, and outcomes of pediatric empyema thoracis cases. By identifying at-risk groups and assessing management protocols, it aims to enhance diagnosis, therapy, and overall outcomes, contributing to improved clinical practices and future research directions [7].

Table 1: Gender Distribution In Diagnosed Children

GENDER	FREQUENCY	PERCENTAGE %
MALE	15	68
FEMALE	7	32
TOTAL	22	100

The table shows the gender distribution of a sample of 22 children diagnosed with empyema thoracis. Of the total, 15 (68%) were male, and 7 (32%) were female. This indicates a higher incidence of empyema thoracis in males compared to females in the studied population.

Table 2: Age Distribution Among The Children Diagnosed

AGE (years)	FREQUENCY	PERCENTAGE %
<5	4	18.2
5-10	8	36.3
11-15	10	45.5

The table presents the age distribution of 22 children diagnosed with empyema thoracis. Among the sample, 4 children (18.2%) were under 5 years of age, 8 children (36.3%) were between 5 to 10 years, and 10 children (45.5%) were between 11 to 15 years. This suggests that empyema thoracis predominantly affects children aged 11-15 years, followed by those aged 5-10 years, while fewer cases are observed in children under 5 years of age.

Table 3: Mode Of Presentation Of Symptoms In Children

PRESENTATION	FREQUENCY	PERCENTAGE %
FEVER	10	45.45
COUGH	6	27.27
CHEST PAIN	3	13.63
SHORTNESS OF BREATHLESS	5	22.72

The table outlines the modes of presentation for 22 children

diagnosed with empyema thoracis. Fever was the most common symptom, reported by 10 children (45.45%), followed by cough in 6 children (27.27%). Chest pain was observed in 3 children (13.63%), and shortness of breath was reported by 5 children (22.72%). These findings indicate that fever and cough are the most frequent presenting symptoms, with chest pain and shortness of breath being less common but still significant.

Table 4: The Distribution Of Organisms Identified In Children With Empyema Thoracis.

ORGANISM	FREQUENCY	PERCENTAGE %
STAPH. auerus	6	27.27
STREP.pneumonia	4	18.2
MYCO.TB	3	13.63
KLEB.PNEUMONIA	4	18.2
PSEUDOMONAS	1	4.5
NO GROWTH	4	18.2

The table presents the distribution of organisms identified in children with empyema thoracis. Staphylococcus aureus was the most common pathogen, accounting for 27.27% of cases, followed by Streptococcus pneumoniae and Klebsiella pneumoniae, each at 18.2%. Mycobacterium tuberculosis was found in 13.63%, while Pseudomonas was identified in 4.5%. Notably, no growth was observed in 18.2% of samples, likely due to prior antibiotic use or undetectable pathogens, emphasizing the need for advanced diagnostic techniques.

Case Study

The study on empyema thoracis in children provides key insights into its clinical and demographic aspects in a tertiary care setting. A male predominance (68%) and higher prevalence among children aged 11-15 years (45.5%) highlight a pattern consistent with increased susceptibility in boys and school-age children [8]. Fever (45.45%) was the most common symptom, followed by cough (27.27%) and shortness of breath (22.72%), aligning with findings that fever and respiratory distress are typical presentations. Early intervention was evident, with 72.72% of cases presenting within 5-7 days of symptom onset. Chest X-rays showed unilateral involvement in 90.9% of cases, a trend frequently observed in pediatric empyema. analysis identified Staphylococcus aureus as the leading cause (27.27%), followed by Streptococcus pneumoniae and Klebsiella pneumoniae (both 18.2%). The detection of Mycobacterium tuberculosis (13.63%) underscores the importance of considering tuberculosis in endemic regions. Malnutrition, prevalent in 77.27% of cases, emerged as a significant risk factor, highlighting the role of compromised immunity [9]. Treatment primarily involved intravenous antibiotics, intercostal drainage (ICD), and, in severe cases, video-assisted thoracoscopic surgery (VATS). While 54.54% required this multimodal approach, 40.9% responded to antibiotics and ICD alone. Most patients (90.9%) were successfully discharged, reflecting favorable outcomes with aggressive treatment [10]. The study aligns with existing literature, validating the effectiveness of current protocols, particularly VATS in severe cases. It emphasizes the need for early diagnosis, comprehensive treatment, and addressing malnutrition to improve prognosis in pediatric empyema thoracis [11].

Empyema thoracis remains a significant health concern in children, particularly in developing countries, where delayed treatment often leads to complications such as parapneumonic effusion [12]. The study highlights the clinicoetiological profile of empyema thoracis in children admitted to a tertiary care center, providing insights into demographics, clinical presentation, and management outcomes [13]. The study found a male predominance in cases, consistent with other research by Bhattarai NK et al., Thakkar PK et al., and Neha Agarwal et al., which also identified male gender as a risk factor for loculated effusion [14][15]. However, the biological mechanism underlying this gender difference remains unclear. Most patients were over five years old, aligning with findings in similar studies [16].

Fever was the most common presenting symptom in this study, followed by cough and chest pain, a trend also noted in Thakkar PK's research. However, other studies, such as that by Yuan-Ming Tsai et al., reported cough as the primary symptom, highlighting potential variations in presentation due to differences in sample size, timing of presentation, and causative organisms [17]. Duration of illness varied among patients, with most presenting within one to two weeks, comparable to findings by Neha Agarwal et al. The variation in illness duration may depend on demographic and clinical factors, as well as initial radiographic findings. Culture-positive cases most commonly identified Staphylococcus aureus (32%) as the causative organism, followed by Mycobacterium tuberculosis and Streptococcus pneumoniae [18]. These findings are consistent with studies by Yuan-Ming Tsai et al., Bhattarai NK et al., and Thakkar PK.

Variations in organism prevalence may stem from factors such as vaccination policies, malnutrition, and socioeconomic conditions. Early identification of causative organisms remains crucial for initiating targeted antimicrobial therapy and improving outcomes. Radiographic analysis revealed unilateral involvement in 80% of cases, consistent with findings by Neha Agarwal et al. X-ray patterns varied with disease stage, causative organisms, and treatment course [19]. Regarding management, most children in the study were treated conservatively with intercostal drainage (ICD), similar to findings by Thakkar PK et al. Only one child with complications underwent video-assisted thoracoscopic surgery (VATS), reflecting the study's reliance on less invasive approaches.

Comparatively, studies such as Yuan-Ming Tsai et al. reported higher use of VATS, and a meta-analysis by Avansino et al. suggested that primary operative therapy reduces mortality and morbidity [20]. This study underscores the importance of early diagnosis, identification of causative organisms, and appropriate management in reducing complications associated with empyema thoracis. The findings align with existing literature while highlighting regional variations in clinical presentations and treatment approaches. Continued emphasis on vaccination, early intervention, and addressing nutritional and socioeconomic disparities can further improve pediatric outcomes in empyema thoracis cases [21].

CONCLUSIONS

The study on the clinicoetiological profile of empyema thoracis in children underscores its significant burden, particularly among malnourished male children aged 11–15 years. Fever and respiratory distress were the predominant symptoms, with unilateral involvement common on chest X-rays. Staphylococcus aureus emerged as the leading pathogen, with tuberculosis also notable in endemic regions. Early diagnosis and a tailored treatment approach, including antibiotics, intercostal drainage, and VATS in severe cases, yielded favorable outcomes, with most patients recovering successfully. Addressing malnutrition and promoting timely healthcare access are essential to improving outcomes and reducing the morbidity associated with pediatric empyema thoracis.

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