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MICROBIOLOGICAL SPECTRUM AND CLINICAL CHARACTERISTICS OF SEPTIC ARTHRITIS IN CHILDREN AGED 0–12 YEARS IN EASTERN INDIA: A MULTI-CENTER RETROSPECTIVE STUDY OF 300 CASES 2017–2023

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ABSTRACT

Background: Septic arthritis is a serious and potentially debilitating condition in children, particularly in resource-limited settings where delays in diagnosis and treatment can lead to irreversible joint damage. The study aimed to evaluate the clinical presentation, microbiological spectrum, treatment outcomes, and relapse patterns associated with pediatric septic arthritis in this region.

Methods: This retrospective multi-center study analyzed 300 pediatric cases of acute septic arthritis in children aged zero to twelve years, treated at five tertiary care hospitals in Kolkata, Eastern India, between 2017 and 2023.

Results: The hip joint was the most frequently affected site, involved in 213 cases, followed by the knee in 71 cases. Less commonly affected joints included the ankle, elbow, shoulder, and wrist. Clinical features were consistent across the cohort, with joint pain, swelling, fever, and restricted movement being the most prominent symptoms. Microbiological cultures were positive in 82 percent of cases. Staphylococcus aureus was the predominant pathogen, isolated in 59.3 percent of cases, followed by Streptococcus species, Haemophilus influenzae, Acinetobacter, atypical organisms, and Candida species. Disseminated sepsis was present in 87 children, and 59 had multiple joint involvement, indicating a substantial disease burden. All patients were treated with a standardized six-week course of antibiotics, primarily vancomycin and cefuroxime, in combination with surgical drainage procedures such as arthrocentesis or synovectomy. Clinical resolution was achieved in 295 cases, representing a success rate of 98.3 percent. Relapse occurred in five cases, most commonly associated with delayed presentation, fungal infections, or immunocompromised status.

Conclusion: This study highlights the importance of early diagnosis, region-specific microbial surveillance, and combined surgical and medical management in improving outcomes for pediatric septic arthritis. The findings underscore the need for heightened clinical awareness of atypical and resistant pathogens and support the continued use of standardized treatment protocols to reduce morbidity and prevent long-term complications in affected children.

Keywords: Septic arthritis, joint infection, Staphylococcus, Streptococcus, fungal arthritis, antibiotic susceptibility, surgical drainage, relapse, resource-limited settings,

INTRODUCTION

Septic arthritis is an orthopedic emergency marked by infection within a joint space, which, if left untreated, leads to rapid destruction of the articular cartilage and adjacent structures. Managing septic arthritis in children remains challenging due to its diverse microbiological causes, variable clinical presentations, and outcomes that are heavily influenced by geographic, socioeconomic, and healthcare-related factors. In Eastern India, the burden of septic arthritis is notably higher among children, likely driven by differences in healthcare accessibility, nutritional status, and environmental exposures. The spectrum of causative organisms is shifting, with an increasing incidence of atypical and antibiotic-resistant pathogens complicating diagnosis and treatment. This study examines the clinical and microbiological characteristics of pediatric septic arthritis cases managed over a seven-year period across multiple tertiary centers in Kolkata. The findings aim to inform region-specific diagnostic approaches and therapeutic strategies to improve patient outcomes**.**

OBJECTIVES

To determine the microbiological spectrum of acute septic arthritis in children aged 0 to 12 years presenting to tertiary care centers in Eastern India between 2017 and 2023.
To assess antibiotic susceptibility patterns of the identified pathogens in the pediatric population.
To identify the most commonly involved joints in septic arthritis among children.
To evaluate clinical outcomes following standard treatment protocols combining surgical and medical management in pediatric cases.

To characterize relapse cases in children in order to inform and improve future pediatric clinical management strategies.

REVIEW OF LITERATURE

Septic arthritis has been extensively studied worldwide, with Staphylococcus aureus traditionally recognized as the leading causative pathogen. Studies from Western populations report similar patterns, though regional variations existespecially in tropical and developing countries where gram-negative and fungal infections may be more prevalent. Indian studies have highlighted the predominance of pediatric septic arthritis involving the hip joint and noted challenges due to late presentation and antibiotic resistance. Recent literature stresses the importance of early surgical drainage combined with tailored antibiotic therapy to reduce complications. However, comprehensive multi-center data from Eastern India remain limited, underscoring the need for region-specific epidemiological studies such as the present one.

MATERIALS & METHODS

This retrospective observational study was conducted across five tertiary care hospitals in Kolkata, India. Medical records of 300 pediatric patients diagnosed with acute septic arthritis between January 2017 and December 2023 were reviewed. Inclusion criteria consisted of children aged 0 to 12 years presenting within three days of symptom onset with clinical signs of joint infection, supported by radiological findings and confirmed by microbiological evidence from joint fluid samples.

Patients with prior antibiotic therapy, tubercular arthritis, chronic osteomyelitis, HIV infection, malignancy, or superadded infections were excluded. Joint fluid samples were obtained through arthrotomy or arthrocentesis and subjected to Gram staining and aerobic cultures to isolate causative organisms. Antibiotic susceptibility testing was performed according to standard

laboratory protocols. Clinical data collected included patient demographics, affected joints, presence of disseminated sepsis, involvement of multiple joints, treatment regimens, duration of therapy, and clinical outcomes including relapse.

RESULTS AND INTERPRETATION

A total of 300 pediatric cases of acute septic arthritis were reviewed across five tertiary care centers in Eastern India. All patients were between the ages of zero and twelve years. The hip joint was the most commonly affected site, involved in 213 cases, which accounted for 71 percent of the total. The knee was affected in 71 cases, representing 23.7 percent. Other joints included the ankle in 7 cases, the elbow in 4 cases, the shoulder in 4 cases, and the wrist in 1 case. Microbiological analysis identified Staphylococcus species as the predominant pathogens, isolated in 178 cases, making up 59.3 percent of the total. Streptococcus species were found in 64 cases, Haemophilus influenzae in 29 cases, Acinetobacter species in 12 cases, atypical organisms in 12 cases, and Candida species in 5 cases. Disseminated sepsis was observed in 87 patients, accounting for 29 percent of the cohort. Multiple joint involvement was noted in 59 patients, which represented 19.7 percent of cases. All children received a standardized six-week course of antibiotics, primarily vancomycin and cefuroxime, along with surgical drainage through arthrocentesis or synovectomy. Clinical resolution was achieved in 295 cases, indicating a success rate of 98.3 percent. Relapse occurred in 5 cases, or 1.7 percent of the total. These relapses were associated with delayed presentation, fungal infections, or immunocompromised status.

Parameter	Number of Cases	Percentage (%)
Total cases	300	100
Affected joints		
Hip	213	71
Knee	71	23.7
Ankle	7	2.3
Elbow	4	1.3
Shoulder	4	1.3
Wrist	1	0.3
Microbiological isolates		
Staphylococcus species	178	59.3
Streptococcus species	64	21.3
Haemophilus species	29	9.7
Acinetobacter species	12	4
Atypical organisms	12	4
Candida species	5	1.7
Disseminated sepsis cases	87	29
Multiple joint involvement	59	19.7
Relapse cases	5	1.7

Table 1: Clinical and Microbiological Profile of 300 Septic Arthritis Cases 2017–2023

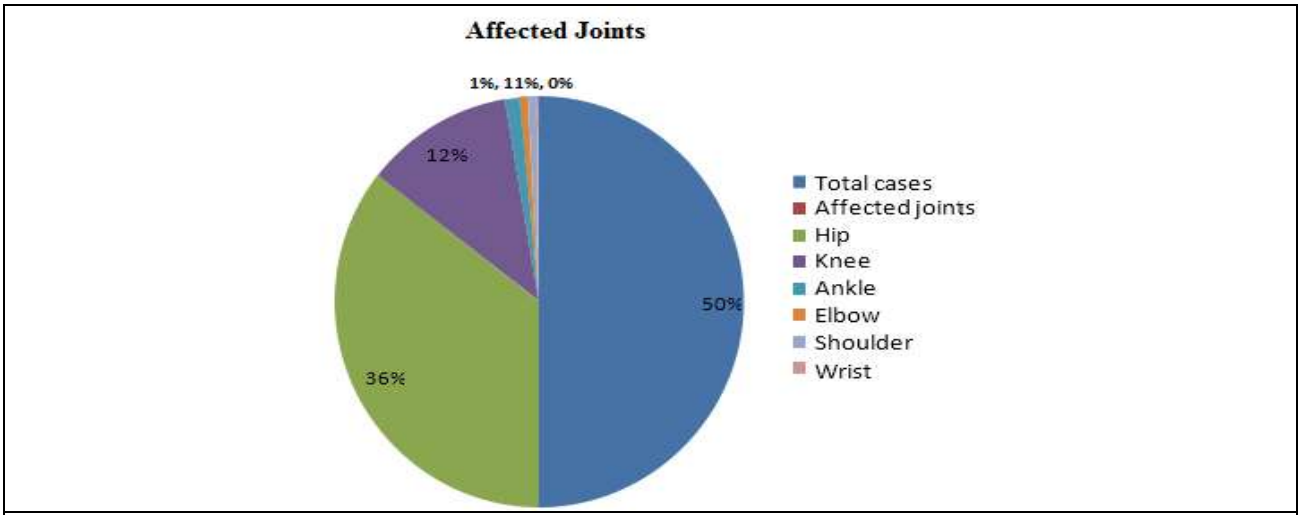

Figure 1 Distribution of Joint Involvement and Microbiological Profile in 300 Cases of Septic Arthritis

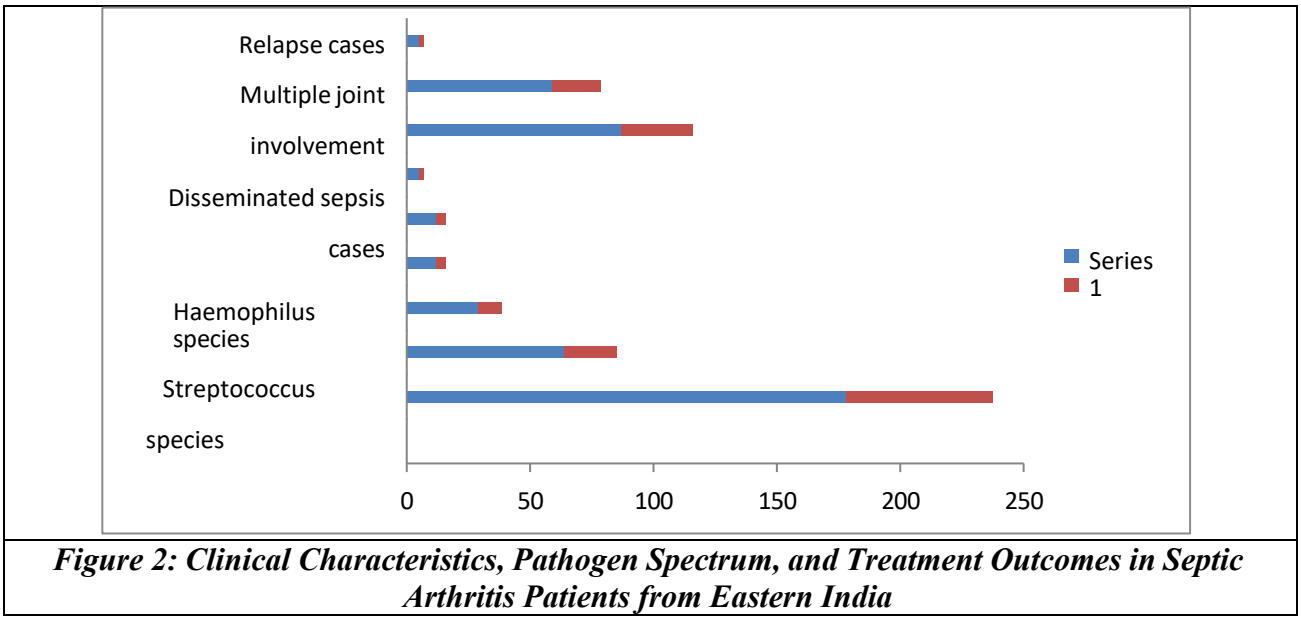

Figure 2: Clinical Characteristics, Pathogen Spectrum, and Treatment Outcomes in Septic Arthritis Patients from Eastern India

DISCUSSION

Septic arthritis is a critical orthopedic emergency in children, with the potential for rapid joint destruction and long-term morbidity if diagnosis and treatment are delayed. In the present study, the hip was the most commonly affected joint, followed by the knee. This distribution is consistent with earlier reports, which also identified large, weight-bearing joints as particularly vulnerable to septic involvement due to their vascular anatomy and susceptibility to hematogenous spread.[1,2]

Staphylococcus aureus was the predominant pathogen in this cohort, followed by Streptococcus species and Haemophilus influenzae. This finding aligns with global literature, where Staphylococcus aureus has consistently been reported as the leading causative organism in both pediatric and adult populations.[1,2,3] The detection of less common organisms such as Acinetobacter and Candida highlights the need for comprehensive microbiological evaluation, particularly in children with atypical presentations or those not responding to standard antibiotic regimens. Similar recommendations have been emphasized in reviews of septic arthritis management in different regions.[3]

The presence of disseminated sepsis in nearly one-third of cases and multi-joint involvement in about one-fifth underscores the severity of disease burden in this population. These patterns are likely influenced by delayed presentation, comorbidities, and limited access to early specialized

care in resource-constrained settings. Comparable challenges have been described in other regional studies, which stressed the impact of healthcare accessibility and nutritional status on outcomes.[4]
Treatment outcomes in this study were favorable, with a high rate of clinical resolution following a standardized six-week antibiotic regimen combined with surgical drainage. The relapse rate was low, which is in agreement with prior reports that advocate for early surgical intervention alongside appropriate antimicrobial therapy to reduce complications and recurrence.[2,3] This reinforces the importance of aggressive, timely management strategies to preserve joint function.
From a clinical standpoint, the findings emphasize the need for region-specific microbial surveillance to guide empirical antibiotic choices. As highlighted in earlier work, tailoring therapy based on local resistance patterns is essential to optimize outcomes and limit the emergence of resistant strains.[1,5] Moreover, strengthening early diagnostic strategies and ensuring timely access to surgical and pediatric orthopedic services remain pivotal in improving prognosis for children with septic arthritis.[4]

Clinical Implications

This study provides essential insights for clinicians managing pediatric septic arthritis in Eastern India. Understanding the regional microbiological profile is critical for guiding empirical antibiotic therapy, especially in resource-constrained settings. The predominance of Staphylococcus aureus and Streptococcus species, along with emerging atypical and fungal pathogens, highlights the need for comprehensive culture and sensitivity testing before initiating treatment.
The findings support the effectiveness of a standardized six-week antibiotic regimen combined with timely surgical drainage, which resulted in high rates of clinical resolution and minimal relapse. Clinicians should maintain a high index of suspicion for atypical organisms and fungal infections, particularly in cases with delayed presentation or poor response to standard therapy. Early diagnosis, aggressive management, and tailored antibiotic selection based on local resistance patterns are key to improving outcomes and preventing long-term joint damage in children.

STRENGTHS AND LIMITATIONS

A major strength of this study is its large sample size, encompassing 300 pediatric cases over a seven-year period across multiple tertiary care centers. This enhances the reliability and generalizability of the findings within the regional context. The use of strict inclusion and exclusion criteria ensured a focused and homogeneous study population, allowing for clearer interpretation of clinical and microbiological trends.
The retrospective nature of the study introduces certain limitations, including potential biases due to incomplete documentation and variability in clinical record-keeping. The exclusion of patients who had received prior antibiotic therapy may have led to an underestimation of resistant organisms. Additionally, the study did not routinely perform anaerobic cultures or advanced molecular diagnostics, which may have limited the detection of certain pathogens. Future prospective studies incorporating these techniques would provide a more comprehensive understanding of the microbial spectrum and resistance patterns.

CONCLUSION

Septic arthritis in children remains a significant clinical challenge, particularly in resource-limited regions such as Eastern India. This study demonstrates that the hip joint is the most frequently affected site, and Staphylococcus species are the leading causative organisms. The combination of early surgical intervention and a six-week antibiotic course proved highly effective, with a low relapse rate and favorable clinical outcomes. The presence of atypical and fungal pathogens, although less common, underscores the importance of thorough microbiological evaluation and individualized treatment strategies. Continued regional surveillance of microbial trends and antibiotic resistance, along with improved access to diagnostic and surgical care, is essential for optimizing management and reducing the burden of septic arthritis in the pediatric population.

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