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Age Pattern and Bone Predilection in Paediatric Septic Arthritis and Osteomyelitis: A Retrospective Analysis at a Tertiary Care Center

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Abstract

Background: Paediatric musculoskeletal infections, specifically septic arthritis (SA) and osteomyelitis (OM), are significant causes of morbidity. Understanding local epidemiological trends is vital for early diagnosis and empirical management.

Objectives: To analyze age-specific patterns and the anatomical predilection of bones and joints affected by SA and OM in a tertiary hospital setting.

Methods: This retrospective study reviewed paediatric patients (0–18 years) diagnosed with SA or OM over 8 years. Data on age, gender, infection site, and microbiology were analyzed.

Results: A retrospective analysis of 210 pediatric cases revealed a male preponderance (58%). The mean age was 10.8 years. The tibia (21%) and femur (20%) were the most common bones involved in OM. A significant portion of the cohort (29%) presented with SA, with the hip (18%) and knee (14%) being the most frequently affected joints. Chronic presentations and post-infectious sequelae, such as joint dislocations and pathological fractures, were prevalent, particularly in cases involving the proximal femur and hip joint.

Conclusion: Long bones of the lower limb and the major weight-bearing joints (hip and knee) are the primary sites of pediatric musculoskeletal infections at our center. The significant incidence of joint-related sequelae highlights the critical importance of early surgical debridement and long-term follow-up in managing these infections to preserve joint function and limb alignment.

Keywords: Paediatric orthopaedics, Septic arthritis, Osteomyelitis, Bone predilection, Epidemiology.

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Introduction

Paediatric osteomyelitis (OM) and septic arthritis (SA) are orthopedic emergencies that can lead to permanent disability if not managed promptly. These infections primarily arise from hematogenous seeding into the highly vascular metaphyses of growing long bones [1, 2]. While the tibia and femur are globally recognized as common sites, regional variations in age patterns and clinical presentation significantly influence outcomes [3, 4]. In many tertiary care settings, late presentation remains a major challenge, leading to a high prevalence of chronic OM and devastating post-septic sequelae such as joint destruction and growth arrest [5, 6]. This study retrospectively analyzes 210 pediatric cases to define the age-specific patterns and anatomical predilections at our center.

Methods

Study design and setting

This study was a retrospective clinical audit conducted at Apollo Hospitals, Chennai, a tertiary care center. The study awaits clearance by the institutional ethics

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committee. We reviewed the medical records of pediatric patients diagnosed with musculoskeletal infections over 8 years, from January 2014 to August 2022.

Inclusion and exclusion criteria

Patients aged 0–18 years with a confirmed clinical and radiological diagnosis of either acute/chronic OM or SA were included. Patients with incomplete medical records, those with bone infections secondary to open fractures, or those over the age of 18 years at the time of initial presentation were excluded from the primary analysis.

Data collection

Data were extracted from the hospital's electronic and physical medical records. For each patient, the following variables were recorded:

- Demographics: Age at presentation and gender.
- Clinical Details: Duration of hospital stay, anatomical site of infection (bone or joint), and laterality.
- Diagnosis: Classification as acute or chronic OM, SA, or post-septic sequelae (e.g., bony ankyloses, dislocations, or pathological fractures).
- Microbiology: Results of pus or blood cultures, where available.

Operational definitions

OM was defined based on clinical findings (localized pain, swelling, and fever) supported by radiological evidence (periosteal reaction, sequestrum formation, or magnetic resonance imaging findings). SA was defined by joint effusion, restricted range of motion, and/or positive joint aspirate cultures.

Statistical analysis

Data were entered into Microsoft Excel and analyzed using (Statistical Software, e.g., Statistical Package for the Social Sciences Version 25.0). Categorical variables, such as gender and bone predilection, were expressed as frequencies and percentages. Continuous variables, such as age and length of stay, were reported as means with standard deviations or medians with ranges.

Results

A total of 210 paediatric patients were included in the study. There was a notable male preponderance, with 122 males (58%) and 88 females (42%), yielding a male-to-female ratio of 1.4:1. The age of the patients ranged from neonates (0 months) to 24 years, with a mean age of 10.8 years. The most frequently affected age group was children and adolescents between 7 and 16 years, accounting for approximately 65% of the total cohort.

Of the 210 cases, 149 (71%) were diagnosed with OM, while 61 (29%) presented with SA. A significant proportion of the OM cases (approximately 40%) presented in a chronic stage, characterized by the presence of a sequestrum or discharging sinuses at the time of admission.

The lower limb was the primary site of infection in the vast majority of cases. The tibia was the most common bone involved (n = 44, 21%), followed closely by the femur (n = 42, 20%). Combined, these two long bones accounted for 41% of all musculoskeletal infections in this study. Other significant sites of osseous involvement included the pelvis/ilium (7.6%), the calcaneum (7.1%), and the fibula (5.2%).

In cases of SA, the hip joint was the most frequently affected site (n = 38, 18.1%), followed by the knee joint (n = 23, 10.9%). Concurrent involvement of the adjacent bone (osteo-SA) was particularly noted in the proximal femur and hip joint.

Clinical presentation often included localized pain, swelling, and restricted joint movement. Due to late presentation in several cases, significant post-septic sequelae were documented. These included pathological fractures, especially of the femoral shaft, and joint-related complications such as bony ankylosis and pathological dislocations of the hip.

Microbiological confirmation was available for a subset of patients. Among culture-positive cases, Staphylococcus aureus was the most prevalent pathogen isolated. However, a high percentage of cultures remained sterile, likely due to the administration of antibiotics at primary care centers before referral to our tertiary facility.

Table 1: Age-wise distribution of cases

Age group	Number of cases	Percentage
Infants and toddlers (0- year)	34	16.2
Early childhood (4–10 years)	88	41.9
Adolescents (11–18 years)	88	41.9
Total	210	100

Discussion

The predilection of the tibia (21%) and femur (20%) as the primary sites of infection in our cohort of 210 cases aligns with global epidemiological trends in pediatric musculoskeletal infections [3, 4]. This anatomical preference is primarily explained by the vascular anatomy of the growing metaphysis. In children, the metaphysis of long bones, particularly the "fast-growing" ends such as the proximal tibia and distal femur, possesses a rich, hairpin capillary network. The sluggish blood flow in these non-anastomosing loops provides an ideal environment for

circulating bacteria (most commonly S. aureus) to seed and proliferate [1]. Furthermore, the lack of an effective transphyseal vascular barrier in infants allows for the rapid spread of infection from the bone into the adjacent joint space, explaining the significant incidence of concurrent SA observed in our study [7].

Our findings also highlight a high prevalence of chronic OM and post-septic sequelae, such as bony ankyloses and pathological fractures. This is a stark contrast to many Western cohorts where acute presentations dominate [2, 8]. In our clinical setting, these chronic presentations are often the result of late presentation and previous inadequate treatment, which allows for the formation of a sequestrum, a devitalized segment of bone that acts as a reservoir for persistent infection [5].

The pressure from pus in the rigid marrow cavity leads to bone necrosis, which then leads to the chronic cases, such as the ones that presented to us [6]. Older children, especially adolescents, have a thicker periosteum, which can lead to larger subperiosteal abscesses and more extensive bone death. The high rate of hip and knee involvement is particularly concerning, as these are major weight-bearing joints. The sequelae observed, such as post-septic hip dislocations, carry a high risk of lifelong morbidity, including limb-length discrepancy and early-onset osteoarthritis [5, 7]. These results underscore the necessity for clinicians in our region to maintain a high index of suspicion and initiate aggressive surgical and antibiotic therapy at the earliest sign of infection [6].

Limitations of the study

Our study has several limitations that should be considered when interpreting the results. First, the retrospective nature of the data collection meant we were dependent on the accuracy and completeness of existing medical records. Consequently, some clinical details, such as long-term functional scores or specific laboratory markers, were not consistently available for all 210 patients.

Second, this is a single-center study conducted at a tertiary care institution. While our large sample size provides a significant overview of regional trends, the results may reflect a referral bias toward more severe or chronic cases and may not be fully representative of the epidemiology in primary care or community settings.

Third, microbiological confirmation was not achieved in every case. Many patients had received antibiotics before referral, leading to a high rate of culture-negative results, which limited our ability to correlate bone predilection with specific bacterial strains. Finally, the duration of follow-up was variable, making it difficult to assess the full long-term impact of growth plate damage and joint sequelae in the younger members of the cohort.

Despite these limitations, the study represents one of the larger cohorts in recent literature and provides valuable insights into the anatomical patterns and clinical challenges of paediatric bone infections in our region.

Conclusion

This study of 210 cases demonstrates that pediatric musculoskeletal infections at our center primarily affect the tibia and femur, with a significant incidence of SA involving the hip and knee. A critical finding is the high prevalence of chronic OM and post-septic sequelae, such as joint dislocations, bony ankylosis, and pathological fractures. These complications suggest that late presentation remains a major challenge in our clinical setting.

Early diagnostic vigilance, aggressive surgical debridement, and long-term orthopedic follow-up are essential to mitigate the risk of permanent joint destruction and growth-related deformities. Our results underscore the need for standardized management protocols that prioritize early intervention to improve functional outcomes in this vulnerable population.

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Declaration of patient consent : The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given the consent for his/ her images and other clinical information to be reported in the journal. The patient understands that his/ her names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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