

Musculoskeletal Infections In Pediatric Patients at Saiful Anwar General Hospital: Observation for 5 Years

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ABSTRACT

Musculoskeletal infection in pediatrics is a disorder that can cause significant disability. Follow-up evaluation is mandatory to ensure good long-term results. However, there is no data regarding this in Indonesia. The purpose of this study was to describe the epidemiology of musculoskeletal infections in pediatrics in Indonesia. This study is an observational epidemiological study of all pediatric musculoskeletal infection patients at Saiful Anwar Hospital Malang, Indonesia. All data were obtained from the database of the Department of Orthopedics and Traumatology of Saiful Anwar Hospital for the 2016-2020 period. A total of 71 patients were included in this study. The data collected were age, gender, diagnosis, anatomic location, treatment, and outcome. There were 48 (67.60%) male and 23 (32.39%) female patients in our study. The most frequent site of infection was the lower extremities (57.75%), followed by the spine (35.21%). In this study, the highest incidence occurred in children (6-12 years) followed by adolescents (12-18 years). This study also showed similar findings to other studies for the site of infection where the most common infection involved the lower extremities. Multidisciplinary treatment must be undertaken to reach an accurate diagnosis, determine the need for surgery, and monitor response to treatment.

Keywords: Pediatrics, musculoskeletal infections, epidemiology, Saiful Anwar General Hospital

INTRODUCTION

Musculoskeletal infections in pediatrics are infections of bones, joints, and other soft tissues that are generally caused by bacteria. This disorder often causes significant disability in children. In children's highly vascular bone, the infection can spread rapidly in an acute hematogenous manner. Understanding, early diagnosis, and treatment of bone, joint, and soft tissue infections continues to improve over time so it is important for orthopedic surgeons to have an understanding of the etiology, diagnosis, basic treatment principles, and current advances to achieve optimal outcomes and prevent sepsis. and long-term morbidity.¹

Musculoskeletal infections, including osteomyelitis, septic arthritis, pyomyositis, and necrotizing fasciitis are the cause of substantial morbidity in children and adolescents. The incidence in developed countries is about 2-13 per 100,000 children per year but this figure is higher in other developing countries.² About half of all pediatric musculoskeletal infections occur in children under five years of age and boys are twice as likely to be infected as girls. The incidence of musculoskeletal infections is also higher in the population of children with compromised immune systems, such as children with sickle cell disease and leukemia. The increasing virulence of infectious agents and the prevalence of antimicrobial-resistant pathogens, particularly methicillin-resistant *Staphylococcus aureus* (MRSA), have led to a more complicated clinical process for diagnosis and management. This is evidenced by an increase in the length of stay in the hospital, the incidence of complications, and the number of surgical interventions performed. Musculoskeletal infections are a challenge for orthopedic surgeons because the percentage and treatment required varies greatly, based on the causative organism, site of infection, and the age of the patient.^{3,4}

Despite the frequency and severity of pediatric musculoskeletal infections and potential changes in the epidemiology of pediatric musculoskeletal infections, there is still a lack of data regarding the clinical characteristics, diagnosis, and management strategies of pediatric musculoskeletal infections in Indonesia. This suggests that periodic reviews are useful to ensure that current methods of evaluation and treatment are consistent with the manifestations of the disease. Recognizing that the incidence and spectrum of infection may vary on a geographic basis, it is relevant to make historical epidemiological reviews within an institution so that experience can be compared. Although each infectious process is

unique, there are certain treatment principles that apply to all pediatric musculoskeletal infections. These include prevention techniques, rapid and accurate diagnosis, and timely medical and/or surgical intervention. Follow-up evaluation is mandatory to ensure good long-term results. This is because the effects of infection may persist after an acute episode in pediatric patients. Long-term follow-up is required to assess late sequelae such as angular deformities and limb length inequalities.^{5,6}

METHOD

This research is a cross-sectional retrospective approach with descriptive method. Research variables were observed without intervention. The subjects of this study were all pediatric musculoskeletal infection patients at Saiful Anwar Hospital Malang in Indonesia with a total sampling technique based on inclusion and exclusion criteria. Data collection was carried out from patient medical records for the 2016-2020 period then tabulated in a table and continued with calculating the percentage and frequency. Inclusion criteria in this study included medical records from pediatric patients who had been diagnosed with musculoskeletal infections clinically by orthopedic specialists at Saiful Anwar Hospital Malang with complete medical record data, including patient biodata (name, gender, age, and patient address) and clinical resume of the patient (history, physical examination, investigations, diagnosis, and therapy). The exclusion criteria in this study were medical records of patients with musculoskeletal infections in children who had not established a definite diagnosis and were not controlled to continue the diagnosis or treatment and the patient's medical record data was not completely filled out. A total of 71 patients were included in this study. Demographic data collected were age and gender. The clinical data collected were diagnosis, anatomic location, treatment, and outcome. Data were compiled and analyzed using SPSS version 25.0, NY, Armonk USA. The results of the analysis are then displayed descriptively using tables and graphs.

RESULTS AND DISCUSSION

Of the 71 pediatric musculoskeletal infection patients, there were 48 (67.60%) male subjects and 23 (32.39%) female subjects in this study. Subjects were grouped according to the WHO categorization system. Most of the subjects were children (6-12 years) and adolescents (12-18 years). Less than 15% consists of neonates, infants, and toddlers.

The most frequently affected anatomic location was the lower extremity (57.75%) followed by the spine (35.21%). Upper extremity and other locations account for less than 10% of all cases. More than 90% (n = 65) were primary cases and the rest were secondary cases.

More than half of the cases (60%) were treated operatively and the rest were treated conservatively. Characteristics of musculoskeletal infections in pediatric patients are described in Table 1.

Table 1. Characteristics of the study population

	Variable	N (%)
Gender	Male	48 (67)
	Female	23 (33)
Age group	Neonate (0-30 hari)	2 (3)
	Baby (1 bulan-2 tahun)	4 (6)
	Small Child (2-6 tahun)	4 (6)
	Children (6-12 tahun)	32 (45)
	Teenager (12-18 tahun)	31 (43)
Anatomical location	Upper extremity	4 (6)
	Lower Extremities	41 (57)
	Spine	25 (35)
	Other	1 (1)
Primary/Secondary Case	Primary	65 (91)
	Secondary	6 (9)
Diagnosis	Osteomyelitis	24 (34)
	Infected Union	5 (7)
	TB spondylitis	25 (35)
	Septic arthritis	14 (20)
	Rheumatoid arthritis	1 (1)
	Cellulitis	2 (2)
Treatment	Operative	43 (60)
	Conservative	28 (40)

Source: Primary data, 2020

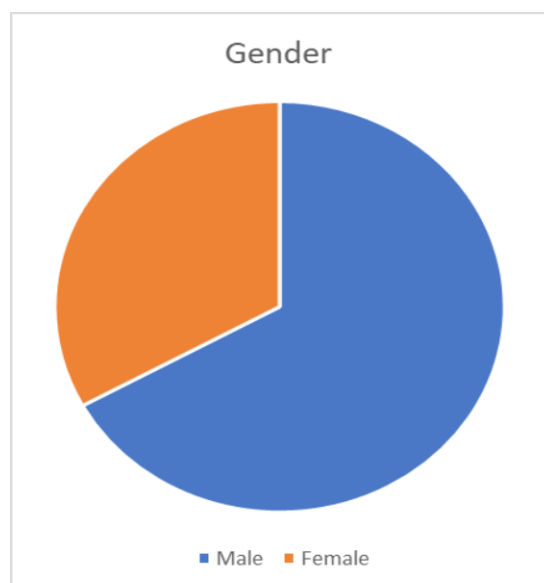


Figure 1. Gender Pie Chart (Two-thirds of the subjects in this study were male)

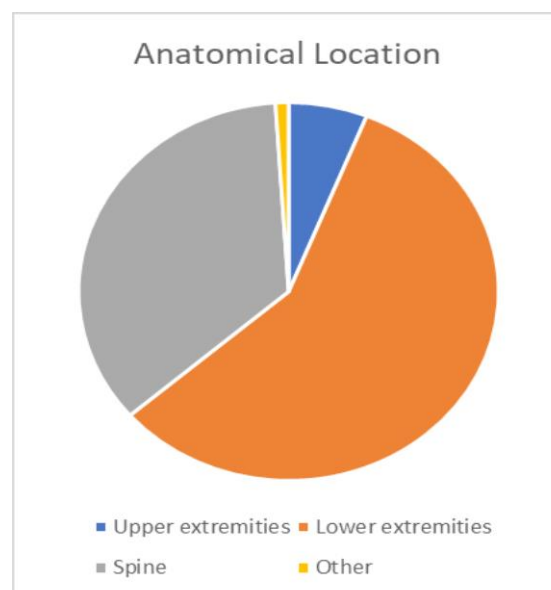


Figure 2. Anatomical Location Pie Diagram (Lower extremity is the most commonly infected anatomic location)

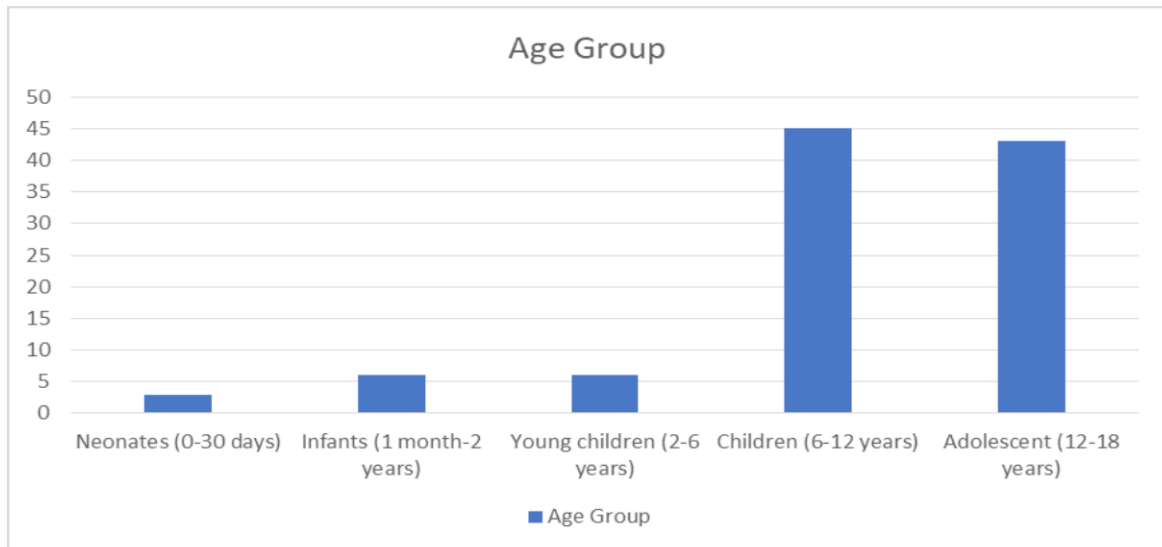


Figure 3. Age Group (almost 90% of the total subjects are in the age group of children or adolescents)

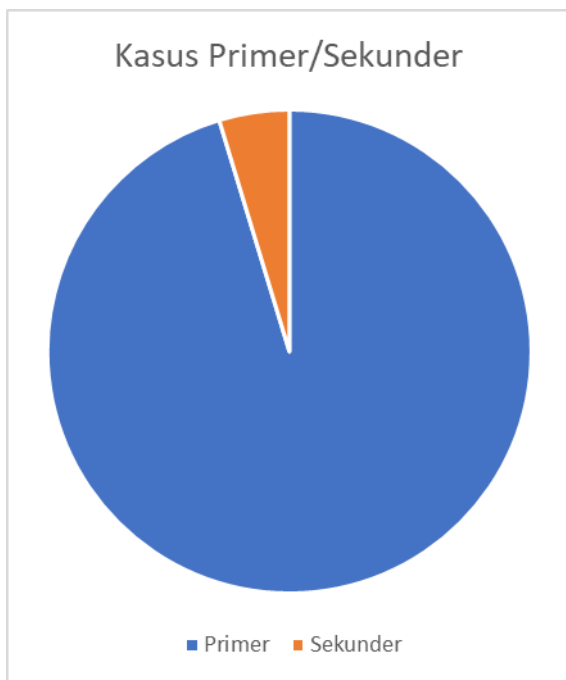


Figure 4. Pie Diagram of Primary/Secondary Cases (The majority of pediatric musculoskeletal infections are primary cases)

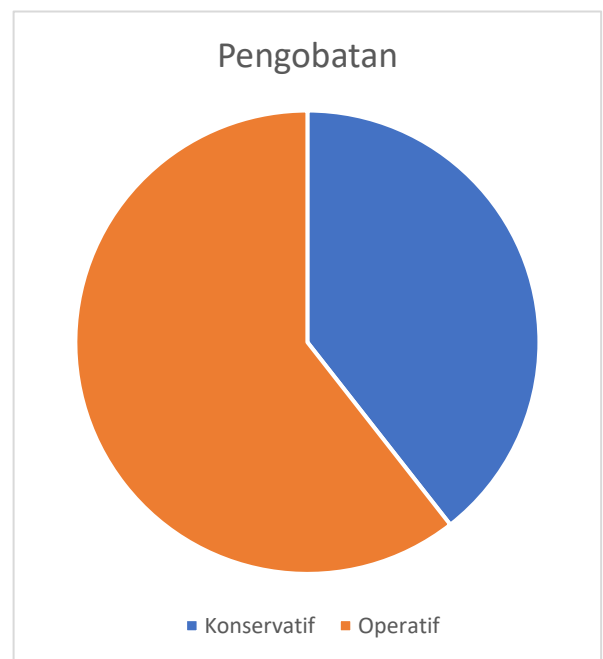


Figure 5. Treatment Pie Diagram (More than half of pediatric musculoskeletal infections treated with surgery)

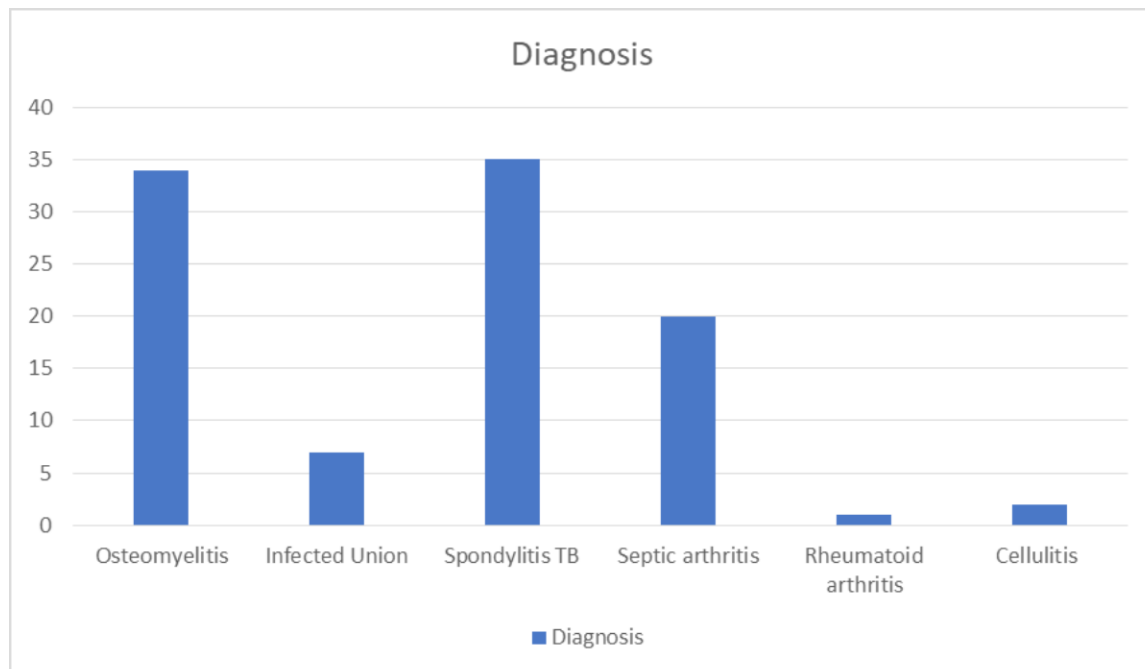


Figure 6. Diagnostic bar chart (the most common diagnoses are osteomyelitis and tuberculous spondylitis)

Pediatric musculoskeletal infections, including acute hematogenous osteomyelitis and septic arthritis are common invasive infections in 80 per 100,000 children in the US.⁷ According to a study by Akinkugbe et al., the reported incidence of osteomyelitis in developed countries varies from 1 to 13 per 100,000 population, and higher values of up to 200 per 100,000 are reported in developing countries. In the past 30 years, some investigators have reported a reduction in incidence of more than 50 percent, while others have reported otherwise. This increase could be due to the increased accuracy of the diagnostic technique. The incidence of pediatric articular infections is rare with an incidence rate of 1 per 100,000 reported in developed countries over the last few decades. As with osteomyelitis, a higher incidence is observed in developing countries. Most cases of articular infection occur in children under three years of age. Septic arthritis is more common than osteomyelitis in this age group. Osteoarticular infections account for 1% of pediatric hospital admissions. Boys are more susceptible to osteoarticular infections.^{8,9}

Interestingly in this study, it was found that the highest incidence occurred in the subject group of children (aged 6-12 years) and adolescents (aged 12-18 years). This shows that there are different epidemiological patterns in developing countries such as Indonesia.¹⁰ For decades, the clinical and epidemiological features of pediatric musculoskeletal infections have not changed

much. *S. aureus* has long been reported as the most common causative organism of musculoskeletal infections in children. Many variables affect the severity of musculoskeletal infections in children. Therefore, further investigation of this mechanism is needed.^{7,11}

Pediatric musculoskeletal infections require long-term antibiotic therapy and are often complicated by bacteremia, septic thrombophlebitis, and myositis.⁷ The use of oral and parenteral antibiotics showed the same level of failure risk based on a study by Keren, et al. The greatest treatment failure is suspected to be the result of non-adherence to treatment.¹² Most of the subjects in this study showed clinical and laboratory improvement after adequate debridement as indicated and appropriate empiric or specific intravenous antibiotics administration. Once the acute phase of inflammation due to infection has resolved, pediatric patients may be switched to oral antibiotics and discharged from the hospital when CRP has reached 2 mg/dL levels.¹¹ Special follow-up in an outpatient setting is required to ensure complete resolution of the infection as treatment failure and late-phase complications can be identified during the follow-up period.¹³

In this study, the site of infection was consistent with previous studies in which the infection frequently involved the lower extremities. Regarding the diagnostic process, it is difficult to compare this study with other studies because most other studies have only included osteomyelitis and septic arthritis in

children. Meanwhile, in this study cases of TB union and infected spondylitis were also included.^{11,2}

There are several limitations in this study. First, as a retrospective review, all data including symptoms and diagnosis depend on medical record documentation which allows errors in the coding system to cause patients to be missed. In addition, infections diagnosed but not treated in the study center were not recorded, which could lead to possible bias.

CONCLUSION

This study obtained different epidemiological characteristics in the age group of pediatric musculoskeletal infections in Indonesia. The highest incidence occurs in children (6-12 years) and adolescents (12-18 years). This study showed similar findings to other studies for the infection site group. The most frequently affected sites are the lower extremities.

Where possible, multidisciplinary care should be established to encourage effective communication between caregivers and the child's family so as to build awareness of barriers to efficient treatment processes and develop guidelines that assist in patient care practice. Good clinical judgment should be exercised continuously in the evaluation and treatment of any child with musculoskeletal infection to reach an accurate diagnosis, determine the need for surgery, and monitor response to treatment.

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