Original Article

Childhood Pyogenic Septic Arthritis as Seen in a Teaching Hospital South East Nigeria

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Abstract

Background: Childhood pyogenic septic arthritis and its associated musculoskeletal morbidity is an important health concern in developing countries. Its pattern of presentation that varies from and within subregions has implications on the early recognition, treatment, and outcome. The aim of this study was to determine the pattern and outcome of childhood septic arthritis in our environment. **Materials and Methods:** This was a retrospective study of all the children seen with pyogenic septic arthritis in Federal Teaching Hospital Abakaliki between January 2005 and December 2015. **Results:** Childhood septic arthritis accounted for 44 (83%) of the 53 patients seen with pyogenic septic arthritis. Female to male ratio was 1:1.75 and the mean age was 5.7 ± 0.73 years. Eight patients (18.2%) had polyarticular involvements. The right shoulder was significantly more involved than the left and the left hip more than right. Overall, there was a preponderance of onset of symptoms in the dry season. Children from the rural areas accounted for 85.7% of those with the onset of symptom in rainy season. Delayed presentation >6 days (in 68.2% of patients) was related to age ($P < 0.042$), and health seeking behavior ($P < 0.036$). *Staphylococcus aureus* was the commonest causative organism. Seventy-seven percent (77%) underwent open arthrotomy. Anemia, septic shock, and joint stiffness were three top complications observed. Mortality rate was 2.3%, and cause of death was overwhelming sepsis. **Conclusion:** In our setting, pyogenic septic arthritis is predominantly a childhood health problem and children under 5 years of age are the most vulnerable. Delayed presentation, an important factor in morbidity and mortality associated with septic arthritis was common among the patients, calls for a public enlightenment program on the importance of early presentation.

Keywords: *Arthritis, childhood, Nigeria, pyogenic, septic*

Introduction

Septic arthritis is a suppurative inflammation arising from invasion and multiplication of bacterial in synovial joints. Its associated musculoskeletal morbidity is an important health concern in developing nations. In published reports, the incidence of septic arthritis varies from 1 in 100,000 in the West to 1 in 5000 in sub-Saharan Africa.[1] In previously published studies, childhood septic arthritis accounted for 75%–87% of pyogenic joint infection seen in Nigerian tertiary hospital setting.[2,3]

Microorganisms gain access into the joint cavity through several routes: hematogenous seeding from a remote septic focus, contiguous spread from osteomyelitis in the metaphyseal ends of long bones, penetrating and open joint injuries as well as surgical instrumentations.[4,5] Irreversible damage to the articular cartilage by bacteria toxins, proteases from the synovial cells, and chondrocytes in addition to accumulated pus

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in joint space is a common pathological feature of septic arthritis.[4,5] Smith *et al*. in an experimental study using animal model demonstrated that cartilage destruction in joint sepsis begins as early as 8 h after the onset of infection and that early treatment with antibiotics reduces the erosion of articular cartilage.[6] In another study using animal model Kuiper *et al*. demonstrated that maximal arthritic symptom occurs in 48 h whereas irreversible changes in articular cartilage occur in 7 days.[7] The finding of rapid and irreversible cartilage destruction observed in animal models correlated with pathological and clinical features in human where a poor outcome is often a sequel of delayed adequate treatment.[8] Thus, the potential for joint and growth plate destruction in children makes diagnosis and intervention in septic arthritis an emergency.[4] In infants, the nonspecific clinical features of septic arthritis, especially in deep-seated joints such as the hip, makes early recognition and diagnosis difficulty. Consequently, missed diagnosis often results in poor outcome, a sequel of delayed adequate intervention.[9]

The predisposing factors in septic arthritis in children are generally the same worldwide. However, the extent of involvement of each factor, as well as the pattern of presentation, varies from and within sub-regions.[10-15] A detailed knowledge of the pattern of presentation, challenges of care and outcome in a given setting can facilitate early diagnosis and strategies aimed at the optimum care and improved outcome.

In West African sub-region, there is limited data on childhood septic arthritis. This has necessitated this study aimed at determining the pattern and outcome of childhood pyogenic septic arthritis seen in a teaching hospital of a developing country.

Materials and Methods

This was a retrospective review of database of all childhood septic arthritis in Federal Teaching Hospital Abakaliki between January 2005 and December 2015. Federal Teaching Hospital Abakaliki came into existence in January 2011 after a successful merger of Ebonyi State University Teaching Hospital and Federal Medical Centre Abakaliki; it is one of the major teaching hospitals in the South-Eastern parts of Nigeria. With the approval of the hospital Ethics and Research Committee, the case notes of all children that presented to the hospital with pyogenic septic arthritis were the source of data. Relevant information such as demographic data, place of abode of patients, initial heath facility used by patients, predisposing factors, route of infection, etiological bacteria agent, season (dry and wet) of onset and duration of symptoms, joint involvement, clinical features, comorbid factors, laboratory/radiological findings, treatment, duration of hospital admission, and outcome were extracted from these case notes.

Data analysis was carried out with Statistical Package for Social Sciences version 16 (SPSS Inc., Chicago, IL, USA). Frequency tables, cross tabulation, and Pearson Chi-square test of significance was used. For all statistical analysis, a $P < 0.05$ was considered statistically significant.

Results

Within the 11-year period, there were total of 53 patients seen with pyogenic septic arthritis, 44 (83.02%) of them in childhood period of growth and development were studied. The female to male ratio was 1:1.75. Patient's age ranged from 4 months to 18 years, and the average age was 5.7 ± 0.73 years. In Figure 1, the peak age incidence is >1–5 years and with increasing age a gradual decline in incidence was observed.

Hematogenous infection from a distant focus and penetrating joint injury respectively accounted for pyogenic arthritis in 42 (95.5%) and two (4.5%) of the cases. In eight patients (18.2%), there was a recent history of infection at the distant site, acute respiratory tract infection in four of them, urinary tract infection, upper respiratory tract infection, septic skin infection, and gastroenteritis each per patient in the rest. There was also a recent history of fall or blunt trauma to the ipsilateral extremity in seven patients (15.9%). Sickle cell disease, malnutrition, and HIV were the predisposing and comorbid conditions observed in 6 (13.6%), 2 (4.6%), and 1 (2.3%) of the patients, respectively. The presenting clinical symptoms were fever, joint pain, joint swelling, and limping in 33 (75.0%), 31 (72.7%), 28 (65.1%), and 27 (62.8%), respectively.

In these 44 patients, 36 (91.2%) had monoarticular pyogenic septic arthritis, and 8 (18.2%) had polyarticular involvement giving 52 infected joints. The incidence of polyarticular septic arthritis was (33.3%) among the patients with sickle cell disease and (15.8%) among nonsickle cell disease patients with septic arthritis ($P < 0.300$). In Figure 2, the joints affected were 28 on the right and 24 on the left, the right shoulder was significantly more involved than the left, and the left hip more than right, 40 (76.9%) of the joints affected were in the lower limb, and the knee was the most involved joint. In Figure 3, the peak age incidence of septic arthritis involving the shoulder was in the 1st year of life, the incidence of septic arthritis of the knee tripled to a peak after the 1st year of life then decreased gradually with increasing age. In Figure 3 also the peak age incidence of hip involvement was >1–5 years thereafter the incidence drops by half as the age increased.

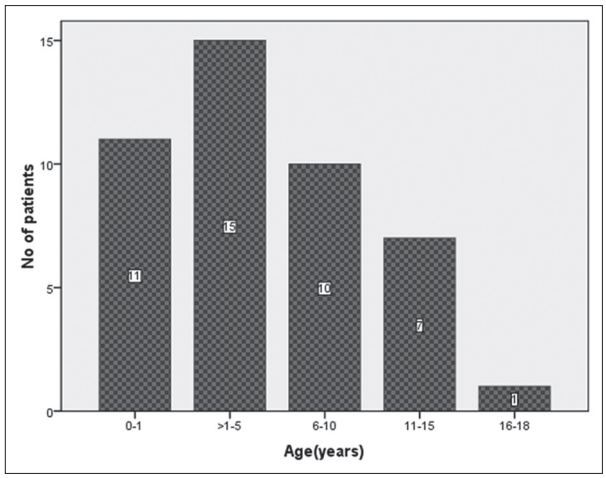

Figure 1: Age distribution of childhood pyogenic septic arthritis

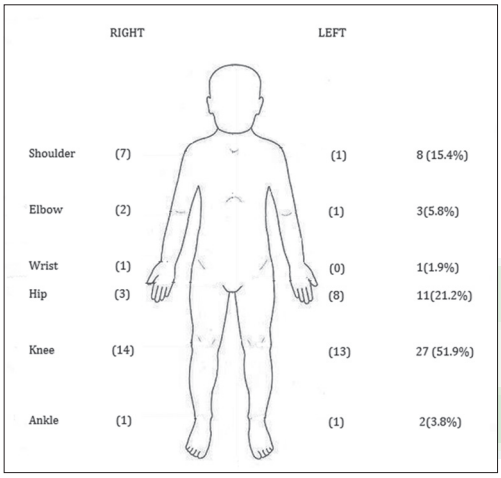

Figure 2: Distribution of the 52 joints involved in childhood pyogenic septic arthritis

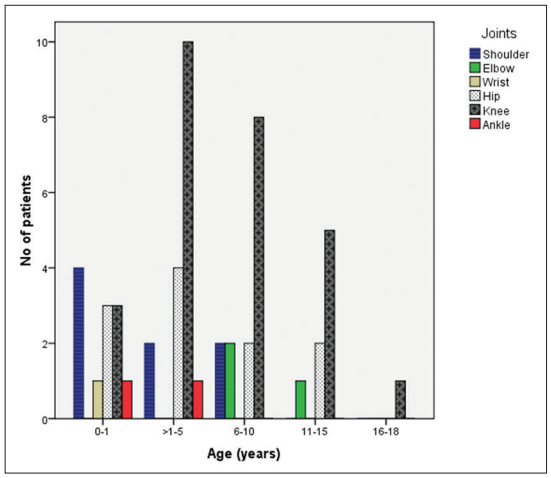

Figure 3: Age distribution by the joints affected

Twenty-six (59.1%) of the patients were resident in rural area whereas 18 (40.9%) were resident in urban area. The onset of symptoms in 30 (68.2%) patients was in dry season and 14 (31.8%) patients in rainy season. Rural and urban children respectively accounted for 12 (85.7%) and 2 (14.3%) of the cases in rainy season and 14 (46.7%) and 16 (53.3%) of the cases in the dry season ($P < 0.014$).

The duration of symptoms before presentation to the hospital was in a range of 1–90 days with a mean of 16.1 ± 2.7 days. In Table 1, the incidence of delayed presentation >6 days correlated significantly to the age of the patient, 88.8% for infants and 57.1% for 11–15 years ($P < 0.042$); the incidence of early presentation within 3 days of symptoms was higher in male than female, and in urban than rural children though not statistically significant. The incidence of delayed presentation was much higher for rural than urban residents (80.8 vs. 50.0%). The incidence of delayed presentation was related to the health seeking behavior of patients, patients who first presented to traditional bonesetters/herbalist before seeking orthodox hospital care were more likely to present later than 6 days than those who presented first to a hospital ($P < 0.036$) as also shown in Table 1. Five of the seven patients (71.1%) with an associated history of trauma presented first to Traditional bone setters (TBS) ($P < 0.091$).

The result of joint aspirate for microscopy culture and sensitivity was available for only 36 patients. *Staphylococcus aureus* was isolated in 13 joints (36.1%), *Escherichia coli* in 3 (8.3%) while 16 joint aspirates yielded no growth as shown in Table 2.

In Table 3, 34 of the patients (77.2%) underwent open arthrotomy and irrigation with Normal saline, seven patients had joint aspiration. One patient who presented with early onset of septic arthritis of the hip had joint irrigation with normal saline in addition to aspiration. The joints affected were immobilized with skin traction for the hip, plaster of Paris back slab for elbow and knee joint and collar and cuff for shoulder joints. The entire patient had intravenous antibiotics for 1 week and oral antibiotic for 2 weeks.

Anemia, septic shock, and joint stiffness were three top complications as observed in Table 4. The incidence of anemia correlated with delayed presentation, a higher rate in patients that presented later than 6 days compared to the ones that presented earlier (64.5% vs. 15.4% $P < 0.003$) was observed.

The mean duration of hospital admission was 20.2 days. Forty-two patients (93.2%) recovered; 2 (4.5%) discharged themselves against medical advice and one died giving a mortality rate of 2.3%. Septic

Table 1: Duration of symptoms before presentation by patient characteristics

	Duration (days), (%)			Total (%)	χ^2	*P*
	1-3	4-6	>6			
Age (years)						
0-1	2 (18.2)	0	9 (81.8)	11 (25.0)	16.018	0.042
>1-5	1 (6.7)	3 (26.7)	10 (66.7)	14 (34.1)		
6-10	0	3 (30.0)	7 (70.0)	10 (22.7)		
11-15	3 (42.9)	0	4 (57.1)	7 (15.9)		
16-18	0	1 (100)	0	1 (2.3)		
Sex						
Male	6 (21.4)	3 (10.7)	19 (67.9)	28 (63.6)	5.791	0.055
Female	0	5 (31.2)	11 (68.8)	16 (36.4)		
Residency						
Rural	2 (7.7)	3 (11.5)	21 (80.8)	26 (59.1)	4.666	0.097
Urban	4 (22.2)	5 (27.8)	9 (50.0)	18 (40.9)		
Health seeking behavior						
TBS and herbalist†	1 (7.1)	1 (7.1)	12 (85.7)	14 (31.8)	13.517	0.036
Patent medicine dealer	1 (11.1)	1 (11.1)	7 (77.8)	9 (20.5)		
Gen and private hospital*	0	4 (33.3)	8 (66.7)	12 (27.3)		
Tertiary hospital	4 (44.4)	2 (22.2)	3 (33.3)	9 (20.5)		

†TBS: Traditional bone setter, *Gen: General

Table 2: Isolated causative microorganisms from joints aspirate in 35 patients

Bacteria	Number of patients	Percentage
Staphylococcus aureus	13	36.1
Escherichia coli	3	8.3
Pseudomonas aeruginosa	2	5.6
Haemophilus influenzae	1	2.7
Klebsiella	1	2.7
No growth	16	44.4
Total	36	100

*Eight joint aspirates did not undergo culture and sensitivity test due to faulty equipment

Table 3: Distribution of treatment modalities administered to the patients

Treatment	Number of patients	Percentage
Open arthrotomy + antibiotics + immobilization	34	77.2
Joint aspiration + antibiotics + immobilization	7	15.9
Joint aspiration and irrigation + antibiotics + immobilization	1	2.3
Antibiotics + immobilization	1	2.3
MUA* + physiotherapy	1	2.3
Total	44	100

*MUA: Manipulation under anesthesia

shock was the cause of death in a 4-year-old girl who presented 6 days after the onset of symptom with acute pyogenic septic arthritis of the knee and overwhelming sepsis.

Table 4: Complications of childhood pyogenic septic arthritis

Complications	Number of patients	Percentage
Anemia	22	50.0
Septic shock	4	9.09
Joint stiffness	4	9.09
Pathologic dislocation (hip)	2	4.55
Osteonecrosis	1	2.27
Total	33	75.0

Discussion

The result of this study indicates that growing children are the population predominantly at risk of pyogenic septic arthritis; this is similar to the finding reported in previous published reports.[2,3,8] The preponderance of male children is also similar to the finding in previous reports.[2,3,8,10] The peak age incidence of >1–5 years in this series differs from peak age incidence of >5–10 years reported by Akinyoola *et al*. in a teaching hospital South-Western Nigeria. The reason for the difference in the peak age incidence observed in this study and that of South-West Nigeria is not evident.

In this study, hematogenous infection from a distant focus was predominant, and a recent history of infection at a distance site was a common feature. This calls for a high index of suspicion of septic arthritis in any child with joint pain or limping following infection at a distant site. The incidence of infection from penetrating joint injury in 4.5% of the children differs from 14.5% reported by Samilson

et al. In this study, the incidence of sickle cell disease among children with septic arthritis is similar to 13.2% reported by Akinyoola *et al*. in South-West Nigeria[12] and higher than 3% reported by Lavy *et al*. in Malawi.[10] This indicates that sickle cell disease is common and important comorbidity and predisposing factor for septic arthritis in our environment. Hence, the importance of determining the genotype of children presenting with pyogenic septic arthritis in our setting cannot be overemphasized.

The incidence of polyarticular pyogenic septic arthritis (18.2%) in this study though within the range reported for septic arthritis in general population differs from 4.9% reported by Wilson and Di Paola,[13] and 5.4% reported by Akinyoola *et al*.[12] Polyarticular septic arthritis is likely in overwhelming sepsis, rheumatoid arthritis and systemic connective tissue disease,[16] and sickle cell disease as observed in this study. The extent of involvement of these likely factors in the higher incidence of polyarticular septic arthritis observed in this series is not evident.

In Figure 1, the two top joints involved in septic arthritis, knee (56%) and hip (21.2%), was almost similar to the finding reported by Jackson and Nelson[17] but differs from the predominance of hip involvement reported by Wilson and Di Paola in Glasgow,[13] and Akinyoola *et al*. in South-Western Nigeria.[12] However, the percentage of septic arthritis of the shoulder in this study is similar to the finding by Akinyoola *et al*. and more than the percentage in Western children reported by Jackson and Nelson.[17]

Trauma, asymptomatic micro trauma most often times, is one of the risk factors for childhood pyogenic septic arthritis.[1] The pattern of distribution of joints involved in septic arthritis is also related to the incidence of trauma to joints.[1,10] In Figure 3, the peak age incidence of septic arthritis of the shoulder joint in the 1st year of life and the peak incidence of knee and hip septic arthritis at the age after walking has started are similar to the findings reported by Lavy *et al*.[10] and Akinyoola *et al*.[12] in sub-Saharan region. The preponderance of shoulder joint involvement among infants in sub-Saharan region compared to Western children has been attributed to minor trauma that may arise when "they are picked up by the mother by grasping in the upper arm and swung to the back."[1,10] The right side dominance found in over 80% of children[18] and the preferential use of the right to left upper limb associated with right side dominance might aggravate this minor trauma, hence the involvement of joints in the right more than left upper limb and the right to left shoulder septic arthritis ratio of 7:1 observed in Figure 1. The higher incidence of injury from falls among children that have started walking also explains the preponderance of knee and hip joint involvement after the 1st year of life as observed in this study and other published reports.[1,3,10,12] Furthermore, in another published report, the left hip was three times more likely than the right hip to be involved in injury in children.[19] This suggests the left hip in children is more likely involved in trauma that makes it more susceptible to infection in the presence of coexisting bacteremia. This perhaps also explains the left to the right hip ratio of 2.6:1 observed for childhood septic arthritis in this study as shown in Figure 2.

In this series, the history of trauma in 15% of the children with septic arthritis does not differ much from 18.3% reported by Akinyoola in South-Western Nigeria. The history of trauma associated with septic arthritis is of important concern in our environment where patronage of traditional bonesetter and herbalist services is a common health seeking behavior among patients with extremity injury and disorders.[20] In Table 1, delayed presentation was related to the category of a patient who first presented to these unorthodox practitioners before hospital admission. This calls for an educational program to enlighten the public on the importance of bringing children with fever, limping, joint pains, and loss of function following real or apparent blunt extremity injury to hospital rather than resort to traditional bonesetters and herbalist.

In the setting of this study, most of the outing to playgrounds and childhood plays occur during the dry season. The minor injury associated with such plays is a plausible explanation for the preponderance of onset of septic arthritis during the dry season observed in this series. A published report indicates that the wet season is a period of stress and scarcity of food in tropical rural areas with predominance of cultivator farmers; consequently, children in these rural areas are more vulnerable to malnutrition and infection in the wet season.[21] The majority of the rural dwellers in this tropical setting are cultivator farmers. This perhaps explains the preponderance of rural children among those with the onset of symptom in the rainy season observed in this study.

The mean duration of symptoms before presentation was similar to the finding reported by Akinyoola *et al*.[12] The nonspecific features of pyogenic septic arthritis in neonates and infants might be the reason behind delayed presentation that was significantly related to infants compared to older children. The health

seeking behavior of people has implications in the timely intervention in septic arthritis and its outcome. Patient that first sought treatment from bonesetters and herbalist were mostly likely to present after irreversible damage had occurred in the joints. This calls for educational program to enlighten the public about early symptoms of pyogenic septic arthritis and the need for early presentation to centers with the capacity for adequate treatment.

The predominance of staphylococcal aureus as the most common bacteria isolate in Table 4 is similar to the finding in other previous published studies.[11-15] The inability to isolate bacteria from joint aspirate (no growth on culture) in 16 of these patients may be due to a common practice of use of antibiotics before hospital presentation in our environment.[3,12]

Adequate treatment of pyogenic septic arthritis consists in drainage of pus from the joints, use of antibiotics and joint immobilization. In the setting of this study, childhood septic arthritis presenting to the hospital through children emergency and children outpatient clinic were referred to the orthopedic surgeons as soon as diagnosis was established. This may explain the relatively higher rate of open arthrotomy observed compared to 55.9% reported by Akinyoola *et al*.[12]

Anemia is a common complication is septic arthritis in children, and this has been attributed to hemolysis and bone marrow toxicity associated with sepsis.[12] Blood transfusion may be indicated in correction of severe anemia or replacement of blood loss during open arthrotomy for septic arthritis. In this study, the incidence of anemia is related to delayed presentation, thus it implies early presentation may reduce the need for blood transfusion. This is also important additional information in an educational program to enlighten the public.

The mean duration of hospital admission was within the range reported by other workers.[12,13] Although the use of antibiotics has significantly reduced the mortality rates in septic arthritis, delayed presentation, and overwhelming sepsis at the time of presentation, remain an important factor in developing countries and accounted for a mortality of 2.3% observed in this series.

The limitation of this study is that it a hospital and single center-based study.

Conclusion

In this setting, pyogenic septic arthritis is predominantly a childhood health problem, children under 5 years of age are most vulnerable, and the distribution of joint involvement is a reflection of previously documented pattern of joints involvement in trauma. Delayed presentation, an important factor for morbidity and mortality associated with septic arthritis was common among the patients. This calls for the educational program to enlighten the public on the importance of early presentation and adequate treatment in pyogenic septic arthritis.

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Conflicts of interest

There are no conflicts of interest.

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