

## Original Research Article

# Septic arthritis of ankle joint in the paediatric age group: a retrospective study

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## ABSTRACT

**Background:** Septic arthritis in paediatric age group poses a significant clinical problem. Common sites are hip and knee joint. There are several orthopaedic literatures available on septic arthritis of the hip and knee joint, however, literature on epidemiology, causative organisms and outcome of septic arthritis of the ankle are very few.

**Methods:** We conducted a retrospective study at a tertiary hospital with an aim to evaluate the incidence, causative pathogen, outcome and to identify differences, if any, between clinical features and laboratory findings of these patients when compared to those with hip and knee joint infection.

**Results:** 47 children were diagnosed with septic arthritis, of which, 14 had septic arthritis of the ankle. Mean age was 5.2 years (8 months - 12 years). 13 children had undergone joint aspiration as a primary procedure. 50% (7) children had positive culture. *Streptococcus pyogenes* was the commonest causative organism in our cohort (29%) followed by *Staphylococcus aureus*. Mean follow-up was 36 months (16 - 56 months). 13 children (93%) had good clinical outcome. 1 child developed early arthritis.

**Conclusions:** Septic arthritis of the ankle is a serious condition. Even-though the joint is superficial, diagnosing it clinically can be difficult due to less pronounced symptoms. This can lead to delay in establishing the diagnosis and commencing treatment, hence, it is imperative to have a high index of suspicion. We found early joint aspiration followed by a course of antibiotics to be an effective regimen in management of this devastating condition.

**Keywords:** Septic arthritis, Ankle, Infection, Paediatric age group, Children

## INTRODUCTION

Septic arthritis is commonly called pyogenic or suppurative arthritis which occurs due to pathological invasion and subsequent inflammation.<sup>1</sup> Although septic arthritis is uncommon in children however, any child presenting with a joint pain needs septic arthritis ruled-out as it remains a significant clinical problem with devastating effects.<sup>2,3</sup> Its incidence is reported as 5 out of

100,000 in a Norwegian study.<sup>4</sup> Common sites are hip, knee and ankle joints. It mostly occurs due to haematogenous spread with a male to female ratio of 2:1 in children below 5 years of age.<sup>5</sup>

While several orthopaedic literatures are available on septic arthritis of hip and knee joint in paediatric population, literature on epidemiology, causative organisms and outcome of septic arthritis of the ankle are

very few. The primary objective of our study was to evaluate the incidence, aetiology, clinical features and outcome of septic arthritis of the ankle in the paediatric population, while the secondary objective was to compare the clinical feature and laboratory finding of a septic ankle joint to that of a septic hip and knee joint.

**METHODS**

We conducted a retrospective study on children with septic joint treated at Royal Hospital for Children, Glasgow, between 1<sup>st</sup> January 1996 and 31<sup>st</sup> December 2008. Permission to review medical records was obtained from

the ethics committee and data was collected to evaluate the incidence, causative pathogen and outcome. Statistical analysis was performed using GraphPad, Prism software (version 8.3.1). Following were the inclusion and exclusion criteria agreed.

**Inclusion criteria**

A positive bacterial culture from an ankle joint aspirate. Positive blood culture with symptoms of septic ankle joint. Patient fulfilling criteria of septic arthritis according to Morrey et al (Table 1).<sup>6</sup>

**Table 1: Morrey et al clinical criteria for septic arthritis.<sup>6</sup>**

Criteria	Clinical findings
<b>Major criteria (atleast 2 criteria must be fulfilled)</b>	Pus aspirated from joint
	Elevated ESR (erythrocyte sedimentation rate)
	Radiological changes in the joint
<b>Minor criteria (all 5 criteria must be fulfilled)</b>	Temperature exceeds 38.3 degree centigrade
	Swelling of suspected joint
	Pain in suspected joint which is exacerbated by movements
	Systemically unwell
	No other ongoing pathological process
	Satisfactory response to antibiotics

**Exclusion criteria**

Patients who developed septic arthritis of the ankle joint by direct inoculation. Previous surgery in the ankle.

Duration of symptoms prior to admission, presence of pyrexia and laboratory findings of children with septic arthritis of the ankle were also compared with those with a diagnosis of septic arthritis of the hip or the knee joint treated within the same time period. Identical inclusion and exclusion criteria were applied to all three groups.

Information about number of children under the age of 13 years residing within the hospital catchment area was obtained from the Glasgow council registrar general’s office to estimate incidence per year per 100,000 children.

**RESULTS**

Among 47 children diagnosed with acute septic arthritis, 14 (30%) children had septic arthritis of the ankle. The mean incidence of acute haematogenous septic ankle joint in children below 13 years in our cohort was 0.9 per year per 100,000 children.

Mean age at presentation was 5.2 years (0.8-12.4 years, SD 4.16). Gender distribution was 1:1. The right ankle was involved in eight patients (57%), while the left in remaining six (43%). The mean duration of symptoms prior to starting treatment was 3 days (2-12 days, SD 2.8). Four patients (28.5%) had been seen earlier either by a

primary care physician or emergency medicine physician and discharged from their care without establishing a correct diagnosis or starting any relevant treatment. Pyrexia (>37.0° C) at presentation to hospital was reported in ten cases (71%) and four patients were found to have had a normal temperature (≤37.0° C) on admission. 40% (6) infection took place between October and December and four children (29%) reported a history of recent trauma. A standard AP and lateral view radiograph of the ankle joint was obtained in all children at the time of presentation. Six children (43%) had undergone an ultrasound scan and one child had an MRI scan at a later stage.

Regarding inflammatory markers, seven patients (50%) had a white cell count above 15000×10<sup>9</sup>/l, while the C-reactive protein (CRP) was elevated in 93% of cases. ESR was checked in 10 patients and was found to be elevated in 8 cases. The mean peripheral leukocyte count at admission was 14,200×10<sup>9</sup>/l (8500-22900×10<sup>9</sup>/l), while the mean value for CRP was 93.7 mg/l (5 - 311 mg/l) and mean value of ESR was 80 mm/hr (19-131 mm/hr) respectively. A value below 5 mg/l for CRP and 20 mm/hr for ESR was considered normal and per laboratory recommendation.

All 14 children (100%) had surgical intervention within 12 hours of admission. 13 children underwent joint aspiration alone, while one child had undergone arthrotomy immediately following joint aspiration due to the surgeon’s preference. Arthrotomy was performed due to longer duration of ongoing symptoms (>1 week). The joint

fluid was sent for culture and sensitivity in all patients. Immobilisation was not recommended for any of the children.

All patients were treated empirically with intravenous antibiotics after microbiology sample were taken. The most common choice of antibiotic was a combination of intravenous benzylpenicillin and flucloxacillin. Other antibiotics used were erythromycin, clindamycin and metronidazole. The mean duration of intravenous antibiotics was 4.3 days (3-7 days, SD 1.1 day). Antibiotics were continued orally in most cases till the 20<sup>th</sup> day. The mean total duration of antibiotic therapy was 23 days (10-42 days). In seven cases pathogen was isolated from blood and joint aspirate. Mean duration of

hospitalization was 6 days (3-20 days, SD 4.2 days). Mean follow up was 36 months (16-56 months) and none of the patients was lost to follow-up.

A good clinical and radiological outcome was considered if the ankle had a painless full range of motion with no radiological changes. We did not observe any early complications. 13 (93%) children had good outcome and returned to pre-infection mobility, however, the child who had presented late had minimally restricted range of motion in his ankle and associated radiological feature suggesting of early secondary arthritis. One child was found to have associated erosion in the Talus, the lesion was drilled and the outcome was satisfactory. A concise result data has been provided in (Table 2 and 3).

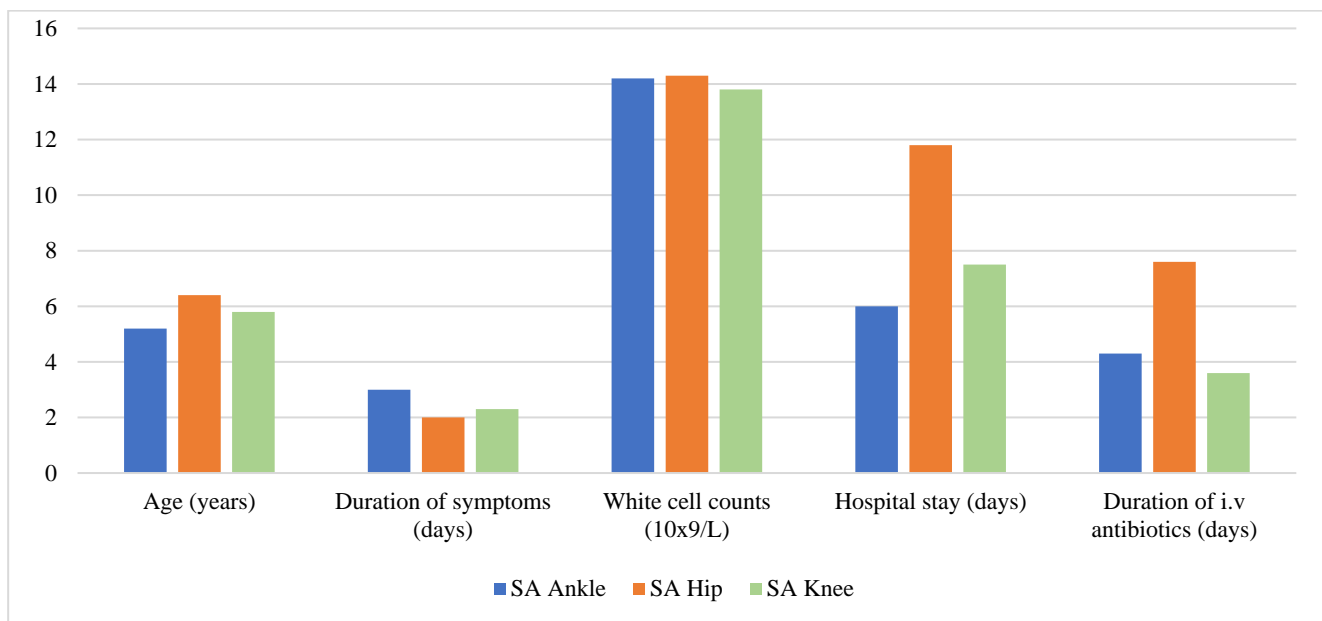
**Table 2: Result data.**

	Number	Mean age (years)	Mean duration of IV Abx (days)	Asp (%)	Arth (%)	(+ve) Culture (%)	Good outcome (%)
<b>Male</b>	7	6.3 (SD 4.9)	4.7 (SD 1.2)	100	14	57	85.71
<b>Female</b>	7	4.1 (SD 3.3)	4.0 (SD 0.8)	100	0	43	100
<b>Total</b>	14	5.2 (SD 4.2)	4.3 (SD 1.1)	100	7	50	92.85

Asp (Aspiration), Arth (Arthrotomy), IV Abx (Intravenous antibiotics).

**Table 3: Frequency of isolated pathogens.**

Isolated pathogen	Number of cases
<i>Streptococcus pyogenes</i>	2
<i>Staphylococcus aureus</i>	1
<i>Streptococcus viridans</i>	1
<i>Micrococcus species</i>	1
<i>Streptococcus pneumoniae</i>	1
<i>Kingella kingae</i>	1



**Figure 1: Finding in septic arthritis of the ankle, septic arthritis of the hip and the septic arthritis of the knee.**

SA ankle: septic arthritis of the ankle; SA hip: septic arthritis of the hip; SA knee: septic arthritis of the knee.

We found the age of patients and changes in the inflammatory markers were comparable in all the three groups. However, duration of hospitalisation and requirement of intravenous antibiotics therapy was longest in patients with hip joint infection. Duration of symptoms prior to admission was longest in those who had septic arthritis of the ankle (Figure 1).

## DISCUSSION

Our study showed children with septic arthritis of the ankle had 24 hours longer duration of symptoms prior to seeking medical advice in comparison to those children who had hip or knee joint infection. This may suggest that although the ankle joint is a superficial joint, it may still be difficult to establish a clinical diagnosis of septic arthritis, we are in the opinion that this could be explained by two reasons. Firstly, the comfortable position or position of ease assumed by a septic ankle joint does not significantly differ from the resting position of an otherwise healthy ankle joint, which is 10° to 20° of plantar flexion, however, the position of ease for patients with hip or knee infection is marked flexion to relieve pain and any attempt to extend the joint causes significant pain which makes parents seek early medical advice. Secondly, the capacity of the ankle joint to accommodate purulent material when compared to the hip or knee joint is much lower. Greater the amount of purulent material inside a joint, earlier is the systemic manifestations and more severe they are, this draws one's attention to seek urgent medical advice.

In our cohort, only one unsatisfactory outcome was noted, and it was in a child with long duration of ongoing symptoms. Most authors emphasise the importance of establishing an early diagnosis in septic arthritis.<sup>7,8</sup> Lee et al reviewed 29 patients (6 children with septic arthritis of the ankle) with a mean follow up of 6.5 years, they concluded that children with duration of symptoms less than 5 days receiving early treatment significantly improves the outcome.<sup>9</sup>

Another interesting observation in our study was the aetiology of ankle septic arthritis. *Staphylococcus aureus* has been reported to be the commonly isolated pathogen in septic arthritis in all age groups.<sup>10-14</sup> Although our findings in hip and knee group did support this, however, in a septic ankle joint, bacterial cultures were more often negative. In our study only seven cases had positive bacteriology. Furthermore, *Staphylococcus aureus* was isolated only in one case. We believe this is a clinically important observation as other aetiological organisms should be considered in patients with suspected septic arthritis of the ankle.

Lee et al and Holtom et al postulated that a positive bacterial culture is one of the risk factors of poor outcome.<sup>9,15</sup> This hypothesis cannot be supported by our study. Unlike other studies white cell count in joint aspirate was not elevated in all cases and it should not be

regarded as a sensitive marker of joint infection in children.<sup>16,17</sup>

ESR and CRP are a sensitive marker, but not a specific marker of septic arthritis of the ankle. Majority of our patients had elevated ESR and CRP on admission, however, it is worth mentioning that in our study children usually presented 2-3 days later from the start of their symptoms, hence, inflammatory markers might not have been elevated if they had presented sooner. It should also be noted that a normal value of serum WCC, ESR and CRP do not exclude the diagnosis of septic arthritis. We did not find significant differences in the level of inflammatory markers among patients with septic ankle joint and those with infection of the hip or the knee joint.

Holtom et al noted elevated levels of CRP and ESR in all their patients with septic arthritis of the ankle, however, the cohort were adults with septic arthritis. Other authors who have evaluated paediatric population with septic arthritis of various joints noted that routine inflammatory markers may only be marginally raised in some patients which suggests that inflammations markers may not be helpful in diagnosing septic arthritis in children. Even if a new diagnostic tool like PCR is used, up to 50% can have a negative result and delay in getting PCR result limits its usefulness in an acute situation.<sup>18</sup>

Clinicians may have to rely on their clinical judgement and experience rather than on results of laboratory tests and imaging studies to make a correct diagnosis.<sup>19</sup>

There is still a debate about whether aspiration is enough surgical procedure in the treatment of septic arthritis in children. Except for two patients all our patients had undergone aspiration as the only surgical intervention. Satisfactory results in our study indicate that aspiration may be the only surgical intervention required along with intravenous antibiotic therapy for effective treatment of septic ankle joint in children.

## CONCLUSION

Septic arthritis of the ankle is a serious condition. Even though the joint is superficial, diagnosing it clinically can be difficult due to less pronounced symptoms. This can lead to delay in establishing the diagnosis and commencing treatment, hence, it is imperative to have a high index of suspicion. We found early joint aspiration followed by a course of antibiotics to be an effective regimen in management of this devastating condition.

## Recommendations

Our study suggests, establishing a correct diagnosis of septic ankle joint may be difficult in children despite its superficial location. A delay in starting effective treatment may compromise the outcome. Early surgical intervention is mandatory to increase the chances of a satisfactory outcome. One cannot solely rely on inflammatory markers

or microbiology results. A high index of suspicion is the key. An early joint aspiration followed by a short course of intravenous antibiotics and then microbiology result directed oral antibiotics seems to be an effective regime in the management of septic arthritis of the ankle joint in children.

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