

**Research Article**

# Cross-sectional Study: Frequency of Microorganisms in Septic Arthritis in Children under Age 10 Years

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**Purpose:** The purpose of this study was to measure the frequency of microorganisms in septic arthritis in children under the age of 10 years in Peshawar.

**Method:** After approval from hospital ethical board, patients fulfilling the inclusion criteria were enrolled from the indoor department of Orthopedic of the hospital. A written informed consent was taken from all study participants after explaining the purpose of study. Complete history was taken and physical examinations were done including careful and gentle examination of the affected joint as per protocol. The involved joint was aspirated under sterile precautions in a separate procedure room under ultrasound guidance. Data was recorded by the researcher himself on especially designed proforma (annexure 1). Data was entered and analyzed by using SPSS version 22.0.

**Results:** We included 171 patients with septic arthritis who met the inclusion criteria. Among 171 patients, 99 patients (57.9%) were males. The median age was 3. In our studies, 72 patients (42.1%) had staph. aureus on culture, 39 patients (22.8%) had group A streptococcus on culture, 34 patients (19.8%) had E.coli on culture, 17 patients (9.9%) had streptococcus pneumoniae and 9 patients (5.2%) had other bacteria including H.influenza, salmonella, P. auroginosa and N.gonorrhoea.

**Introduction**

Septic arthritis is a painful infection in a joint that occurs from pathogens that travel through bloodstream from another part of body.<sup>1</sup> Septic arthritis can also occur when a penetrating injury, such as an animal bite or trauma, delivers germs directly into the joints. Osteomyelitis of adjacent bone may also result in septic arthritis. Septic arthritis most commonly occurs in the hip and knee joints.<sup>2</sup> Other joints commonly infected include the shoulder and ankle but it can occur in any synovial joint in the body. Staphylococcus aureus is the most common pathogen.<sup>3</sup>

Other causative organisms include group A Streptococcus and Enterobacter species. Hemophilus influenza may also cause septic arthritis in children who have not been vaccinated. The incidence of Kingella kingae septic arthritis is almost certainly significant but underreported due to its fastidious nature in culture.

Children with septic arthritis commonly present with acute onset of joint pain, limited movement and fever. Limping or non-weight bearing is typical presentation in lower limb joints. In subcutaneous joints, such as knee or ankle, signs of effusion including swelling and warmth may be noticed. Clinical detection of an effusion in the hip or shoulder is not possible. The child will generally hold the joint in a position where the capsule is most lax. The knee will be held slightly flexed and the hip will classically be held flexed, abducted and externally rotated. Any passive movement of the joint is extremely painful.<sup>1,2</sup>

Several studies have shown that a history of non-weight bearing and a temperature greater than 38.5°C are the most

reliable clinical signs differentiating septic arthritis and transient synovitis.<sup>4,7</sup> Any child presenting with symptoms and signs of septic arthritis should be urgently referred to the emergency department (ED) of a hospital. Antibiotics should not be administered before obtaining a synovial fluid sample for laboratory analysis.<sup>1</sup> In the ED, blood should be sent for a white blood cell count (WCC) and differential leukocyte count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP) and cultures. Several studies have shown that WBC count (WCC) greater than 12.0 x 10<sup>9</sup> cells/L, CRP greater than 20 mg/L and ESR greater than 40 mm/hr are significantly more common in septic arthritis when compared to transient synovitis.<sup>5,6,7,8</sup> X-rays of the involved joint and adjacent bones should be obtained to exclude other pathology such as fractures, tumors or osteomyelitis. In the hip, Legg-Calve-Perthes disease or a Slipped upper femoral epiphysis should be excluded radiographically. An ultrasound of the involved joint, the most sensitive test for detecting a joint effusion, should be obtained.<sup>3</sup> Treatment of septic arthritis involve surgical drainage and lavage of the joint and antibiotics. The drainage and lavage can be performed arthroscopically or via an open arthrotomy. In the paediatric setting, for the knee and shoulder joints arthroscopic approach are done, whereas the hip and ankle joints are generally approached via an arthrotomy. In very young children, the standard arthroscopic instruments are too large and, therefore, arthrotomy is generally preferred.<sup>3</sup>

Once a synovial fluid sample has been obtained, high-dose, empirical, intravenous (IV) antibiotics are administered. Empiric therapy for bacterial arthritis in infants of age less than 3 months should be directed against staphylococcus,

group B streptococcus and Gram negative bacilli. Gentamycin, nafcillin, oxacillin, or vancomycin in combination with cefotaxime or ceftazidime if Pseudomonas is considered is the treatment of choice.<sup>9</sup> Empiric therapy for bacterial arthritis in children of age greater three months should be directed toward S. aureus and other Gram positive organisms(e.g group a streptococci, S. pneumonia). A 10 day clindamycin therapy with 2-4 days high initial IV dose or 1st generation Cephalosporin seems to be an effective treatment. If the child is not vaccinated against H.influenzae, ampicillin or amoxicillin should be administered additionally.<sup>10,11</sup> If less than 10 to 15% of community S.aureus isolates are methicillin resistant and the child is hemodynamically stable, cefazolin and nafcillin/oxacillin are treatment of choice. If greater than 10-15% of the community isolates are methicillin resistant, then Clindamycin and Vancomycin are recommended.<sup>12,13</sup> K.kingae can usually be treated with Cephalosporins, such as cefazolin, cefatoxime, and ceftriaxone.<sup>14,15,16</sup>

**Materials and Methods**

**Study Design:**

Cross-Sectional Study

**Study Setting:**

Department of Orthopedics, Leady Reading Hospital, MTI, Peshawar

**Study Duration:**

This study was conducted from January 5, 2021 to June 13, 2022.

**Sampling Technique:**

Non Probability Consecutive Sampling Technique

**Sample Size:**

Sample size was calculated using WHO sample size formula, using the proportion, anticipated frequency of E. coli, p = 8%  
 Margin of error = 7.5%  
 Confidence Level = 95%  
 Sample size, n = 171

**Selection Criterion:**

**Inclusion Criteria:**

- Patient age 1 month to 10 years
- Patients of both genders
- Presenting with septic arthritis as per operational definition

**Exclusion Criteria:**

- Patients with congenital joint deformity
- Immunocompromised patients
- Patients with rheumatologic joint disease
- Patients with traumatic joint injury

**Data Collection Procedure:**

After approval from hospital ethical board, patients fulfilling the inclusion criteria were enrolled from the indoor department of Orthopedic of the hospital. A written informed consent were taken from all study participants after explaining the purpose of study. Demographic data including age (years), gender, duration of illness (days) and type of joint

(large/small) and number of joint involved were noted. Complete history was taken and physical examinations were done including careful and gentle examination of the affected joint as per protocol. The involved joint was aspirated under sterile precautions in a separate procedure room under ultrasound guidance. Turbidity in the fluid was noted. 02 cc aspirate was sent for gram stain and culture to the hospital laboratory within 30 minutes of taking the sample. Robertson Cooked Meat Media was used to transport the aspirated sample for culture.

The aspirate was cultured both in aerobic and anaerobic medium following standard protocols. MacConkey agar, blood agar, and chocolate agar were used for inoculation. The microorganisms were incubated for 48 hours. Growth Staph aureus, E. coli, Strep pneumoniae and Strep pyogenes colonies were noted. Frequency of microorganism were noted as per operational definition. Data was recorded by the researcher himself on especially designed proforma (annexure – 1).

**Data Analysis Procedure:**

Data was entered and analyzed by using SPSS version 22.0. Mean and standard deviation was calculated for quantitative variables like age and duration of disease and number of joints involved. Frequency and percentage was calculated for categorical variables like gender, type of joint involved and presence of microorganisms. Effect modifiers like age, gender and duration of diseases, number of joints and type of joints involved were controlled through stratification. Post stratification chi square test was applied. p value ≤0.05 will be considered statistically significant.

**Results:**

We included 171 patients with septic arthritis who met the inclusion criteria. Among 171 patients, 99 patients (57.9%) were males (Table 1). The median age was 3 (Table 2).

**Table 1: Frequency Of Genders**

	Frequency	Percent	Cumulative Percent
Male	99	57.9	57.9
Female	72	42.1	100.0
Total	171	100.0	

**Table 2: Age of Patients**

N	171
Mean	4.1520
Median	3.0000
Mode	1.00 <sup>a</sup>
a. Multiple modes exist. The smallest value is shown	

Most of the Patients included in this study were under the age

of 3 (50.3%) (Table 3). Among 171 patients, 30 patients (17.5%) had knee joint involved while the hip joint

**Table 3: Frequency Of Age Among Patients**

	Frequency	Percent	Cumulative Percent
1 year	29	17.0	17.0
2 years	29	17.0	33.9
3 years	28	16.4	50.3
4 years	15	8.8	59.1
5 years	17	9.9	69.0
6 years	13	7.6	76.6
7 years	15	8.8	85.4
8 years	14	8.2	93.6
9 years	11	6.4	100.0
Total	171	100.0	

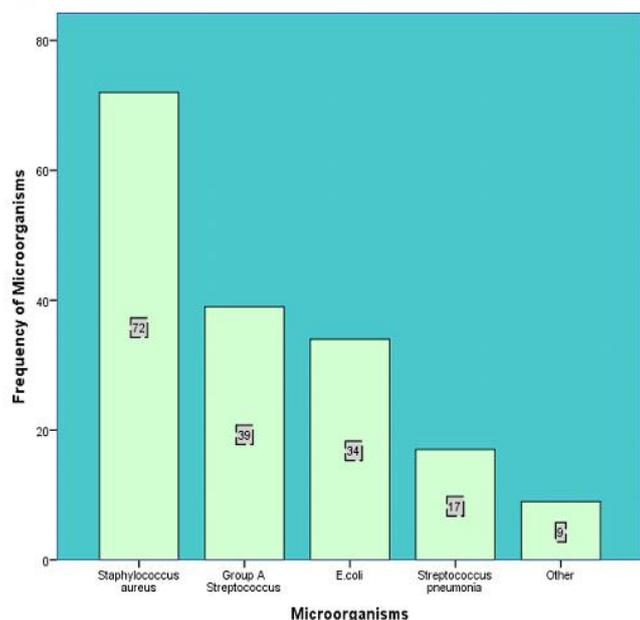
**Table 4: Frequency of Joints Involved**

Count	Microorganism					Total
	Staphylococcus aureus	Group A Streptococcus	E.coli	Streptococcus pneumonia	Other	
Male	45	22	21	7	4	99
Female	27	17	13	10	5	72
Total	72	39	34	17	9	171

**Table 5: Frequency of Microorganism On Gender Base**

	Frequency	Percent	Cumulative Percent
Knee	30	17.5	17.5
Hip	75	43.9	61.4
Elbow	7	4.1	65.5
Ankle	36	21.1	86.5
Wrist	9	5.3	91.8
Shoulder	14	8.2	100.0
Total	171	100.0	

**Figure 1: Frequency Of Micro-organisms in Septic Arthritis**



Was involved in 75 patients (43.9%), elbow in 7 patient (4.1%), ankle in 36 patients (21.1%), wrist in 9 patients (5.3%), and shoulder in 14 patients (8.2%) (Table 4). In our studies, 72 patients (45 males plus

27 females , 42.1%) had staph. aureus on culture , 39 patients ( 22 males plus 17 females, 22.8%) had group A streptococcus On culture, 34 patients ( 21 males plus 13 females, 19.8%) had E.coli on culture, 17 patients ( 7 males plus 10 females, 9.9%) had streptococcus pneumoniae and 9 patients (4 males plus 5 females, 5.2%) had other bacteria including H.influenza , salmo nella, P. auroginosa and N.gonorrhoea. (Figure 1 & Table 5) .

**Discussion:**

In our study, we found that staph. aureus (42.1%) is the most common organism causing septic arthritis in children under the age of 10 years. The Other common microorganisms include E.coli(19.8%) , Group A streptococcus(22.8%), and streptococcus pneumonia(9.9%).

In a study by Moro-Lago and colleagues, in children with age less than 10 years presenting with septic arthritis, Staphylococcus aureus was most commonly isolated pathogen in 23% patients, followed by Streptococcus pneumoniae in 15%, Streptococcus pyogenes in 13% and E. coli in 8% patients.<sup>17</sup>

According to Rheumatol Ther, staph. Aureus was 48.6% and streptococcus was 14.1%.<sup>18</sup>

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