

CLINICAL FEATURE AND ETIOLOGY OF SEPTIC ARTHRITIS AND OSTEOMYELITIS IN CHILDREN

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Abstract- Currently there is little information regarding septic arthritis and osteomyelitis in Iran. This retrospective study has been conducted to assess the clinical features and determine the pathogens responsible for septic arthritis and osteomyelitis in patients admitted to our hospital over a 10 year period between 1995 and 2005. A total of 145 cases of septic arthritis and osteomyelitis were studied. The mean age of patients was 18 month, 56.5% (82/145) were male and 43.5% (63/145) were female. The most frequent presenting symptom was pain reported by 69.6% of the patients. Fever at presentation defined as an oral temperature above or equal to 38°C was present in 67.5% of the patients. 71 of 145 (48.9%) cases of septic arthritis and osteomyelitis that reviewed in this investigation were culture positive that 71.8 % (51/71) of microorganisms recovered from synovial fluid culture. Moreover 8.4% (6/71) of microorganisms isolated from blood culture alone, while 19.7% (14/71) of microorganisms recovered from both synovial fluid and blood culture. *Staphylococcus aureus* was the most common pathogen isolated, making up 60.5% of all positive culture. Coagulase negative staphylococci and klebsiella sp. was found in 7 cases (9.8%) and 10 cases (14%) respectively. Group B streptococcus identified in 5 patients (7%). The present study highlights the importance of characterizing the profile of species causing septic arthritis or osteomyelitis in specific regions.

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INTRODUCTION

Septic arthritis and osteomyelitis refers to all joint or bone infections caused by pyogenic bacteria. The incidence of osteomyelitis in normal children has been examined in several populations during the past 40 years. Estimates have varied from as low as 1 in 20000 adolescent females in Newzealand to as high as 1 in 1000 Australian aboriginals (1). There is distinct variability in the causative organisms of

septic arthritis and osteomyelitis in different parts of the world (1). In most European and North American reports the most common bacterial isolates in septic joints have been staphylococci and streptococci (2-5) with *Neisseria gonorrhoea* particularly prevalent in North America.

Currently there is little information regarding septic arthritis and osteomyelitis in Iran. Although the development of effective antibiotics over the last few decades has had a significant effects on the duration and outcome of this type of infection, it is still remains a common problem. Despite advances in antibiotic treatment, septic arthritis and osteomyelitis results in considerable morbidity and even mortality in patients. Prognosis worsens when appropriate antibiotic treatment is delayed (6). In the

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absence of clear indications of the causative organism, the initial choice of antibiotic is an educated guess. Staphylococci and streptococci, the most commonly isolated pathogens, are targeted (7).

The present study was undertaken to determine the epidemiological and clinical characteristics, laboratory data, causative organisms, and risk factors of patients with septic arthritis or osteomyelitis who admitted to Children Medical Center Hospital of Tehran over a 10 year period.

MATERIALS AND METHODS

The present study included 145 cases of septic arthritis and osteomyelitis who were admitted to the Children Medical Center Hospital from March 1995 to February 2005. First, records of patients admitted to hospital during this time for septic arthritis or osteomyelitis were collected.

The essential features for diagnosis of septic arthritis or osteomyelitis were: 1) Microbial pathogen identified in, or isolated from, synovial fluid or joint tissue or bone biopsy; 2) Typical features of septic arthritis or osteomyelitis with pathogen isolated from blood; 3) Pus obtained from the joint of subperiosteal, but culture was sterile due to previous administration of antibiotics; 4) Pathologic or radiographic evidence of osteomyelitis with clinical features of osteomyelitis. The data about age, sex, trauma, fever, previous antibiotic therapy, and underlying diseases such as immunodeficiency, hemophilia, steroid treatment, cancer, diabetes, and hemodialysis were recorded.

RESULTS

Eighty two (56.5%) of our patients were male and 63 (43.5%) were female. Mean age of them was 18 months, range from 6 days to 15 year (71 less than 2 years, 21 from 2 to 5 years and 53 more than 5 years old). Seventy one (48.9%) patients had positive cultures that included blood, synovial or both. In 51(71.8%) cases positive synovial fluid culture alone was diagnostic, while in 14 (19.7%) cases both synovial fluid and blood culture were positive; in 6 (8.4%) cases blood culture alone was used to identify the responsible infective fluid (Table 1).

Table 1. Distribution of microorganisms by method of isolation*

Bacteria	Blood	Syn	Syn and blood
<i>S. aureus</i>	2	30	11
CONS	2	5	0
<i>Klebsiella</i> sp.	1	6	3
Strep group B	0	5	0
<i>Enterobacter</i> sp.	0	2	0
<i>H. influenza</i>	0	2	0
<i>Campylobacter</i> sp.	1	0	0
<i>Pneumococcus</i>	0	1	0

* Data are given as number.

Abbreviations: Syn, synovial fluid; CONS, coagulase negative staphylococci.

The most frequent presenting symptom was pain reported by 101(69.6%) of the patients. Fever at presentation, defined as an oral temperature above or equal to 38° C was present in 98 (67.5%). Leukocytosis defined as leukocyte count above 11×10^9 /litre recorded in 69 (47.5%). Erythrocyte sedimentation rate (ESR, normal range less than 30 mm/hr) and C reactive protein (CRP, normal: negative) were constantly raised in 91% and 92% of the patients, respectively (Table 2). Knee (29.6%) and hip (17.2%) joints were the most common involved joints with septic arthritis.

Femur (13.7%) and Tibia (11%) were the most common bone that involved by osteomyelitis in our patients. Seventy four (51%) of our patients had negative culture, but 22 of 74 (29.7%) case of these patients had received antibiotics before admission. The diagnosis of culture-negative septic arthritis or

Table 2. Clinical and laboratory findings

Parameters	Number	Percent
History of trauma	55	38
History of antibiotic use	22	29.7
Sex		
Male	82	56.5
Female	63	43.5
Swelling	87	60
Pain	101	69.6
Fever	98	67.5
Leukocytosis	69	47.5
ESR	132	91
CRP	134	92

Abbreviations: ESR, erythrocyte sedimentation rate; CRP, C reactive protein.

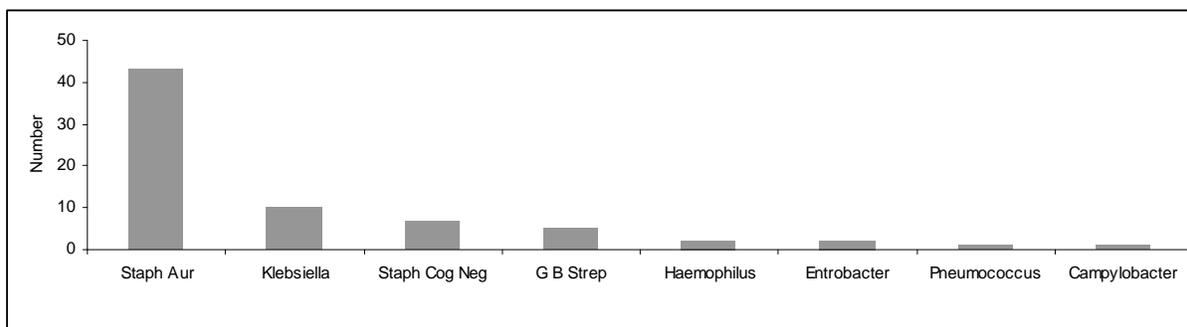


Fig 1. Isolated bacteria from cultures of patient with septic arthritis or osteomyelitis.

osteomyelitis was established based on clinical features and response to antibiotic therapy, synovial fluid characteristics, biopsy, and imaging. In 145 cases surveyed, 9 species of bacteria were identified via cultures of synovial fluid or blood (Fig. 1).

S. aureus was the most common pathogen found in 60.5% of all positive cultures. CONS were identified in 9.8%, klebsiella sp. 14% and group B streptococcus in 7% of cases. All of the klebsiella sp. infections occurred in neonate in our study. Six cases of neonatal osteoarthritis (total case: 10) occurred in hospitalized neonate. Five cases (3.44%) of our patients had underlying diseases. Three patients had immunodeficiency, two of them had chronic granulomatosis disease and one case had Bruton disease. One of the patients was a case of hemophilia and one case was a case of Familial Mediterranean Fever (FMF).

DISCUSSION

To our knowledge, this is the first large-scale study about occurrences and etiology of bacteria that cause septic arthritis and osteomyelitis in Iran. These data are likely to be an understanding of the etiology, antimicrobial susceptibility and occurrences of septic arthritis and osteomyelitis in Iran. Because information's about occurrences and clinical characteristics of patients with septic arthritis and osteomyelitis are unknown (2), data regarding the etiology of bacteria that cause arthritis septic and osteomyelitis are scarce (3), and understanding of etiology of major bacteria that cause septic arthritis and osteomyelitis in Iranian patients provide essential information regarding the selection of

antibiotic therapy for this infected children. In our study similar to other study such as Peltola *et al.* (8) and Gillespie *et al.* (9) studies septic arthritis and osteomyelitis were more common in male than female (56.5% vs. 43.5%).

In the present survey similar to other studies conducted by Nelson (10) and Lamont (11) the most common age of our patients was before 2 years old. Seventy one cases (49%) of our patients were 2 years old or younger. The present data confirm the findings of past studies (12) supporting the central importance of obtaining synovial fluid and blood cultures before administration of antibiotics. Seventy one (48.9%) patients had positive cultures that included blood, synovial or both and 29.7% of our patients had negative culture because of previous antibiotic therapy similar to other study (13,14). Blood cultures contributed to diagnosis when synovial cultures were sterile. In the Eder study (14) 50% of patients had no fever, abnormal ESR and CRP was found in 91% and 100% of the patients and in our study 32% of our patients had no fever 91% and 92% had abnormal ESR and CRP, respectively. This data confirm that over-reliance on other non-specific parameters such as peripheral white blood cell count and body temperature, may be misleading. In the present study acute phase reactants such as ESR and CRP were more sensitive indicators of possible septic arthritis and osteomyelitis. In the study that conducted by Huseyn Caksen in turkey (15) 52.5% of patients had history of trauma before infection and in our study 38% of patients had history of trauma. Similar to other study such as Trobs (16) and Yagupsky (17) knee and hip were the most common involved joints and tibia and femur were the most common involved bones in our study.

In our study staphylococci were the most common agent isolated from culture. It is similar to other studies such as Kaandrop, Rayan, and Gupta studies (3-5).

Klebsiella sp. was the second most common organism resulted in septic arthritis or osteomyelitis in our study. In our study, all of the infections caused by *Klebsiella* sp. occurred in neonates whereas in other studies *S. aureus* and group B streptococcus are the most frequent organism in neonatal osteomyelitis and septic arthritis (18, 19). In Table 3, isolated organisms in our study have been compared to other studies. Differences can be due to: 1) different part of country that these studies have been done; 2) frequency of multi partner mothers is low in our patients that results in low frequency of some infection such as group B streptococcus; 3) 50% of CONS infection occurred in hospitalized patients in our study. Therefore contamination with normal flora of skin such as CONS should be considered.

In conclusion, *S. aureus* was the most common agent isolated from culture. In blind treatment of patients with septic arthritis and osteomyelitis in whom the cultures are negative, we should always cover *S. aureus*. ESR and CRP are more sensitive indicators of possible septic arthritis and osteomyelitis than fever and leukocytosis. Trauma is an important risk factor in osteoarthritis. The present data confirm the findings of past studies supporting the central importance of obtaining synovial fluid

Table 3. Comparison of isolated bacteria in our study to other studies*

Bacteria	Our study	Nelson ¹⁰	Lamont ¹¹
<i>S. aureus</i>	60.5	67	70
CONS	9.8	3	1
<i>Klebsiella</i> sp.	14	-	-
Streptococci	7	12	-
Pneumococcus	1.4	2	16
<i>Haemophilus</i> sp.	2.8	4	5
<i>Salmonella</i> sp.	-	2	8
<i>E. coli</i>	-	<1	-
<i>Pseudomonas</i> sp.	-	3	-
Mix	-	4	-
<i>Campylobacter</i> sp.	1.4	-	-
<i>Enterobacter</i> sp.	2.8	-	-

Abbreviation: CONS, coagulase negative staphylococci.

*Data are given as percent.

and blood cultures before administration of antibiotics. The physicians and people should be educate to avoid antibiotic consumption before true diagnosis.

We recommend the study of neonatal septic arthritis and osteomyelitis in our country to find the most frequent organism responsible to septic arthritis and osteomyelitis because *Klebsiella* sp. was the second organism result in septic arthritis or osteomyelitis in our study and all of the infections caused by *Klebsiella* sp. occurred in neonate in our study whereas in other studies (18, 19) *S. aureus* and group B streptococcus are the most frequent organism in neonatal osteomyelitis and septic arthritis.

Conflict of interests

We have no conflict of interests.

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