

## Clinical and Laboratory Symptoms of Septic Arthritis among Children Hospitalized in Imam Reza Hospital of Mashhad, Iran

Maryam Khalesi<sup>1</sup>, Alireza Ghodsi<sup>2</sup>, \*Abdolkarim Hamed<sup>3</sup>

<sup>1</sup>Assistance Professor of Pediatrics Faculty of Medicine. Mashhad University of Medical Sciences, Mashhad Iran.

<sup>2</sup>Student Research Committee, Faculty of Medicine Mashhad University of Medical Sciences, Mashhad Iran.

<sup>3</sup>Professor of Pediatric Infectious Disease, Infection Control Hand & Hygiene Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

### Abstract

#### Background

Septic arthritis is an acute infection of the joint space and a pediatric emergency. Delay in proper diagnosis and treatment, while prolonging the course of treatment, can have serious complications. The present study aimed to assess the clinical and laboratory profile of septic arthritis among patients hospitalized in the pediatric ward of Imam Reza Hospital of Mashhad, Iran.

**Materials and Methods:** This retro-prospective study was conducted on the medical files of children from 2 months to 16 years old hospitalized in Imam Reza Hospital, Mashhad, Iran, from March 2011 to March 2019 due to a diagnosis of septic arthritis. A checklist capturing the age, gender, clinical symptoms, laboratory symptoms, affected joint, and type of treatment was prepared and completed according to the medical files of the patients.

**Results:** Out of 173 studied patients, 91 (53%), and 82 (47%) of cases were boys and girls, respectively. The patient was two months to 16 years old. The hip joint was affected more in 78 patients (45%). Among the clinical symptoms, fever was the most common found in 134 cases (77%). Moreover, 11 cases had positive blood culture where staphylococcus aureus with five positive reported cases (45%) was a major observation. Furthermore, four cases were reported to have a positive joint culture. CRP was positive in 94.8% of patients.

#### Conclusion

Septic arthritis is one of the pediatric emergencies that should be diagnosed rapidly, and immediate treatment should be started to prevent irreversible complications. The most common symptom of arthritis in infants is restlessness and immobility and limp in children.

**Key Words:** Children, Pyogenic arthritis, Septic arthritis, Suppurate arthritis.

\*Please cite this article as: Khalesi M, Ghodsi A, Hamed A. Clinical and Laboratory Symptoms of Septic Arthritis among Children Hospitalized in Imam Reza Hospital of Mashhad, Iran. Int J Pediatr 2020; 8(10): 12205-211. DOI: [10.22038/ijp.2020.51071.4054](https://doi.org/10.22038/ijp.2020.51071.4054)

#### \*Corresponding Author:

Abdolkarim Hamed, Professor of Pediatric Infectious Disease, Infection Control Hand & Hygiene Research Center, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

Email: [hamedia@mums.ac.ir](mailto:hamedia@mums.ac.ir)

Received date: Jun.17, 2020; Accepted date: Aug.22, 2020

## 1- INTRODUCTION

Septic arthritis develops following an infection of the joint space, which is also known as pyogenic and suppurate arthritis (1). It is one of the pediatric emergencies (2) since, if not appropriately treated, other complications will occur, such as joint degeneration, halted development, and even death of the patient (3, 4). The most common path for the microbe to reach the joint is through the bloodstream. The infection of tissues close to the joint, joint surgical operations, and invasion of penetrating bodies to the joint also cause microbial transfer into the joint and infection (4-6). The initial signs and symptoms of the disease depend on age, such that these symptoms are very deceptive among neonates. Due to the diffusion of infection from the epiphysis, comorbid osteomyelitis also exists among several young neonates and infants.

The typical clinical characteristics of septic arthritis in older infants and children include fever, pain, joint effusion, localized symptoms such as swelling, sense of warmth, joint erythema as well as the involvement of the hip and claudication of the lower limbs, and refraining from walking (2). The estimated annual rate of septic arthritis prevalence among children is 5-12 cases per every 100,000 individuals, which is different across various geographical regions of the world (7). It is more common in younger children and boys compared to girls (8).

Hip and knee are the most common joints affected by the disease, and in 90% of cases, involvement is a single joint (9). *Staphylococcus aureus* is the most common causative agent, especially among children (4, 9, 10). *Streptococcus* group A and pneumococcus are other common agents; however, due to vaccination against *Hemophilus influenzae* Type B, these organisms are considered as a rare cause of septic arthritis. Nevertheless, in countries without the

practice of routine vaccination against *Hemophilus influenzae* Type B, *Streptococcus* group A has been reported as a common cause of septic arthritis (2, 10, 11). The diagnosis of septic arthritis is carried out according to the history taking and physical examination in addition to laboratory results, imaging, and arthrocentesis (6). Arthrocentesis and synovial fluid analysis are the best approaches and, indeed, the test of choice for rapid diagnosis of the disease (2, 11, 12). Laboratory results emerge as leukocytosis, increased Erythrocyte Sedimentation Rate (ESR), and C-reactive protein (CRP), where simple radiography, sonography, computerized tomography (CT), Magnetic Resonance Imaging (MRI), and radionucleotide scan can help for a definite diagnosis. For the hip joint septic arthritis, sonography is indeed the diagnostic method of choice (2, 13, 14).

The initiation of primary antibiotic treatment is based on the prevalence of possible organisms, the age of the child, and synovial fluid gram staining. The antibiotic treatment should develop proper therapeutic levels in the joint and have suitable coverage for common organisms. In joints such as hip and shoulder, in addition to pharmacotherapy, surgery and pus drainage are also essential. The treatment course is characterized by the clinical improvement of fever, pain, and the reduction of ESR and CRP (2, 15).

Septic arthritis is considered a pediatric emergency, and delay in proper diagnosis and treatment leads to severe consequences for the patient. Accordingly, the clinical and laboratory symptoms of septic arthritis must be known rapidly for a timely diagnosis of the disease and proper therapeutic regimens. In this study, we intended to examine the clinical and laboratory profile of septic arthritis patients hospitalized in the pediatric ward of Imam Reza Hospital (Mashhad, Iran). According to the results, practical

solutions would be presented for the diagnosis and treatment of this disease.

**2- MATERIALS AND METHODS**

**2-1. Study design and population**

This retro-prospective study was performed on 2-month to 16-year-old children hospitalized and treated with the diagnosis of septic arthritis from March 2011 to March 2019 in the pediatric ward of Imam Reza Hospital, Mashhad, Iran.

**2-2. Methods**

All files (2011-2017) of septic arthritis patients were evaluated. Moreover, hospitalized patients (2017-2019) suspected of septic arthritis were examined until discharge. Essential information of patients was completed using a questionnaire. A checklist was prepared to capture age, gender, clinical symptoms, and the chief complaint of the patient, laboratory findings, duration of hospitalization, type of treatment, and the affected joint, and it was completed based on the available files of the patients.

**2-3. Ethical consideration**

The parents completed informed consent in hospitalized patients. Moreover, the study protocol was fully approved by the Ethics Committee of Mashhad University of Medical Sciences (IR.MUMS.fm.REC.1395.185).

**2-4. Inclusion and exclusion criteria**

All patients whose hospital files were complete or who had not left the hospital by the time of discharge were included in our study. Incomplete files and patients who were ill or had the skeletal disease or severe immune disorder were excluded from the study.

**2-5. Data Analyses**

After collecting data, the data were analyzed using SPSS version 22.0. A p-value of less than 0.05 was considered as statistically significant.

**3- RESULTS**

We studied 173 patients' profiles. The sex and age distribution of patients is shown in **Table. 1**. Further investigation was finding the month and season with the most frequency of patient referral. The results indicated that the maximum number of septic arthritis cases was observed in September with 16.9% and in summer with 38.3%. Out of the 173 patients suspected of having arthritis, 103 had clinical or laboratory symptoms of septic arthritis, the remaining 70 had viral and inflammatory arthritis and tenosynovitis. Half of the non-purulent arthritis cases (35 patients) had brucellosis. Out of all 173 studied patients, more than 60% had a history of trauma.

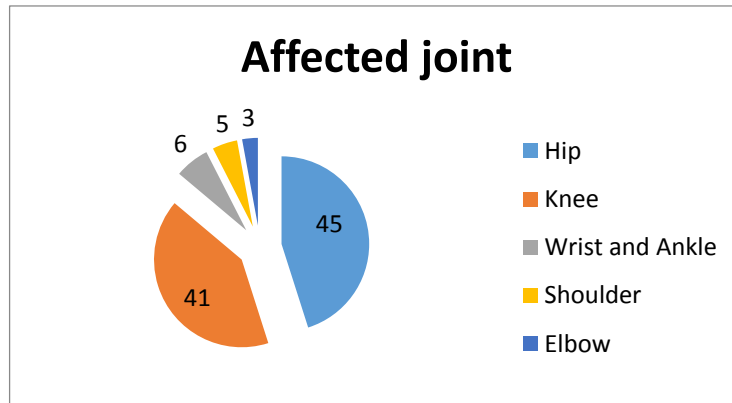
**Table-1:** Frequency distribution of patients on age and sex, n=173.

Feature	Category	Number (%)
Gender	Male	91 (53)
	Female	82 (47)
Age (Years)	Less than 2	55 (31.8)
	2-4	63 (36.4)
	4-6	5 (2.8)
	6-8	16 (9.4)
	More than 8	34 (19.6)

**3-1. Affected Joint**

Regarding the affected joints, the main one was the hip joint, which was observed in

78 patients, followed by the knee (n=41), wrist and ankle (n=11), shoulder (n=8), and elbow (n=5) as illustrated in **Figure. 1**.



**Fig.1:** Distribution of affected joints in patients on study suspected septic arthritis (Percentage).

**3-2. Clinical Signs and Symptoms**

The joint symptoms in this disease include pain, fever, claudication, and restricted movement. The local symptoms of the joint included warmth, redness, and

swelling. As shown in **Table. 2**, the main symptoms observed in the patients were fever (n=134, 77.4%). It was followed by pain (n=108, 62.4%), swelling (n=75, 43.3%), and movement restriction (n=59, 34.1%).

**Table-2:** Frequency distribution of patients on joint symptoms.

Symptoms	Abundance	Percentage
Fever	134	77.4%
Joint Pain	108	62.4%
Swelling	75	43.3%
Limitation of motion	59	34.1%

**3-3. Laboratory Symptoms**

1- Culture: In our patients, 11 cases (6%) had a positive blood culture, and 4 cases had a positive joint culture. Staphylococcus aureus was the most common germ. **Table. 3** shows the frequency of organisms grown in the

blood. Five patients with septic arthritis had a positive Wright’s test after treatment and drainage (Brucellosis). 2- CRP: The CRP was negative in 5.2% and positive in 94.8% of patients. The maximum level was +1. The frequency distribution of CRP was qualitatively outlined in **Table. 4**.

**Table-3:** Frequency distribution of blood and joint culture organism, n=11.

Feature	Category	Number (%)
Blood culture	<i>Staphylococcus aureus</i>	5 (45.4)
	<i>Enterobacter</i>	2 (18.2)
	<i>Streptococcus</i>	1 (9.1)
	<i>Streptococcus viridans</i>	1 (9.1)
	<i>Haemophilus influenzae</i>	1 (9.1)
	<i>E. coli</i>	1 (9.1)
Joint culture	<i>Enterobacter</i>	1
	<i>Staphylococcus aureus</i>	4

**Table-4:** Frequency distribution of CRP in different ranges.

CRP	Abundance	Percentage
Negative	9	5.2%
1+	52	30.1%
2+	40	23.1%
3+	54	31.2%
4+	18	10.4%

CRP: C-reactive protein.

### 3-4. Type of Treatment

In 50 cases (29%), in addition to medical treatment, an arthrotomy of the affected joint had also been performed.

### 4- DISCUSSION

The present study aimed to assess the clinical and laboratory profile of septic arthritis among children. Septic arthritis develops following a joint space infection, which is transmitted through blood, and mostly occurs during the first two years of life and adolescence (2). In this study, most patients were boys with a 1.1:1 ratio. In a similar study in Tehran, the prevalence among boys and girls was 1.8:1 (16). Similarly, in another study on infants, the male-to-female ratio was 1.95:1 (17). In the present study, most patients were younger than four years old. In the study conducted by Nelson on 682 children with septic arthritis, it was found that 53% of them were younger than two years old (18). In the present study, regarding the

clinical symptoms of patients, the pain was observed among 62.4% of them. Moreover, in the study conducted by Goergen et al., the major clinical symptom was pain, which was observed in 100% of patients (24). While the patients may not necessarily have a fever in septic arthritis, among our patients, the fever had been reported in 77.4%, and the study by Goergen et al. also reported 28% afebrile patients (19). ESR and CRP are used as an index in the diagnosis and course of treatment. They have high-sensitivity but are not specific (20). In the present study, ESR was positive in 99% of patients, with a maximum level within the range of 40- and the mean of 55.5. Furthermore, CRP had been reported positive in 94.8% of patients. In the study by Bonhoeffer et al., ESR and CRP were reported positive in 100% and 85% of patients, respectively (21). In a similar study by Kao et al. on children with septic arthritis, ESR, and CRP were elevated respectively in 91% and 88% of pediatric patients (20). A significant diagnostic measure is the

aspiration of the synovial fluid from affected joints for smear, culture, and analysis (18, 22, 23). In our patients, 11 cases had positive blood culture, with *Staphylococcus aureus* being the most common germ with five positive cases (45.4%). Four positive joint cultures had also been reported. In a similar study by Justin Kung, out of 167 patients, joint culture was positive in 31 patients, in which the major germ was *Staphylococcus aureus* (24). Furthermore, several studies have mentioned *Staphylococcus aureus* as the major cause of infection (23, 25). The reason for the negative synovial fluid culture in infected arthritis can be the presence of uncommon organisms, wrong laboratory techniques, or the patients who have consumed antibiotics before aspiration (2).

#### 4-1. Limitations of the study

File limitations and hospital discharge in patients who were hospitalized before the diagnosis was among the limitations of this study.

### 5- CONCLUSION

Generally, for the patients who refer with fever and joint pain, while considering differential diagnoses, septic arthritis should be kept in mind, and through precise examination and necessary tests, the treatment should be initiated as rapidly. Since any delay in the diagnosis and treatment of the disease can lead to severe and irrecoverable consequences. Moreover, ESR and CRP have high-sensitivity in the disease diagnosis. Furthermore, in children who have arthritis, even septic arthritis should be considered for brucellosis, and a Wright's test should be requested.

### 7- ACKNOWLEDGEMENTS

We thank Mashhad University of Medical Sciences Research Vice Chancellor for approving the research project (Research

No: 950570). We also thank Dr. Maryam Soodmand for helping with the study.

### 6- CONFLICT OF INTEREST: None.

### 7- REFERENCES

1. Alarcón AE, Shetty AK, Gedalia A. Septic Arthritis in Children: Clinical Update. *Infections and the Rheumatic Diseases*: Springer; 2019. p. 29-40.
2. Kliegman RM, Behrman RE, Jenson HB, Stanton BM. *Nelson textbook of pediatrics e-book*: Elsevier Health Sciences; 2007.
3. Pääkkönen M. Septic arthritis in children: diagnosis and treatment. *Pediatric health, medicine and therapeutics*. 2017;8:65.
4. Tanwar Y, Jaiswal A, Singh S, Arya R, Lal H. Acute pediatric septic arthritis: a systematic review of literature and current controversies. *Polish orthopedics and traumatology*. 2014;79:23-9.
5. Jackson MA, Burry VF, Olson LC. Pyogenic arthritis associated with adjacent osteomyelitis: identification of the sequela-prone child. *The Pediatric infectious disease journal*. 1992;11(1):9-13.
6. Montgomery NI, Epps HR. Pediatric septic arthritis. *Orthopedic Clinics*. 2017;48(2):209-16.
7. García-Arias M, Balsa A, Mola EM. Septic arthritis. *Best practice & research Clinical rheumatology*. 2011;25(3):407-21.
8. Gigante A, Coppa V, Marinelli M, Giampaolini N, Falcioni D, Specchia N. Acute osteomyelitis and septic arthritis in children: a systematic review of systematic reviews. *Eur Rev Med Pharmacol Sci*. 2019;23(2):145-58.
9. Pääkkönen M, Peltola H. Management of a child with suspected acute septic arthritis. *Archives of disease in childhood*. 2012;97(3):287-92.
10. Kocher MS, Mandiga R, Murphy JM, Goldmann D, Harper M, Sundel R, et al. A clinical practice guideline for treatment of septic arthritis in children: efficacy in improving process of care and effect on

outcome of septic arthritis of the hip. *JBJS*. 2003;85(6):994-9.

11. Brown DW, Sheffer BW. Pediatric Septic Arthritis: An Update. *The Orthopedic clinics of North America*. 2019;50(4):461.

12. Agarwal A, Aggarwal AN. Bone and joint infections in children: septic arthritis. *The Indian Journal of Pediatrics*. 2016;83(8):825-33.

13. Plumb J, Mallin M, Bolte RG. The role of ultrasound in the emergency department evaluation of the acutely painful pediatric hip. *Pediatric emergency care*. 2015;31(1):54-8.

14. Ben-Zvi L, Sebag D, Izhaki G, Katz E, Bernfeld B. Diagnosis and Management of Infectious Arthritis in Children. *Current infectious disease reports*. 2019;21(7):23.

15. Deshpande S, Taral N, Modi N, Singrakhia M. Changing epidemiology of neonatal septic arthritis. *Journal of orthopaedic surgery*. 2004;12(1):10-3.

16. Zamani A, Raeeskarami S.R, Akbrai Asbagh P, Oloomi Yazdi Z, Matloob R, Zamani N, et al. Pediatric septic arthritis: a 10-year epidemiologic study in Imam Khomeini Hospital Complex. *Tehran University Medical Journal*. 2010;67(10):736-42.

17. Amini E, Daneshjou Kh, M G. A 17-year study of septic arthritis in neonates in two University Hospitals. *Tehran University Medical Journal*. 2007;65(5):33-8.

18. Nelson JD. Osteomyelitis and suppurative arthritis. *Infectious Diseases of Children*. 1998:273-84.

19. Goergens E, McEvoy A, Watson M, Barrett I. Acute osteomyelitis and septic arthritis in children. *Journal of paediatrics and child health*. 2005;41(1-2):59-62.

20. Kao HC, Huang YC, Chiu C-H, Chang LY, Lee ZL, Chung PW, et al. Acute hematogenous osteomyelitis and septic arthritis in children. *Journal Of Microbiology Immunology And Infection*. 2003;36(4):260-5.

21. Bonhoeffer J, Haeberle B, Schaad UB, Heininger U. Diagnosis of acute haematogenous osteomyelitis and septic arthritis: 20 years experience at the University Children's Hospital Basel. *Swiss medical weekly*. 2001;131(39-40):575-81.

22. Kabak S, Halici M, Akcakus M, Cetin N, Narin N. Septic arthritis in patients followed-up in neonatal intensive care unit. *Pediatrics international*. 2002;44(6):652-7.

23. Wang C-L, Wang S-M, Yang Y-J, Tsai C-H, Liu C-C. Septic arthritis in children: relationship of causative pathogens, complications, and outcome. *Journal of microbiology, immunology, and infection= Wei mian yu gan ran za zhi*. 2003;36(1):41-6.

24. Kung JW, Yablon C, Huang ES, Hennessey H, Wu JS. Clinical and radiologic predictive factors of septic hip arthritis. *American Journal of Roentgenology*. 2012;199(4):868-72.

25. Christiansen P, Frederiksen B, Glazowski M, Scavenius M, Knudsen F. Acute hematogenous osteomyelitis and purulent arthritis in childhood. A 10-year study from the county of Copenhagen with a follow-up. *Ugeskrift for laeger*. 2002;164(36):4177-81.