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Research Article

RISK FACTORS AND CLINICAL PRESENTATION OF SEPTIC ARTHRITIS OF HIP IN INFANTS: A PROSPECTIVE STUDY

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ABSTRACT

Objective: The objective of this study was to analyze the risk factors and clinical presentation of septic arthritis of hip in infants.

Methods: Thirty infants with unilateral septic arthritis of hip were included in this study on the basis of a pre-defined inclusion and exclusion criteria. The study was conducted in PIOS Medilinks Pvt. Limited, Jaysingpur, Kolhapur, India. The duration of the study was 18 months from June 2021 to December 2022. The institutional ethical committee approved the study. The diagnosis of septic arthritis was made on the basis of Morrey's criteria. Risk factors associated with septic arthritis and clinical presentation were studied.

Results: Out of the total 30 infants diagnosed to be having septic arthritis of unilateral hip, 17 (57.67%) were males and 13 (43.33%) were females. In our study, an overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). Low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.33%) patients. All infants having septic arthritis had increased local temperature (100%) and reduced joint movements (100%). Erythema (86.67%), swelling (73.33%), and irritability (60%) were other common clinical features associated with septic arthritis. The most common offending organism was *Staphylococcus aureus* (33.33%) followed by *Klebsiella pneumoniae* (13.33%). The analysis of outcome at the end of 3-month follow-up showed that out of 30 studied cases, 28 (93.33%) infants had a painless hip with normal range of motion.

Conclusion: Septic arthritis of hip in infants is an emergency and requires prompt treatment. Any delay in diagnosis can have catastrophic consequences. However, in majority of appropriately managed infants, there is no residual damage to the affected joint.

Keywords: Septic arthritis, Morrey's criteria, Joint effusion, Clinical presentation, Outcome.

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INTRODUCTION

Septic arthritis is caused by infection and inflammation of hip joint. Septic arthritis in neonates and infants can be considered an emergency. High index of suspicion, early diagnosis, and prompt antimicrobial treatment is essential. Any delay in the diagnosis can have catastrophic consequences such as permanent damage to hip joint. In many cases of septic arthritis of hip in neonates, the diagnosis is delayed because of subtle as well as non-specific signs and symptoms [1].

The most common cause of septic arthritis in neonates as well as infants is hematogenous spread of microorganism from a distant focus. Irrespective of the etiology of arthritis, the inflammatory process that ensues consists of release of proteolytic enzymes by inflammatory cells. These proteolytic enzymes cause damage to joint cartilage [2]. This inflammatory process, release of proteolytic enzymes, and damage to joint cartilage result in compression of intra-articular blood vessels, thereby further compromising blood flow to the cartilage as well as bones in the vicinity. These changes if progress unchecked may cause necrosis and destruction of synovium and cartilage of hip join, and this destructive process may quickly spread to involve ligaments, femoral head, and adjacent bone [3].

The offending organism may depend upon the age of infant. In neonatal period as well as in infants <2 months of age, the most commonly involved organisms may include *Staphylococcus aureus*, *Escherichia coli*, Group B streptococci, and Gram-negative bacilli such as *Pseudomonas*. In older infants such as between the age of 2 months and 1 year, the common offending organisms include *Haemophilus influenzae*, *S. aureus*, Group A streptococci, and *Streptococcus* pneumoniae [4].

Irrespective of the offending organism, the clinical presentation in early phase is subtle and non-specific. This is non-specific symptomatology which makes it extremely difficult to diagnose septic arthritis at an early stage unless a high index of suspicion is maintained particularly in neonatal period. The usual presentation in neonatal period is excessive crying associated with refusal to tolerate any range of motion. A careful physical examination may reveal little or no range of motion, local tenderness, swelling, raised local temperature, and erythema. Constitutional symptoms such as fever and refusal to feed are present in majority of infants. The differential diagnosis which needs to be considered includes transient synovitis of hip which is a transient and self-limiting condition [5].

The diagnosis is usually made on the basis of clinical examination and confirmed by imaging and analysis of synovial fluid. An arthrocentesis needs to be performed in any infant who presents with constitutional symptoms such as refusal to feed and fever along with painful monoarticular arthritis. In cases of septic arthritis, synovial fluid will have abundant white blood cells (>50,000–100,000/mL), predominantly polymorphonuclear neutrophils. Culture sensitivity of synovial fluid may help in diagnosis as well as aiding in choosing appropriate antibiotic therapy. Advanced diagnostic tests such as polymerase chain reaction can be used in identifying the involved organisms. Imaging techniques such as X-ray may show widening of joint space secondary to joint effusion; however, this is not very sensitive in the diagnosis, particularly if effusion is relatively small. Ultrasound may show the presence of effusion and is fairly sensitive in expert hands. MR imaging and scintigraphy are usually reserved for cases in which the diagnosis is doubtful [6].

Once the diagnosis is made clinically and confirmed on the basis of imaging and synovial fluid analysis, the treatment is administration of parenteral antibiotics. In cases with significant effusion, an orthopedic consultation for irrigation and drainage of effusion may be indicated.

We undertook this study to analyze the risk factors and clinical presentation of septic arthritis of hip in infants.

METHODS

This was a prospective cohort study in which 30 infants with monoarticular septic arthritis of hip were included on the basis of a pre-defined inclusion and exclusion criteria. The study was conducted in PIOS Medilinks Pvt. Limited, Jaysingpur, Kolhapur, India. The duration of the study was 18 months from June 2021 to December 2022. The institutional ethical committee approved the study. Informed and written consent was obtained from parents of the infants to be part of the study. Demographic details such as age and gender were noted. A thorough general, systemic, and local examination was done. The presence of local erythema, pain, and tenderness was noted. The range of motion of the affected hip was determined. The diagnosis of septic arthritis was made when 2 of the major and 5 of the minor criteria as described by Morrey *et al*. are met [7] (Table 1).

All infants underwent complete blood count, C-reactive protein, erythrocyte sedimentation rate, blood culture, X-ray, and ultrasound examination of affected hip. All patients received parenteral antibiotics for 3–4 weeks. Irrigation and drainage of effusion was done in selected cases. In cases where irrigation and drainage of effusion was done, affected hip joint was meticulously debrided and extensively irrigated, and was subsequently immobilized with a continuous suction drain in a functional position for 2 weeks. Patients were followed up for 3 months. During each follow-up, the range of motion was determined. The presence of local pain or tenderness was also noted. If required, an ultrasound examination of affected hip was done during follow-up visit.

The sample size was calculated according to previous reference studies of septic arthritis hip. With assumptions 95% confidence interval, 5% marginal error and 80% power, the calculated sample size was 25. We therefore included 30 patients (more than minimum required number of patients) in our study. For statistical purposes, SSPS 21.0 software was used. Microsoft Excel was used for preparation of charts and graphs.

Inclusion criteria

1. Infants diagnosed to be having unilateral septic arthritis of hip on the basis of Morrey's criteria for septic arthritis
2. Parents gave informed consent.

Exclusion criteria

1. Parents refused consent
2. Infants with congenital skeletal deformities
3. Infants with transient synovitis of hip.

RESULTS

Out of the total 30 infants diagnosed to be having septic arthritis of unilateral hip, 17 (57.67%) were males and 13 (43.33%) were females. There was a slight preponderance of males as compared to females in patients with septic arthritis with a M: F ratio of 1:0.76 (Fig. 1).

In our study, an overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). In majority of the cases, right hip was involved (63.33%). Left hip was involved in the remaining 11 (36.67%) cases (Table 2).

Analysis of patients on the basis of risk factors for development of septic arthritis showed that low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.33%) patients. After low birth weight and premature infants, septicemia (10%), history of umbilical cord catheterization (6.67%), and birth asphyxia (6.67%) were other risk factors. History of invasive procedure and trauma was seen in 1 (3.34%) infant each (Fig. 2).

The analysis of the infants on the basis of clinical presentation showed that all infants having septic arthritis had increased local temperature (100%) and reduced joint movements (100%). Erythema (86.67%), swelling (73.33%), and irritability (60%) were other common clinical features associated with septic arthritis. Refusal to feed (46.67%) and lethargy (26.67%) were other common features seen in infants with septic arthritis (Fig. 3).

Diagnostic joint aspirate was done under ultrasound guidance in 9 (30%) cases. The analysis of blood culture and/or joint aspirate showed that the most common offending organism was *S. aureus*

Table 1: Morrey's criteria for the diagnosis of septic arthritis

Criteria	Condition
Major criteria (at least 2 conditions)	Pus aspirated from the joint Marked elevation of the erythrocyte sedimentation rate. Specific roentgenographic changes in the involved site.
Minor criteria (at least 5 conditions)	Fever>38.3°C Pain (localized to the joint) made worse by gentle passive motion Swelling of the involved joint Systemic symptoms of lethargy, malaise, irritability No other demonstrable pathological process Satisfactory response to antibiotic therapy

Table 2: Age and affected side distribution of the studied cases

Age group and affected side	No. of cases	Percentage
Age group		
Up to 1 month (Neonates)	24	80.00
1 month–2 months	3	10.00
2 months–6 months	2	6.67
6 months–1 year	1	3.33
Total	30	100
Affected side		
Right	19	63.33
Left	11	36.67
Total	30	100

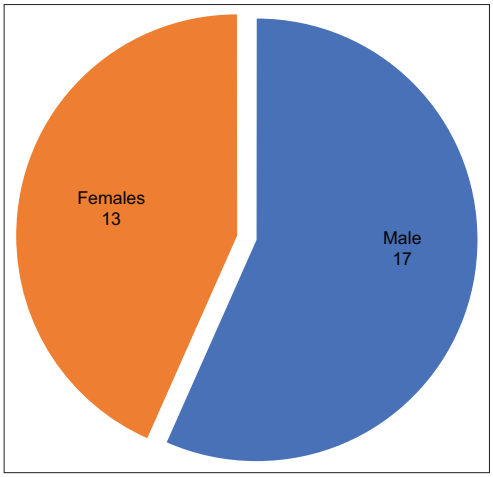

Fig. 1: Gender distribution of the studied cases

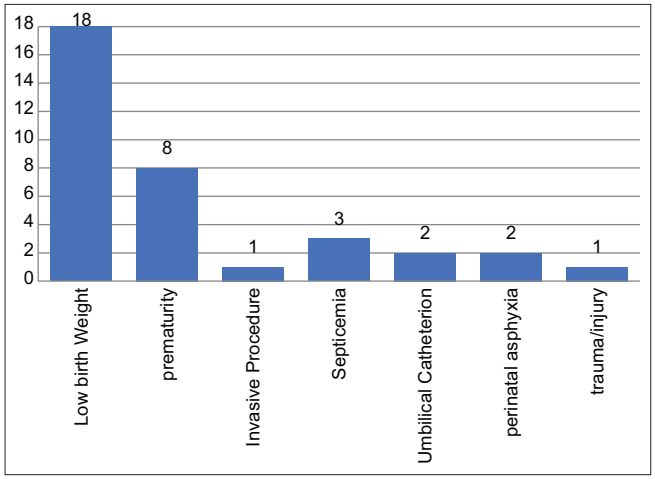

Fig. 2: Risk factors for the development of septic arthritis hip in infants

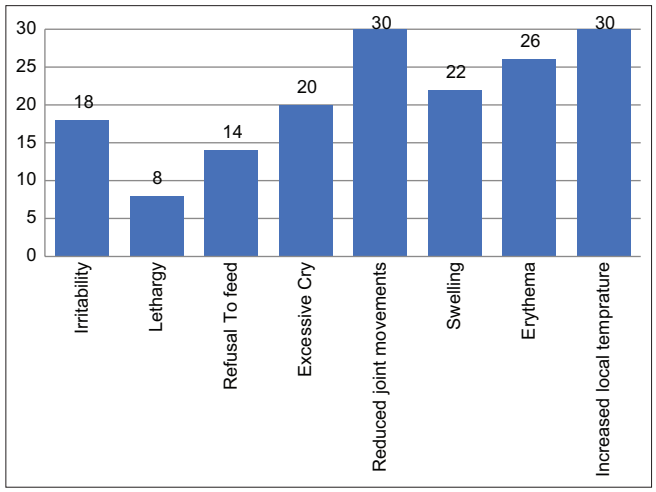

Fig. 3: Clinical presentation for the development of septic arthritis hip in infants

(33.33%) followed by *Klebsiella pneumoniae* (13.33%), Group B streptococci (10%), and *E. coli* (6.66%). *Pseudomonas aeruginosa* was found to be offending organism in 1 (3.33%) patient. In the rest of the infants (33.33%), no organism was found on blood culture or culture of joint aspirate (Table 3).

All infants received parenteral antibiotics. Empiric antibiotics were started immediately (combination of cefotaxime and vancomycin) and then switched over to appropriate antibiotics depending on culture sensitivity reports. If the joint aspirate or blood culture did not yield any bacterial growth, then antibiotics were stepped up to piperacillin+tazobactam and vancomycin to cover a wide spectrum of bacterial infection. The analysis of outcome at the end of 3-month follow-up showed that out of 30 studied cases, 28 (93.33%) infants had a painless hip with normal range of motion. Two (6.66%) infants were found to have painless but restricted hip movements of the affected hip joint.

DISCUSSION

This study comprised 30 infants who had been diagnosed with septic arthritis. Out of 30 infants, 17 (56.67%) were males and 13 (43.33%) were females. There was a slight preponderance of males as compared to females in patients with septic arthritis with a M: F ratio of 1:0.76. Madhan *et al*. conducted a study to analyze the clinical features and outcome of neonates with septic arthritis; for this purpose, 319

Table 3: Organism grown either on blood culture or joint aspirate

Organisms in blood culture or joint aspirate	No of cases	Percentage
Staphylococcus aureus	11	36.67
Klebsiella pneumoniae	5	16.67
Group B streptococci	3	10.00
Escherichia coli	2	6.67
Pseudomonas aeruginosa	1	3.33
No organisms	8	26.67
Total	30	100

neonates with septic arthritis irrespective of the joint involved, admitted to NICU, were included in this study [8]. The neonates who did not respond to antibiotic therapy were treated by arthrotomy and lavage of the affected joint. The male-to-female ratio of the affected cases in this study was found to be 1.73:1. Male preponderance found in this study was similar to our study. Similar male preponderance was also reported by the authors such as Caksen *et al*. [9] and Bono *et al*. [10].

In our study, an overwhelming majority of the patients belonged to neonatal age group (80%) followed by 1 month–2 months (10%). Only 3 infants were between 2 months and 1 year of age (10%). Infants, particularly neonates, are predisposed for development of septic arthritis because of hematogenous spread of organisms from a distant focus. Immature immune system allows such a hematogenous spread to take place without much hindrance. Halder *et al*. undertook a study of 10 infants with septic arthritis [11]. The mean age of presentation was 15.6 days. Similar age of presentation was also reported by the authors such as Devi *et al*. [12] and Li *et al*. [1].

The analysis of risk factors in our study showed that low birth weight and prematurity or a combination of these two factors was the most common risk factor in neonates with septic hip arthritis and was seen in 7 (23.33%) patients. After low birth weight and premature infants, septicemia (10%), history of umbilical cord catheterization (6.67%), and birth asphyxia (6.67%) were other risk factors. Kabak *et al*. conducted a study to identify risk factors for development of septic arthritis [13]. The common risk factors associated with septic arthritis were prematurity (4/14), umbilical catheterization or venous catheterization (3/14), sepsis (3/14), perinatal asphyxia (2/14), and difficult birth (1/14).

In our study, the analysis of blood culture and/or joint aspirate showed that the most common offending organism was *S. aureus* (33.33%) followed by *K. pneumoniae* (13.33%), Group B streptococci (10%), and *E. coli* (6.66%). *P. aeruginosa* was found to be offending organism in 1 (3.33%) patient. In the rest of the infants (33.33%), no organism was found on blood culture or culture of joint aspirate. Wang *et al*. conducted a study to analyze the microorganisms involved in cases of septic arthritis [14] The predominant causative organism in this study was *S. aureus* (43%, 25/58), 6 isolates of which were methicillin resistant, followed by coagulase-negative *Streptococcus*, *Streptococcus pneumoniae*, *Salmonella*, *H. influenzae* Type B, and Group B *Streptococcus*. A similar microbiological profile in cases of septic arthritis in infants was also reported by the authors such as Young *et al*. [15] and Rai *et al*. [16].

The analysis of outcome at the end of 3-month follow-up showed that out of 30 studied cases, 28 (93.33%) infants had a painless hip with normal range of motion. Two (6.66%) infants were found to have painless but restricted hip movements of the affected hip joint. Frederiksen *et al*. conducted a study to analyze the outcome of 22 patients with septic arthritis [17]. Risk factors for AO and SA were prematurity (13/22), respiratory distress syndrome (15/22), and perhaps most important: umbilical artery catheterization (15/22). Severe sequelae were found in only 1 patient, while 3 patients had slight asymptomatic changes. A similar good outcome of infants with properly treated septic arthritis

was also reported by the authors such as Pääkkönen [18] and Peltola *et al*. [19].

CONCLUSION

Septic arthritis in infants is an emergency in infants and requires a high index of suspicion for early diagnosis and treatment. The most common risk factors for development of septic arthritis are low birth weight and prematurity. If appropriately treated, majority of the infants having septic arthritis do not show any residual damage to affected joint.

CONFLICT OF INTEREST

None.

REFERENCES

1. Li Y, Zhou Q, Liu Y, Chen W, Li J, Yuan Z, *et al*. Delayed treatment of septic arthritis in the neonate: A review of 52 cases. Medicine (Baltimore) 2016;95:e5682. doi: 10.1097/MD.0000000000005682, PMID 28002339
2. Lavy CB. Septic arthritis in Western and sub-Saharan African children-a review. Int Orthop 2007;31:137-44. doi: 10.1007/s00264-006-0169-9, PMID 16741731
3. De Boeck H. Osteomyelitis and septic arthritis in children. Acta Orthop Belg 2005;71:505-15. PMID 16305073
4. Shirtliff ME, Mader JT. Acute septic arthritis. Clin Microbiol Rev 2002;15:527-44. doi: 10.1128/CMR.15.4.527-544.2002, PMID 12364368
5. Kocher MS, Zurakowski D, Kasser JR. Differentiating between septic arthritis and transient synovitis of the hip in children: An evidence-based clinical prediction algorithm. J Bone Joint Surg Am 1999;81:1662-70. doi: 10.2106/00004623-199912000-00002, PMID 10608376
6. Omene JA, Odita JC. Clinical and radiological features of neonatal septic arthritis. Trop Geogr Med 1979;31:207-12. PMID 505551
7. Morrey BF, Bianco AJ Jr., Rhodes KH. Septic arthritis in children. Orthop Clin North Am 1975;6:923-34. doi: 10.1016/S0030-5898(20)30955-X, PMID 1101133
8. Jeyaraman M, Jeyaraman N, Eswar R, Mohan SR. Arthrotomy and lavage of neonatal septic arthritis: A multicenteric study. J Orthop Bone Dis 2019;3:000186.
9. Caksen H, Oztürk MK, Uzüm K, Yüksel S, Ustünbaş HB, Per H. Septic arthritis in childhood. Pediatr Int 2000;42:534-40. doi: 10.1046/j.1442-200x.2000.01267.x, PMID 11059545
10. Bono KT, Samora JB, Klingele KE. Septic arthritis in infants younger than 3 months: A retrospective review. Orthopedics 2015;38:e787-93. doi: 10.3928/01477447-20150902-56, PMID 26375536
11. Halder D, Seng QB, Malik AS, Choo KE. Neonatal septic arthritis. Southeast Asian J Trop Med Public Health 1996;27:600-5. PMID 9185277
12. Devi RU, Bharathi SM, Anitha M. Neonatal septic arthritis: Clinical profile and predictors of outcome. Indian J Child Health 2017;4:10-4.
13. Kabak S, Halici M, Akcakus M, Cetin N, Narin N. Septic arthritis in patients followed-up in neonatal intensive care unit. Pediatr Int 2002;44:652-7. doi: 10.1046/j.1442-200x.2002.01649.x, PMID 12421264
14. Wang CL, Wang SM, Yang YJ, Tsai CH, Liu CC. Septic arthritis in children: Relationship of causative pathogens, complications, and outcome. J Microbiol Immunol Infect 2003;36:41-6. PMID 12741732
15. Young TP, Maas L, Thorp AW, Brown L. Etiology of septic arthritis in children: An update for the new millennium. Am J Emerg Med 2011;29:899-902. doi: 10.1016/j.ajem.2010.04.008, PMID 20674219
16. Rai A, Chakladar D, Bhowmik S, Mondal T, Nandy A, Maji B, *et al*. Neonatal septic arthritis: Indian perspective. Eur J Rheumatol 2020;7(Suppl 1):S72-7. doi: 10.5152/eurjrheum.2019.19052, PMID 35929862
17. Frederiksen B, Christiansen P, Knudsen FU. Acute osteomyelitis and septic arthritis in the neonate, risk factors and outcome. Eur J Pediatr 1993;152:577-80. doi: 10.1007/BF01954084, PMID 8354317
18. Pääkkönen M. Septic arthritis in children: Diagnosis and treatment. Pediatr Health Med Ther 2017;8:65-8. doi: 10.2147/PHMT.S115429, PMID 29388627
19. Peltola H, Pääkkönen M, Kallio P, Kallio MJ, Osteomyelitis-Septic Arthritis (OM-SA) Study Group. Prospective, randomized trial of 10 days versus 30 days of antimicrobial treatment, including a short-term course of parenteral therapy, for childhood septic arthritis. Clin Infect Dis 2009;48:1201-10. doi: 10.1086/597582, PMID 19323633