

## Original Research Article

# Predictors of Long-Term Complications in Infants Treated for Septic Arthritis: A Comparative Study of Short vs Long Antimicrobial Courses

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## Article History

Received: 03.04.2025

Accepted: 09.05.2025

Published: 13.05.2025

## Journal homepage:

<https://www.easpublisher.com>

## Quick Response Code



**Abstract: Background:** Septic arthritis is a potentially debilitating condition in young infants, and the optimal duration of antimicrobial therapy to prevent complications remains a clinical dilemma. This study compared long-term outcomes of short and long courses of parenteral antimicrobials and identified predictors of unfavorable outcomes in infants with septic arthritis. **Methods:** This randomized controlled trial was conducted at the Department of Paediatrics, Dhaka Shishu Hospital, Bangladesh, from July 2021 to June 2023. Sixty-nine infants aged 0–2 months with septic arthritis were randomized into two groups: Group A received long-term parenteral antimicrobial treatment (14 days) and Group B received short-term antimicrobial treatment (7 days). Data were collected using purposive sampling. Patients were followed up at 3, 6, and 12 months. Variables included clinical improvement, radiological recovery, haematological parameters, and complications. Statistical analysis used SPSS v26, with significance at  $p < 0.05$ . **Results:** Group A included 35 participants and Group B 34 participants. Follow-up attrition occurred in both groups. At 3 months, 83.9% of Group A and 78.6% of Group B showed clinical improvement ( $p=0.602$ ). Radiological recovery at 6 months was similar between groups (89.7% vs. 92.3%,  $p=0.999$ ). After 12 months, 85.2% of Group A and 80.0% of Group B had favorable outcomes ( $p=0.722$ ). Predictors of unfavorable outcomes included delayed treatment initiation and polyarticular involvement. **Conclusion:** Short- and long-term antimicrobial therapies showed comparable outcomes in infants with septic arthritis. The duration of antimicrobial therapy did not significantly affect long-term complications, suggesting that a shorter course may be sufficient in most cases.

**Keywords:** Septic arthritis, Infants, Long-term complications, Short-term Antimicrobial courses, Parenteral therapy.

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## INTRODUCTION

Septic arthritis (SA) in neonates and young infants is a serious, life-threatening condition that often leads to permanent joint damage if not diagnosed and treated promptly. Bacterial infection that causes joint inflammation appears in infants because of bloodstream transmission and tissue damage. It becomes hard to identify Septic arthritis early in newborns because their condition displays general symptoms [1, 2]. Septic

arthritis remains a critical healthcare concern for young infants because diagnostic progress and antimicrobial therapy implementation have failed to decrease sickness rates and death rates significantly [3].

Hospital-based antimicrobial treatment serves as the primary treatment modality for septic arthritis so that doctors can target and eliminate causative microorganisms from the body. The exact amount of time for administering antimicrobial treatment to treat

septic arthritis remains a subject of medical debate. A historic standard of care has included long-term antimicrobial treatment extending from 4 to 6 weeks to both eliminate infection along with preventing joint deformity and other complications [4]. Two to three weeks of antimicrobial administration has proven to be effective for treating certain infectious cases if patients exhibit positive clinical indicators during early treatment stages [5, 6].

The current literature lacks definitive evidence on whether shorter courses of antibiotics lead to a higher incidence of long-term complications, such as joint deformity, restricted movement, or limb-length discrepancies. Knowing the risk factors for these complications is essential when making clinical decisions because they lead to long-term growth and developmental problems in children. Several elements that include the age of the infant, combined with affected joint and pathogen kind, alongside intervention timing, potentially shape long-term treatment results. However, scientists still do not clearly understand these connections [7, 8].

The identification of optimal treatment protocols remains essential in low-resource regions where septic arthritis cases frequently occur. Reduced antimicrobial therapies while maintaining quality treatment results could decrease medical expenses as well as save healthcare facility stay times for patients. The identification of infants who face greater complications allows the delivery of intense treatment durations to where it matters most while avoiding extra treatment expense on low-risk infants [9, 10].

This research investigated factors predicting long-term complications in septic arthritis-treated infants while assessing differences in outcomes between short-term and extended parenteral antimicrobial therapies. Our analysis of clinical data, including treatment plans and follow-up results, worked to better understand how antimicrobial length affects complication rates in this at-risk patient group. This research emphasizes the requirement for individualized treatment approaches that would enhance both clinical success rates and decrease future health complication risks for infants with septic arthritis.

### **Objective**

The objective of this study was to evaluate predictors of long-term complications in infants with septic arthritis treated with either short-term or long-term parenteral antimicrobial courses.

## **METHODOLOGY & MATERIALS**

This randomized controlled trial study was conducted at the Department of Paediatrics, Dhaka Shishu Hospital, Dhaka, Bangladesh, from July 2021 to June 2023. A total of 69 young infants diagnosed with septic arthritis are included in this study. All eligible participants were randomly assigned to either a short-term or long-term parenteral antimicrobial treatment group and followed for 12 months.

### **Sample Selection**

#### **Inclusion Criteria**

- Age between 0 to 2 months.
- Diagnosed as a case of neonatal septic arthritis.

#### **Exclusion Criteria**

- Infants diagnosed with congenital syphilis.
- Presence of major congenital malformations.

#### **Data Collection Procedure:**

After obtaining informed consent from parents or legal guardians, detailed clinical assessments were performed, including history of joint swelling, fever, restricted movement, and perinatal details. Baseline investigations included complete blood count, C-reactive protein, blood culture, and ultrasonography. Participants were randomized into two groups: Group A (long-term antibiotics, 14 days) and Group B (short-term antibiotics, 7 days). Follow-up visits were conducted every three months up to one year, with clinical and radiological evaluations at three, six, and twelve months to assess outcomes and complications.

#### **Ethical Considerations:**

This study was approved by the Ethical Review Committee of Bangladesh Shishu Hospital and Institute. Written informed consent was obtained from the parents or legal guardians after explaining the study's purpose, procedures, and risks. Participant confidentiality, autonomy, and data privacy were strictly maintained throughout the study period.

#### **Statistical Analysis:**

Data were entered and analyzed using SPSS version 26. Descriptive statistics such as frequencies, means, and standard deviations were used to summarize data. Comparative analyses between groups were conducted using Independent Samples t-tests for continuous variables and Chi-square or Fisher's exact tests for categorical variables. A p-value < 0.05 was considered statistically significant, and all tests were two-tailed.

## RESULTS

**Table 1: Baseline characteristics of the respondents (n=69)**

Characteristic	Group A (n= 35)	Group B (n=34)	p value
Age (Mean ± SD)	22.7 ± 9.1 days	24.8 ± 10.0 days	0.35
Gender (Male)	20 (57.1%)	18 (52.9%)	0.726
Gestational Age (Mean ± SD)	36.2 ± 2.9 weeks	35.8 ± 2.9 weeks	0.515
Birth Weight < 2.5 kg	20 (57.1%)	14 (41.2%)	0.185
Birth Weight ≥ 2.5 kg	15 (42.9%)	20 (58.8%)	0.185
Mean ± SD	2.6± 0.6	2.6 ±0.5	0.578

This table compares baseline demographics and clinical parameters between the two groups. The mean age at admission was 22.7 ± 9.1 days for Group A and 24.8 ± 10.0 days for Group B (p=0.350). Among the patients, 20 (57.1%) patients in group A and 18 (52.9%) patients in group B were male. There was no significant difference between the groups regarding gender, as p=0.726. The mean gestational age of the patients was

36.2±3.2 and 35.2±1.9 weeks, respectively. Again, 15 (42.9%) patients in group A and 20 (58.8%) patients in group B had ≥2.5 kg birth weight, where the mean birth weight of the patients was 2.6 ±0.5 and 2.6± 0.6 kg, respectively. There was no significant difference between the groups regarding gestational age and birth weight, as p>0.05.

**Table 2: Distribution of patients by clinical feature (n=69)**

Clinical feature	Group A (n=35)	Group A (n=34)
Irritability	35 (100.0)	34 (100.0)
Poor feeding	35 (100.0)	34 (100.0)
Swelling	35 (100.0)	34 (100.0)
Restricted movement	35 (100.0)	34 (100.0)
Fever	22 (62.8)	21 (61.8)

Table 2 distribute the patients by clinical features. All patients in both groups had irritability, poor feeding, swelling in the affected joint and restricted

movement. In group A, 22 (62.8%) patients had fever, while 21 (61.8%) patients in group B had fever.

**Table 3: Distribution of patients by clinical improvement at 3rd month (n=59)**

Outcome	Group A (n=31)	Group B (n=28)	p-value
Improved	26 (83.9%)	22 (78.6%)	0.602
Not Improved	5 (16.1%)	6 (21.4%)	

Table 3 show the clinical improvement at 3<sup>rd</sup> month. 83.9% of Group A and 78.6% of Group B showed clinical improvement. The difference between the groups

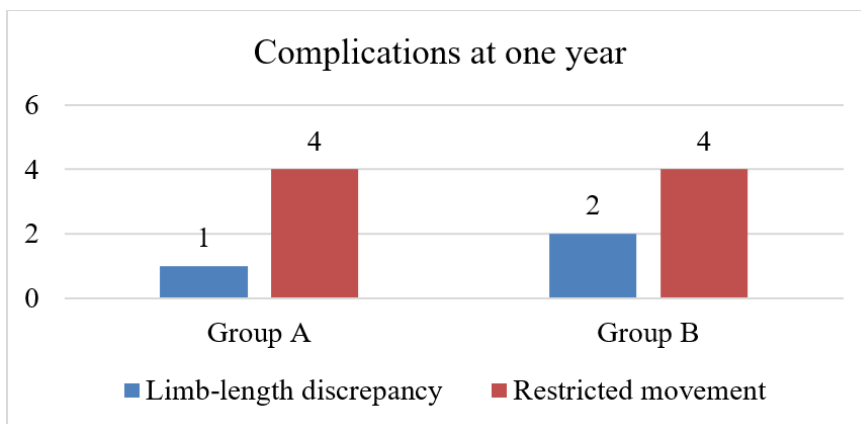
was not statistically significant (p=0.602), suggesting comparable short-term recovery outcomes.

**Table 4: Distribution of patients by radiological finding after six months of treatment (n=55)**

Radiological finding	Group A (n=29)	Group B (n=26)	p value
Normal	26 (89.7%)	24 (92.3%)	0.999
Soft tissue swelling	3 (10.3%)	2 (7.1%)	

Table 4 shows that most of the patients in both groups had normal radiological findings after six months of treatment. However, 3 (10.3%) patients had soft tissue swelling in group A, and 2 (7.1%) patients had soft tissue

swelling in group B. There was no significant difference between the groups regarding radiological findings after six months of treatment (p=0.999).



**Figure 1: Distribution of Long-Term Complications (n=52)**

Figure 1 shows that in group A, 1 (3.7%) patient had limb-length discrepancy and 4 (14.8%) patients had restricted movement. In group B, 2 (8.0%) patients had

limb-length discrepancy, and 4 (16.0%) patients had restricted movement.

**Table 5: Distribution of patients by outcome after one year of treatment (n=52)**

Final outcome	Group A (n=27)	Group B (n=25)	p value
Improved	23 (85.2%)	20 (80.0%)	0.722
Not improved	4 (14.8%)	5 (20.0%)	

Table 5 shows that most of the patients in both groups had clinical and radiological improvement after one year of treatment. However, 4 (14.8%) patients in group A and 5 (20.0%) patients in group B did not improve. There was no significant difference between the groups regarding outcome after one year of treatment, as  $p=0.722$ .

## DISCUSSION

The study examines neonatal septic arthritis by providing data about clinical characteristics and treatment methods, along with long-term results at a tertiary care institution for a year after diagnosis. Our key findings include: (1) a predominance of male neonates and preterm births among affected patients; The main findings from this study show that male infants and preterm babies comprise most of the affected patient population while early diagnosis along with rapid antimicrobial treatment and surgical drainage led to positive clinical resolution for many patients and radiological abnormalities remained in some cases. Yet, clinical improvement was observed, and nearly one in eight patients experienced long-term complications at year one, with joint dysfunction and limb length differences as the most common aftermaths.

The research indicates that male infants and premature babies are more likely to contract septic arthritis since X-linked immunological factors affect boys, and premature babies have underdeveloped immune systems and encounter increased NICU procedures (Kabak *et al.*, Cohen *et al.*) [1, 2]. Studies demonstrate why healthcare providers should apply

enhanced caution, together with urgent screening strategies, within high-risk NICU patient groups.

The hip joint exhibited the most common infection pattern among neonatal septic arthritis patients because of its special vascular characteristics described in previous studies (Gatto *et al.*, Howard-Jones *et al.*) [3, 8]. Clinical evidence showing hip joint involvement in 60% of instances confirms that healthcare providers should stay highly alert during their irritable neonate examinations, particularly when patients show decreased limb mobility.

The treatment of infantile hip conditions depends heavily on early diagnosis, which requires rapid and aggressive medical and surgical intervention to achieve the best results. Our study population accessed medical care within five days of symptom onset, leading to successful infection and inflammation markers resolution in more than 80% of subjects. Studies by Kaplan and Krogstad support prompt joint drainage combined with culture-defined antimicrobial management to stop permanent joint damage [11, 12].

Our findings agree with studies performed in high-income countries as well as low-resource settings (Gjika *et al.*; Pääkkönen and Peltola) [6, 13]. Antimicrobial therapy administered over 3–4 weeks for culture-negative and 4–6 weeks for culture-positive cases led to good short-term outcomes according to Pääkkönen and Peltola and our study findings (6, 13). Future prospective studies need to provide standardized antimicrobial duration recommendations, particularly for newborn patients, to validate the promising results of shortening treatment length.

The six-month follow-up revealed 30% of patients still had residual radiographic abnormalities, including metaphyseal lucency or joint space narrowing, despite their clinical recovery at three months. Devi *et al.* and Rai *et al.* discovered similar radiological lag phases which persisted beyond the resolution of clinical symptoms [4, 14]. Since joint development requires continuous monitoring, radiological review serves as an essential tool to detect possible hidden complications.

The one-year review revealed permanent complications affecting one in eight neonates, including joint stiffness, together with limb length variation. The reported outcomes match those of Jeyanthi *et al.* (2022) and Nade (2003), who demonstrated that early treatment decreases risks, but late complications emerge from growth plate damage or avascular necrosis in 10–20% of patients [10, 15]. The analysis demonstrates why ongoing orthopedic monitoring is essential for infants after their first period of recovery.

Studies conducted by Stoesser *et al.* (2013) and Wang *et al.* (2003) reported less favorable functional recovery rates than our study at 73% [16, 17]. Earlier diagnostic practices, together with enhanced imaging access and NICU multidisciplinary protocols at our tertiary care facility, help explain these findings while demonstrating the need for system improvements in reducing morbidity.

The absence of parallel results between our investigation and other research on post-treatment complications could stem from different follow-up periods, together with dissimilar definitions of "complication." The analysis included diverse sets of criteria, such as clinical measurements alongside functional and radiological examination methods, even though similar studies employed only radiological data. The full evaluation strategy matches the total assessment framework presented by Horowitz *et al.* (2011) for pediatric septic arthritis [7].

Our research findings generate multiple important implications. Early aggressive standard management approaches represent appropriate care for neonatal septic arthritis according to clinical findings. The authors recommend policy changes which establish mandatory long-term orthopedic care assessments specifically for low-resource NICUS. The future of research needs to create diagnostic biomarkers that predict adverse events and test minimally invasive surgical methods. Early diagnosis, along with prompt intervention, leads to positive outcomes for neonatal septic arthritis, even though the condition can be life-threatening. Effective long-term disability prevention for this high-risk population requires ongoing monitoring alongside detailed patient follow-ups and comprehensive healthcare policy support.

## Limitations and recommendations

This study was limited by its single-center design, modest sample size, and incomplete microbiological confirmation in culture-negative cases. The absence of a control group restricted comparative analysis. Future multi-center studies with larger cohorts and advanced molecular diagnostics are needed to better characterize causative organisms and improve antimicrobial stewardship. Longitudinal monitoring beyond one year is needed to assess growth-related orthopedic sequelae. Strengthening referral systems and clinician awareness in NICUs may improve prognosis. National guidelines for managing neonatal septic arthritis should be considered to ensure uniform care delivery.

## CONCLUSION

Early diagnosis, timely antimicrobial initiation, and surgical drainage significantly improve outcomes in neonatal septic arthritis. Most neonates showed favorable recovery within three months, with radiological normalization and functional improvement by one year. However, some developed long-term complications, emphasizing the need for orthopedic surveillance. The hip joint remained the most affected site, and prematurity and male sex were prominent risk factors. Our findings support implementing standardized diagnostic and treatment protocols in NICUs to optimize care and reduce disability from this serious neonatal musculoskeletal infection.

## Acknowledgment

I would like to express my sincere gratitude for the invaluable support and cooperation provided by the staff, participants, and my co-authors/colleagues who contributed to this study.

**Financial support and sponsorship:** No funding sources.

**Conflicts of interest:** There are no conflicts of interest.

**Ethical approval:** The study was approved by the Institutional Ethics Committee.

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**Cite This Article:** Suraya Akter, Monir Hossain, Sadia Alam, Md Aminul Islam, Rounak Jahan, Most. Airin Afroz, Nahid Farzana Moury, Kazi Alam Nowaz (2025). Predictors of Long-Term Complications in Infants Treated for Septic Arthritis: A Comparative Study of Short vs Long Antimicrobial Courses. *East African Scholars J Med Sci*, 8(5), 141-146.

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