


## ORIGINAL ARTICLE

# Surgical Versus Conservative Management of Paediatric Femur Fractures – A Comparative Study

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## ABSTRACT

**Background:** Paediatric femoral shaft fractures represent a major cause of morbidity in children, with management varying widely between conservative and surgical approaches. Determining the most suitable treatment requires evaluation of demographic characteristics, fracture patterns and clinical outcomes within specific healthcare contexts. **Objective:** This study compared the treatment outcomes between conservative and surgical management of paediatric femoral shaft fractures in a tertiary center in Bangladesh. **Methods & Materials:** This comparative observational study was conducted in the Department of Orthopedic Surgery, Ideal Health City, Rangpur, Bangladesh, from January 2021 to December 2024. A total of 100 children aged 2–14 years with diaphyseal femoral fractures were included and assigned to conservative ( $n = 50$ ) or surgical ( $n = 50$ ) groups. Data were collected from clinical records and radiographs. Descriptive statistics summarized baseline variables and group comparisons were performed using  $t$ -tests and chi-square tests, with significance set at  $p \leq 0.05$ . **Results:** Surgical treatment was more frequently performed in older children and those sustaining high-energy trauma. Transverse fractures predominated in the conservative group, whereas oblique and spiral patterns were more common surgically. Surgical treatment demonstrated significantly shorter time to radiographic union, reduced hospital stays and earlier full weight-bearing. Limb length discrepancy and malunion occurred more frequently with conservative treatment, while infection and re-intervention were observed only in surgically managed children. **Conclusion:** Surgical fixation offers faster recovery and fewer alignment-related complications in older children, whereas conservative treatment remains appropriate for younger patients with stable fractures.

**Keywords:** Femoral shaft fracture, paediatric trauma, conservative management, surgical fixation.

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## INTRODUCTION

Femoral shaft fractures are among the most severe injuries encountered in paediatric trauma, representing a significant proportion of long-bone fractures in children worldwide and carrying important implications for mobility, growth and long-term function [1,2]. These injuries typically arise from high-energy mechanisms such as road traffic accidents or falls from height, although the specific aetiology varies across geographical regions and socioeconomic contexts [3]. In many low- and middle-income countries, including Bangladesh, the burden of paediatric femoral fractures remains substantial owing to inadequate road safety, limited play-area supervision and delayed access to specialized trauma care [4]. The management of these fractures has evolved considerably, with multiple treatment options now available depending on patient age, fracture configuration, resource availability and surgeon preference [5].

Traditionally, conservative methods such as traction followed by hip spica casting were widely used in younger children due to their satisfactory healing potential and the remodeling capacity of paediatric bone [6]. However, longer hospitalization, prolonged immobilization and risks of malalignment have been noted as limitations of conservative management. With advances in paediatric orthopaedics, surgical interventions such as titanium elastic nailing, plating and external fixation have gained prominence, particularly among school-aged children and in cases involving unstable or length-unstable fractures [7,8]. Contemporary clinical guidelines increasingly emphasize operative fixation for older children to achieve earlier mobilization, reduced hospital stay and more predictable alignment outcomes [9].

Despite these developments, treatment practices vary markedly between regions and institutions. Differences in healthcare infrastructure, surgical expertise, implant availability and cultural expectations contribute to

heterogeneous management approaches [10]. Many facilities in resource-limited settings continue to rely extensively on conservative methods, even when surgical fixation may offer biomechanical or practical advantages. Conversely, some centers report a growing preference for operative strategies, reflecting global shifts in paediatric fracture management and improved availability of implants and imaging support [11]. This variability underscores the need for context-specific evidence evaluating the relative performance of available treatment modalities within local healthcare conditions.

Studies from different settings have compared conservative and surgical management and generally reported faster union, improved alignment and earlier functional recovery among surgically treated children [12]. However, conservative treatment continues to yield favorable outcomes in younger children, particularly those with stable or minimally displaced fracture patterns, due to substantial remodeling capacity and robust healing potential [13]. While international research provides important insights, evidence from Bangladesh remains limited. Existing regional studies often involve small cohorts, lack uniform treatment protocols, or focus on a single modality, restricting the generalizability of their findings. As a result, gaps persist regarding the comparative performance of conservative and surgical strategies in local clinical settings.

Given these considerations, a structured evaluation comparing both modalities within a Bangladeshi tertiary care environment is warranted. This study aims to assess demographic characteristics, injury patterns, early treatment outcomes and complication profiles among children treated for diaphyseal femoral fractures. By generating contextually relevant evidence, the study seeks to support more informed decision-making and contribute to the optimization of paediatric trauma care in resource-constrained environments.

**OBJECTIVES**

This study aimed to compare treatment outcomes between conservative and surgical management of paediatric femoral shaft fractures in a tertiary center in Bangladesh.

**METHODS & MATERIALS**

This comparative observational study was conducted in the Department of Orthopedic Surgery, Ideal Health City, Rangpur, Bangladesh. Data collection spanned January 2021 to December 2024. The study population comprised children aged 2–14 years who presented with diaphyseal femoral shaft fractures. A total of 100 patients were included and categorized into two groups based on treatment modality: conservative management (n = 50) and surgical management (n = 50).

**RESULTS**

**Table – I: Baseline Characteristics of Study Participants (n = 100)**

| Variable               | Conservative (n = 50) | Surgical (n = 50) | p-value |
|------------------------|-----------------------|-------------------|---------|
| Age (years), mean ± SD | 6.2 ± 2.1             | 8.5 ± 2.8         | <0.001  |
| Gender                 | Male                  | 42 (84.0)         | 0.453   |
|                        | Female                | 12 (24.0)         |         |
| Residence              | Rural                 | 34 (68.0)         | 0.833   |
|                        | Urban                 | 18 (36.0)         |         |
| Socioeconomic status   | Low                   | 28 (56.0)         | 0.417   |
|                        | Middle                | 14 (28.0)         |         |
|                        | High                  | 2 (4.0)           |         |

Table I summarizes the baseline profile of the participants. Children in the conservative group were younger (mean age

**Selection Criteria:**

**Inclusion Criteria**

- Children aged 2–14 years with radiologically confirmed diaphyseal femoral shaft fracture.
- Patients were treated with either conservative (traction or hip spica) or surgical techniques (elastic nails, plating, or external fixation).
- Presentation within 7 days of injury.
- Availability of complete medical records and follow-up data.

**Exclusion Criteria**

- Pathological femur fractures.
- Polytrauma patients require prioritized management for life-threatening injuries.
- Previous femoral fractures or congenital limb abnormalities.
- Associated neurovascular or open injuries requiring specialized intervention.

**Data Collection Procedure**

Data were collected from patients clinical records, operative notes and follow-up documentation maintained in the orthopedic department. A structured data extraction sheet was used to ensure consistency across recorded variables, including demographic information, socioeconomic indicators, mechanism of injury, fracture classification, treatment modality, time to radiographic union and occurrence of treatment-related complications. Radiological data were reviewed through archived digital imaging using standard anteroposterior and lateral femur radiographs and union was assessed by cortical bridging and absence of fracture-site tenderness. Treatment details, such as traction duration, application of hip spica and type of implant used, were recorded directly from procedural logs.

Clinical follow-up records were used to extract information on hospital stay, time to full weight-bearing and complications such as limb length discrepancy, malunion, infection, or need for re-intervention. Informed consent had been obtained at the time of treatment and confidentiality was maintained through anonymization of patient identifiers during data handling and analysis. Data were analyzed using SPSS version 26.0. Descriptive statistics were summarized using means, standard deviations, frequencies and percentages. Continuous variables were compared using the independent samples t-test, while categorical variables were analyzed using chi-square tests. A p-value ≤0.05 was considered statistically significant.

6.2 ± 2.1 years) compared with the surgical group (8.5 ± 2.8 years). Male children comprised most cases in both groups

(76% vs. 84%). Rural residence was common (64% vs. 68%) and low socioeconomic status was predominant in both groups (68% vs. 56%).

**Table – II: Mechanism of injury and fracture characteristics (n=100)**

| Variable            | Conservative (n = 50) | Surgical (n = 50) | p-value   |        |
|---------------------|-----------------------|-------------------|-----------|--------|
| Mechanism of injury | Fall from height      | 20 (40.0)         | 12 (24.0) | 0.0132 |
|                     | Road traffic accident | 12 (24.0)         | 28 (56.0) |        |
|                     | Sports injury         | 8 (16.0)          | 4 (8.0)   |        |
|                     | Others                | 10 (20.0)         | 6 (12.0)  |        |
| Fracture type       | Transverse            | 22 (44.0)         | 6 (12.0)  | 0.001  |
|                     | Oblique/spiral        | 12 (24.0)         | 30 (60.0) |        |
|                     | Comminuted            | 8 (16.0)          | 4 (8.0)   |        |
|                     | Segmental/other       | 8 (16.0)          | 10 (20.0) |        |

Table II presents injury mechanism and fracture morphology. Falls from height were the leading cause in the conservative group (40%), whereas road traffic accidents dominated among surgical cases (56%). Transverse fractures were more

common in the conservative group (44%), while oblique/spiral fractures predominated in the surgical group (60%).

**Table – III: Early clinical outcomes following conservative and surgical management**

| Variable                                       | Conservative (n = 50) | Surgical (n = 50) | p-value |
|--|-----------------------|-------------------|---------|
| Time to union (weeks), mean ± SD               | 12.5 ± 3.1            | 9.0 ± 2.4         | <0.001  |
| Hospital stays (days), mean ± SD               | 7.2 ± 2.0             | 3.8 ± 1.6         | <0.001  |
| Time to full weight-bearing (weeks), mean ± SD | 10.5 ± 2.8            | 6.2 ± 1.9         | <0.001  |

Table III outlines early outcomes, showing clear differences between treatment modalities. Surgical management resulted in significantly faster union (9.0 ± 2.4 vs. 12.5 ± 3.1 weeks),

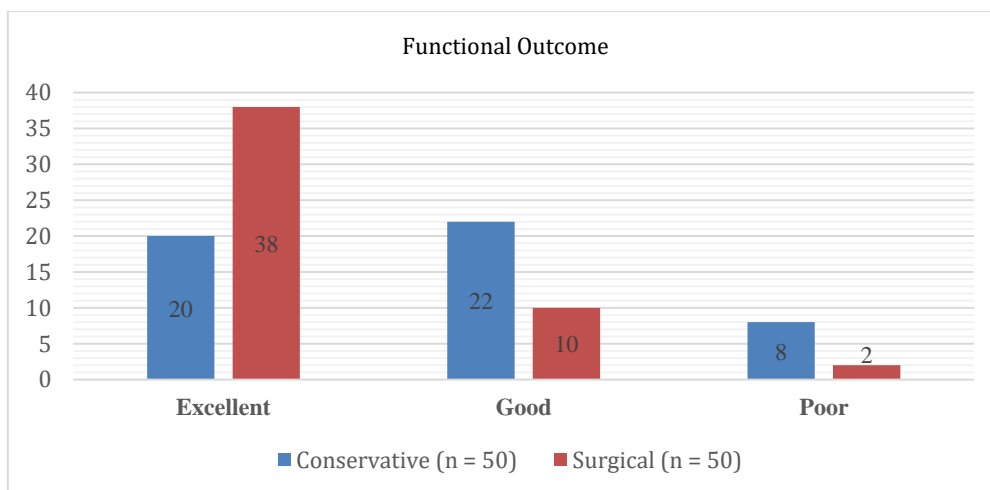
shorter hospital stays (3.8 ± 1.6 vs. 7.2 ± 2.0 days) and earlier full weight-bearing (6.2 ± 1.9 vs. 10.5 ± 2.8 weeks).

**Table – IV: Complications observed during follow-up in both treatment group (n=100)**

| Complications                   | Conservative (n = 50) | Surgical (n = 50) | p-value |
|---------------------------------|-----------------------|-------------------|---------|
| Limb length discrepancy (>1 cm) | 7 (14.0)              | 2 (4.0)           | 0.162   |
| Malunion                        | 6 (12.0)              | 1 (2.0)           | 0.117   |
| Infection                       | 0 (0.0)               | 3 (6.0)           | 0.241   |
| Re-intervention required        | 0 (0.0)               | 2 (4.0)           | 0.475   |

Table IV summarizes complication patterns. Limb length discrepancy (14% vs. 4%) and malunion (12% vs. 2%) were more frequent in the conservative group, while infection (6%)

and re-intervention (4%) occurred only in surgically treated children. Although complication types differed, overall rates remained low in both groups.



**Figure – 1: Functional outcomes at 12-month follow-up (Flynn’s criteria)**

Figure 1 illustrates functional outcomes at 12 months. The surgical group achieved a higher proportion of excellent outcomes (76%) compared with the conservative group

(40%), while poor outcomes were less frequent among surgical patients (4% vs. 16%).

## DISCUSSION

The findings of this comparative observational study demonstrate clear differences in demographic patterns, injury mechanisms, treatment outcomes and complication rates between conservative and surgical management of paediatric femoral shaft fractures. The mean age differed markedly between the study groups, with younger children more frequently treated conservatively, whereas older children tended to undergo operative fixation. This pattern aligns with observations by Shakya et al., who reported a strong correlation between age and treatment preference, reflecting both patient-related factors and surgeon decision-making [1]. Similarly, Sun et al. emphasized that age-based treatment algorithms remain central to contemporary practice due to differences in bone healing potential and remodeling capacity [9].

The mechanism of injury differed significantly, with road traffic accidents dominant among surgically treated patients, a finding consistent with trends reported in recent paediatric trauma literature from rapidly urbanizing regions. Navarro Vergara and Fretes associated road traffic accidents with higher-energy trauma and more complex fracture patterns, which often necessitate operative stabilization [3]. This relationship between mechanism and fracture morphology was also evident in the present study, where oblique and spiral fractures were more prevalent in the surgically managed group. Similar patterns have been described by Dey et al., who noted a higher incidence of unstable fracture configurations among older children and those exposed to high-energy trauma [7].

Treatment outcomes showed clear differences between the two modalities. Surgical management resulted in significantly faster radiological union, shorter hospitalization and earlier full weight-bearing. These findings are consistent with those of Yaokreh et al., who identified accelerated recovery as a principal advantage of operative fixation in school-aged children [4]. Grauberger et al. also reported that earlier intervention and stable fixation techniques contribute to reduced healing time and improved early rehabilitation [2]. Likewise, the current study reflects global shifts in paediatric orthopaedics, wherein flexible intramedullary nailing has been widely adopted as a safe and effective method for children above five years of age, as supported by Rollo et al. and Atassi et al. [14,15].

Despite the advantages of surgical treatment, complications remain an important consideration. In this study, malunion and limb length discrepancy occurred more frequently in conservatively managed children, a trend consistent with the classic limitations of traction and spica casting reported in several earlier studies [16]. However, surgical treatment was not without risks. Infection and the need for re-intervention were reported exclusively in the operative group, findings that mirror outcomes described by Radamessi et al., who highlighted the potential for implant-related complications in polytraumatized or high-energy injury patients [17]. These observations reinforce the ongoing debate regarding the balance between the predictability of surgical alignment and the biological advantages of conservative treatment in selected age groups.

Functional outcomes at the 12-month follow-up demonstrated a higher proportion of excellent results among surgically treated patients, supporting international evidence favoring

operative stabilization for older children or unstable fracture patterns. This aligns with the conclusions of Chen et al., whose meta-analysis confirmed superior functional outcomes associated with elastic stable intramedullary nailing compared to conservative methods [13]. Meanwhile, younger children continue to demonstrate satisfactory recovery with non-operative management [12].

The present study also contributes to regional literature by providing context-specific data from a Bangladeshi tertiary center. Treatment practices in Bangladesh vary widely based on resource availability, surgeon experience and socioeconomic considerations. The predominance of low-income participants underscores the importance of cost-effective treatment planning, a factor highlighted in several low-resource-setting studies [4]. In many such contexts, conservative treatment remains a practical option, particularly for stable fractures and younger children.

Altogether, the findings reaffirm that both conservative and surgical options remain viable within specific clinical indications. Surgical management offers faster recovery and more predictable alignment for older children, whereas conservative treatment continues to provide satisfactory outcomes for younger patients with stable fractures. The study strengthens existing literature by validating these principles within a Bangladeshi healthcare setting, offering data that may guide future treatment protocols and resource allocation.

## CONCLUSION

Surgical management of paediatric femoral shaft fractures achieved faster union, shorter hospital stays and earlier mobilization compared with conservative treatment, particularly among older children and those with unstable fracture patterns. Conservative management, however, continued to yield acceptable outcomes in younger children with stable fractures. These findings underscore the importance of individualized treatment decisions based on patient age, fracture morphology and resource availability within the Bangladeshi clinical context.

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## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Shakya A, Kakadiya G, Soni Y, Garje V. A comparative study of the management of pediatric femoral shaft fractures treated conservatively with traction or spica casting. *International Journal of Research in Orthopaedics*. 2020 Jul;6(4):793.
2. Grauberger J, O'Byrne M, Stans AA, Shaughnessy WJ, Larson AN, Milbrandt TA. Does shorter time to treatment of pediatric femur shaft fractures impact clinical outcomes? *Journal of Pediatric Orthopaedics*. 2020 Jul 1;40(6): e435-9.
3. Vergara DN, Fretes AN. Femoral fractures in the immature skeleton: Characterization, risk factors and treatment options in a developing country. *Injury*. 2023 Nov 1; 54:110819.
4. Yaokreh JB, Sounkééré-Soro M, Tembely S, Kouamé YG, Thomas AH, Odéhouré-Koudou TH, Kouamé BD, Ouattara O. Compared outcomes of femoral shaft fracture treatment in school-age children in Sub-Saharan Africa: Primary open reduction and intramedullary K-wire fixation versus traction followed by spica

- cast. *African Journal of Paediatric Surgery*. 2021 Apr 1;18(2):79-84.
5. Liao GZ, Lin HY, Wang Y, Nistala KR, Cheong CK, Hui JH. Pediatric femoral shaft fracture: an age-based treatment algorithm. *Indian Journal of Orthopaedics*. 2021 Feb;55(1):55-67.
  6. Antabak A, Borščak N, Čagalj M, Ivelj R, Bumči I, Papeš D, Čavar S, Bogović M, Bulić K, Luetić T. Liječenje prijeloma bedrene kosti kod djece u Gradu Zagrebu. *Acta clinica Croatica*. 2020 Dec 1;59(4):686-94.
  7. Dey S, Mishra K, Nagda TV, Dhamele J, Rathod C, Dey D. Titanium elastic nailing with temporary external fixator versus bridge plating in comminuted pediatric femoral shaft fractures: a comparative study. *Indian Journal of Orthopaedics*. 2018 Oct;52(5):507-12.
  8. Hong P, Rai S, Tang X, Liu R, Li J. Operative choice for length-unstable femoral shaft fracture in school-aged children: locking plate vs. monolateral external fixator. *Frontiers in Pediatrics*. 2022 Feb 10; 9:799487.
  9. Sun J, Wang T, Zhao N, Chen H, Chen C. Pediatric femoral shaft fractures: the American Academy of Orthopaedic Surgeons clinical practice guidelines versus actual management in a teaching hospital. *Translational Pediatrics*. 2024 Jun 20;13(6):938.
  10. Arneitz C, Szilagyi I, Lehner B, Kienesberger B, Gasparella P, Castellani C, Singer G, Till H. Therapy preference of 131 parents confronted with a pediatric femoral fracture. *Frontiers in Pediatrics*. 2022 Aug 15; 10:949019.
  11. Li D, Wang X, Lu J, Xue M. Submuscular plating vs. elastic stable intramedullary nailing for diaphyseal femur fractures in children: a systematic review and meta-analysis. *Frontiers in Pediatrics*. 2023 Nov 8; 11:1256630.
  12. Zaidman M, Simanovsky N, Goldman V, Saleem-Zedan R, Jabal TA, Weisstub E. Titanium Elastic Nail Fixation Versus Spica Cast Application for the Treatment of Diaphyseal Femoral Fractures in Children Under Five Years Old: A Retrospective Study. *Cureus*. 2025 Jan 14;17(1).
  13. Chen Z, Han D, Wang Q, Li L. Four interventions for pediatric femoral shaft fractures: Network meta-analysis of randomized trials. *International Journal of Surgery*. 2020 Aug 1; 80:53-60.
  14. Rollo G, Guida P, Bisaccia M, Pichierra P, Filippini M, Lanzetti RM, Caraffa A, Stasi A, Russi V, Lupariello D, Meccariello L. TEN versus external fixator in the management of pediatric diaphyseal femoral fractures: evaluation of the outcomes. *European Journal of Orthopaedic Surgery & Traumatology*. 2018 Oct;28(7):1421-8.
  15. Atassi O, Fontenot PB, Busel G, De La Fuente G, Donohue D, Maxson B, Shah AR, Watson DT, Infante AF, Downes K, Sanders RW. "Unstable" pediatric femoral shaft fractures treated with flexible elastic nails have few complications. *Journal of Orthopaedic Trauma*. 2021 Feb 1;35(2): e56-60.
  16. Antabak A, Borščak N, Čagalj M, Ivelj R, Bumči I, Papeš D, Čavar S, Bogović M, Bulić K, Luetić T. Treatment of pediatric femoral fractures in the city of Zagreb. *Acta Clinica Croatica*. 2020 Dec 1;59(4):686-94.
  17. Radamessi DK, Nicola DR, Sarmiento LP, De Prá AL, Mourão NM, Cocco LF, Dobashi ET. Outcomes of surgical treatment of diaphyseal femur fractures in polytraumatized children. *Acta Ortopédica Brasileira*. 2024 Nov 1;32: e278518.