

# Periprosthetic Knee Fractures In Awka, Southeast Nigeria, Prevalence, Aetiology And Treatment Outcomes.

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## Abstract

**Introduction:** periprosthetic fractures post-total knee arthroplasty pose serious risks, with rising incidence linked to factors like prolonged lifespan and activity levels in older individuals. Risk factors include osteoporosis, advanced age, and implant issues. Treatment focuses on anatomical alignment and stable fixation, with modern methods like retrograde intramedullary nailing or locked plating favored. Nonoperative approaches are considered for some cases. A study in Awka, Nigeria, aims to gauge the prevalence of periprosthetic knee fractures.

**Methodology** in a study conducted at a tertiary orthopedic institution in southeast Nigeria, clinical records of 134 patients with severe knee osteoarthritis who underwent total knee arthroplasty (TKA) over 7 years were reviewed. Fracture causes, age, sex, weight, and outcomes were assessed via X-rays and Oxford knee score during follow-up visits. Surgery involved open reduction and internal fixation with distal femoral plates.

**Result** during a 7-year review, three periprosthetic fractures occurred among females aged 57 to 70, constituting a prevalence of 1.92% in 156 total knee replacements. All fractures were left supracondylar femur fractures attributed to minor falls, occurring 4 months to 4 years post-fixation. Treatment involved open reduction and internal fixation with distal femoral plates. Scotch cast support was provided for up to 8 weeks, with callus formation observed at an average of 10 weeks. Partial weight-bearing was maintained for up to 8 months. The prevalence of periprosthetic knee fractures in this population is approximately 1.92%.

**Conclusion** this study highlights the efficacy of distal femoral plate fixation for periprosthetic fractures, emphasizing timely identification, accurate classification, and personalized treatment approaches to enhance patient recovery.

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## I. Introduction

Periprosthetic fractures, occurring alongside orthopaedic implants typically used in joint arthroplasty or fracture treatment, pose significant health risks, including heightened morbidity and, in severe cases, increased mortality. The incidence of these fractures is on the rise due to factors such as extended patient lifespans, sustained high activity levels in older individuals, and the growing need for revision arthroplasty in ageing populations. Various factors, including implant characteristics, surgical techniques, and patient demographics, contribute to the likelihood of periprosthetic fractures.[1,3]

The periprosthetic fractures of the distal femur can occur during or following total knee arthroplasty. The majority of the fractures result from a fall from a standing height. They are, therefore, categorized as fragility fractures.[2,3] When treating patients with this type of fracture, it is essential to assess their overall health condition, bone stock, bone quality and the integrity of the knee's ligaments and stability of the implants because these factors directly impact treatment choice. Furthermore, the combination of a fracture in the setting of a prosthesis necessitates a working knowledge of fracture fixation and revision arthroplasty. Combining these issues makes the reversion of the patient to their pre-morbid or pre-injury functional level particularly difficult[3]

The risk factors for sustaining a periprosthetic distal femur fracture mainly relate to the quantity and quality of bone present in the distal femur. They include osteoporosis/ osteopenia, inflammatory arthritides (such as rheumatoid arthritis), chronic corticosteroid use, advanced age, stress shielding /osteolysis, revision arthroplasty, anterior femoral notching, infection and implant loosening.[4]

A full thickness of the anterior cortex or significant notching greater than 3 mm has been shown to cause load decreases and result in fracture patterns involving the notched portion of the bone.

Rorabeck and Taylor described the most commonly used classification for periprosthetic fractures of the distal femur. These authors divided these fracture types into distinct types: 1) Type 1-undisplaced fracture with components not loosening; 2) Type 2-a fracture with 5° of angulation and no loosening of components or > 5 mm of displacement; and 3) Type 3- any supracondylar fracture type in association with loosening of components.

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This classification is advantageous due to its clarity and ability to stratify patients into different potential treatment options.[5,6,8]

The cardinal principles of management of periprosthetic fractures of the distal femur include:

Anatomic reduction of axial rotation and alignment and stable fixation to allow an early range of motion.[7]

The treatment of periprosthetic fractures around the knee can be challenging for a number of reasons: (1) these fractures occur in patients with poor bone stock that can compromise potential fixation; (2) the majority of these patients are elderly and by virtue of their age may have retarded fracture healing; and (3) the attachment of the ligamentous structures to the fracture fragment may predispose these knees to potential instability and necessitate the use of constrained prostheses with all their potential problems.[9,10,11] Despite these complications, the ultimate goal of a painless, well aligned knee with functional range of motion may be attained in a large number of these.

Treatment options are guided by three factors: 1) fracture displacement: consideration can be made for inoperable treatment in undisplaced fractures. However, all displaced fractures require location of the fracture, surgical fixation; 2) and bone stock of the distal fragment: in more distal fractures (e.g., distal to the anterior flange of the femoral component), achieving fixation in the distal fragment can become increasingly complex and may affect the choice of implants. Moreover, if there is inadequate distal bone stock for surgical fixation, options such as prosthesis revision or allograft augmentation should be considered; and 3) the femoral component stability: if the prosthesis is loose, distal femoral replacement, revision arthroplasty is necessary, or an allograft-prosthetic composite (APC) may be required.[12][13][14][15]

Nonoperative treatment in a cast or hinged brace with protected weight-bearing may be undisplaced fractures. Close radiographic monitoring is required to ensure fracture displacement does not occur due to high nonunion, knee stiffness and malunion after the nonoperative management of displaced periprosthetic fractures of the distal femur. The nonoperative treatment is reserved for non-ambulatory patients or those unsuitable for anaesthesia.[3][16][17]

The conventional nonlocked plating (including condylar buttress plates, angled blade plates, and dynamic condylar screw plates) and older formal open reduction and internal fixation techniques have mainly been replaced in the recent body of literature by modern fixation methods of retrograde intramedullary nailing or locked plating combined with minimally invasive procedures. This results from the biomechanical advantages of current fixation and the physical benefits of minimally invasive procedures.[18][19][20]

The Retrograde intramedullary nailing method represents a viable option for treating displaced periprosthetic fractures of the distal femur with adequate distal bone stock. There must be sufficient bone stock distal to the fracture to accommodate two locking screws to permeate stable fixation with a retrograde intramedullary nail. Advantages of the retrograde intramedullary nailing method include the potential for minimally invasive surgical insertion, disruption of the fracture site, avoidance of soft tissue stripping and the ability to use the previous midline total knee arthroplasty incision.[21][22] In addition, retrograde intramedullary nailing is biomechanically superior to locked plating

This study aims to determine the prevalence of periprosthetic knee fracture in Awka, Nigeria,

## II. Methodology

This study was conducted in a Tertiary Orthopaedic Institution in South East, Nigeria.

We reviewed the clinical records of 134 patients with 156 severe knee osteoarthritis who underwent Total Knee Arthroplasty (TKA) over a 7-year period. The patients were also assessed during follow-up visits.

The age of presentation, sex, weight, and fracture cause were reviewed. The classes of fractures were determined using preoperative X-rays, and the implants used were identified with postoperative X-rays.

The surgeries were open reduction and internal fixation with distal femoral plates. A frail patient had a cast support to the fixation. The outcomes were assessed using the postoperative and serial follow-up X-rays at 6 weeks, 12 weeks, 6 months, and 1 year post-operation. Callus formation was used to assess healing. Patients' clinical outcomes were assessed using the Oxford knee score.

## III. Result

During the 7-year review period, three cases of periprosthetic fractures were identified.

**Table 1: Demographic Characteristics of all the knee sur**

Variable	Frequency	Percentage (%)
Mean Age (years)	63.6 ± 9.29	27-87
Gender		
Male	33	24.6
Female	101	75.4

<b>Religion</b>		
<b>Christian</b>	134	100
<b>Tribe</b>		
<b>Igbo</b>	133	99.3
<b>Others</b>	1	0.7
<b>Marital Status</b>		
<b>Married</b>	123	91.5
<b>Widowed</b>	6	4.3
<b>Single</b>	6	4.3
<b>Occupation</b>		
<b>Business</b>	51	38.1
<b>Unemployed</b>	48	35.8
<b>Civil Servants</b>	27	20.1
<b>Retired</b>	8	6.0

**Demographics**

All affected individuals were female, ranging in age from 57 to 70. The prevalence was 1.92%. Furthermore, the mean weight of the patients was 84kg. Notably, all fractures were left supracondylar fractures of the femur. Treatment for all cases involved the use of distal femoral plates.

All fractures occurred on the left femur and were attributed to minor falls. They occurred within a timeframe ranging from 4 months to 4 years following fixation

They were all managed with open reduction and internal fixation. The fractures were treated with distal femoral cobra plates. There was scotch cast support for each of the fractures for up to 8weeks. Callus formation was noted at average of 10 weeks in a range of 8 to 12 weeks

Partial weight bearing was maintained for up to 8months

**Table 2 Total knees operated on**

TOTAL NUMBER OF KNEES	RIGHT KNEES	LEFT KNEE	TOTAL	%
Right Knees	85		85	54.5
Left Knees		71		45.5
Total	85	71	156	

**Table 3  
Knees with Periprosthetic fractures**

KNEES	RIGHT KNEES	LEFT KNEE	Total	%
Knees with intact prosthesis	85	68	153	98.1
Knees with periprosthetic fracture		3	3	1.9
Total	85	71	156	100

**Table 4  
Implants used**

KNEES	Intramedullary nail	Distal femoral plate	Others
Knees with periprosthetic fracture	-	3	-
Total	0	3	0

Prevalence:

The prevalence of 3 periprosthetic fractures in a population of 156 total knee replacement shows:

Prevalence = 3 / 156

To get the fraction in simplest form, you can divide both the numerator and the denominator by their greatest common divisor (GCD), which in this case is 3:

Prevalence = (3 ÷ 3) / (156 ÷ 3) Prevalence = 1 / 52

So, the prevalence of periprosthetic knee fractures in the given population is 1 per 52 knees.

Prevalence (in percentage) = (1 / 52) × 100% Prevalence (in percentage) ≈ 1.923%

Therefore, the prevalence of 3 periprosthetic knee fractures in a population of 156 knees is approximately 1.923%.

#### **IV. Discussion**

This study was conducted in a Tertiary Orthopaedic Institution in Awka Southeast, Nigeria.

We reviewed the clinical records of 134 patients with 156 severe knee osteoarthritis who underwent Total Knee Arthroplasty (TKA) over a 7-year period.

The finding highlights several key aspects regarding periprosthetic fractures, particularly those occurring in the distal femur following total knee arthroplasty.

**Low Prevalence:** The identified prevalence of periprosthetic fractures (1.92%) among the knees studied indicates that while these fractures are relatively rare, they still present a significant challenge in patient management.

**Demographics:** All the identified fractures occurred in females aged between 57 and 70, with a mean weight of 84 kg. This demographic alignment is consistent with the literature's findings that suggest increasing age and female gender as risk factors for periprosthetic fractures [3,4]

**Fracture Characteristics:** All fractures were supracondylar fractures of the left femur, attributed to minor falls within a timeframe of 4 months to 4 years post-fixation. This aligns with the typical presentation of fragility fractures associated with periprosthetic fractures, which often result from low-energy trauma. [1,3]

**Classification:** Two of the fractures were classified as Basys and Su Type 2, while one was Type 1, all falling under the Lewis and Rorabeck Type 2 category. This classification system aids in treatment decision-making by stratifying patients into different potential treatment options based on fracture characteristics. [5,6,8]

**Treatment Approach:** The fractures were managed with open reduction and internal fixation using distal femoral cobra plates. This aligns with the current treatment guidelines, emphasizing the importance of anatomical reduction and stable fixation to allow early range of motion.[5][6]

**Post-Operative Care:** Scotch cast support was provided for up to 8 weeks post-fixation, and callus formation was noted at an average of 10 weeks. This reflects the standard post-operative care protocol aimed at promoting healing and preventing complications such as nonunion or malunion.

**Functional Outcome:** The mean time for commencement of full weight-bearing was 8 months, indicating a prolonged recovery period. Additionally, the mean Oxford Knee Score after one year ranged from 40 to 41, reflecting acceptable functional outcomes following treatment. [23,24]

#### **V. Conclusion:**

The prevalence of periprosthetic fractures in Awka, Nigeria is low. Unlocked distal femoral plate is effective and still relevant in the treatment of periprosthetic fractures. In a resource-poor environment where many treatment options are unavailable, Periprosthetic fractures can still be treated effectively.

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