Scientific Research Publishing

Open Journal of Orthopedics, 2026, 16(5), 231-241
https://www.scirp.org/journal/ojo
ISSN Online: 2164-3016
ISSN Print: 2164-3008

Femoral Neck Fractures in the Elderly: Short-Term Treatment Outcome Using Unipolar Hemiarthroplasty at Muhimbili Orthopedic Institute

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How to cite this paper: Ngalawa, R.N., Assey, A.B., Ndeki, P.E., Ntiyakama, B.F., Mohammed, M.K., Sitta, F.J., Nzella, D.J., Mwasota, D.J. and Waria, G.G. (2026) Femoral Neck Fractures in the Elderly: Short-Term Treatment Outcome Using Unipolar Hemiarthroplasty at Muhimbili Orthopedic Institute. *Open Journal of Orthopedics*, **16**, 231-241.
https://doi.org/10.4236/ojo.2026.165022

Received: February 13, 2026
Accepted: May 12, 2026
Published: May 15, 2026

Abstract

Background: A femoral neck fracture in the elderly is commonly due to osteoporosis and a simple fall for various reasons such as visual disturbance. Most of these patients have osteoporosis and co-morbidities, thus posing great challenges to their management. Moreover, there are different treatment options for elderly patients with femoral neck fractures depending on the age of the patient (physiologically old or physiologically young), fracture pattern, and degree of displacement. At MOI, unipolar hemiarthroplasty is one of the commonly used treatment modalities for femoral neck fractures in the elderly. **Objectives:** To determine the short-term treatment outcome of elderly patients with femoral neck fractures treated using unipolar hemiarthroplasty at MOI from July 2017 to April 2018. **Methodology**: A cross-sectional study was conducted on elderly patients aged 60 years or above with femoral neck fractures and treated using unipolar hemiarthroplasty. The study was conducted at MOI for a period of ten months from July 2017 to April 2018. Thirty-three patients met the inclusion criteria and were recruited into the study. They were followed up for a period of three months post-surgery. Three patients were excluded late in the study after being noted to develop metastatic carcinoma and died before completion of the follow-up period. These patients were re-

viewed in follow-up clinics, and at the 12th week post-surgery, ambulatory status was assessed using the Cumulative Ambulation Score (CAS) in a structured questionnaire. **Results:** Thirty-three patients with femoral neck fractures were enrolled. Of these patients, three patients died during the course of follow-up. Thirty patients with femoral neck fracture were followed for at least 3 months and they were analyzed. The proportion of femoral neck fractures among all femur fracture patients attended to at MOI was 17.9%. Among enrolled patients, the majority were female, accounting for 60%. The mean age of participants was 67.5 years. Two patients developed dislocation post-surgery, accounting for 6.7%. Postoperative ambulatory status was assessed using the Cumulative Ambulation Score. Twenty-six patients (86.7%) showed independence in basic activities (*i.e.*, getting in and out of bed, sit-stand-sit from a chair, and walking) as the minimum criteria in order to go home. Four patients (13.3%) had a low CAS, meaning they had poorer mobilization. **Conclusion and Recommendation:** Hemiarthroplasty in elderly patients with femoral neck fractures had an excellent cumulative ambulation score. The study shows a low dislocation rate and a low infection rate post hemiarthroplasty. Patients who are ≥60 years and physically less demanding will benefit from hemiarthroplasty.

Keywords

Femoral Neck Fracture, Elderly Patients, Unipolar Hemiarthroplasty, Short-Term Treatment Outcome, Hip Arthroplasty, Muhimbili Orthopedic Unit

1. Introduction

The elderly population increases worldwide due to a rise in life expectancy. This, in turn, reflects the global rise of femoral neck fractures [1]-[3]. Femoral neck fractures are common fractures in the elderly, and it has been found to cause a decrease in life expectancy, loss of hope of independence, and need for full-time nursing care [4]. Femoral neck fractures in the elderly are due to a simple fall, whereas high-energy injuries are common among younger people [5].

The femoral neck is defined as the region between the femoral head and greater trochanter [6] [7]. The anatomical position of the femoral neck is anteverted with respect to the femoral shaft, and the angle of the femoral neck varies between the sexes in adulthood as 130˚ to 135˚ [5]. Femoral neck fractures are intracapsular fractures involving different parts of the femoral neck (sub-capital and trans-cervical) [6] [8]-[10]. This type of fracture is more common in the elderly due to osteoporosis and a significant reduction of bone mineral content below the fracture threshold [8] [11]. The proximal femur loses its mechanical strength, associated with an increased risk of fracture as age advances, due to disruption of bone metabolism by biologic menopause, tobacco use, and certain medications such as corticosteroids, barbiturates, hormonal therapy, and calcium or magnesium binding agents for seizure control [8] [12] [13]. Moreover, the femoral neck within the

capsule lacks a cambium layer for participating in peripheral callus formation after fracture; therefore, it depends on endosteal union [5].

There are different classification systems describing femoral neck fractures, including Garden's, Pauwels, and AO. These classifications help in deciding the proper treatment modality for the fracture and their prognoses [7] [13]. Many elderly patients have poor bone quality due to osteoporosis; hence, treatment is challenging [8] [11] [12] [14]. In our hospital, we have various treatment modalities; these are non-operative, HA, and THR. The HA method is used in patients with poor bone quality, while the THR method is opted for patients with good bone quality [8] [15].

2. Materials and Methods

2.1. Study Setting and Data Collection

The study was conducted at Muhimbili Orthopedic Institute (MOI), which is a consultant hospital specialized in orthopedics and trauma. It is a teaching hospital offering services in neurosurgery as well. Muhimbili Orthopaedic Institute has a 270-bed capacity.

All elderly patients operated on for unipolar hemi-arthroplasty after sustaining femoral neck fractures who were ambulant before injury and consented to participate in the study were included.

The data collection procedures started as the patient was planned for operation. The researcher introduced the research topic and requested the participant to consent, and demographic particulars were taken.

Patients who were ambulant before injury, with displaced or non-displaced fractures, and no cognitive impairment were included in the study after consent. Full blood picture and blood group were taken; comorbidities were screened and treated accordingly. Intra-operatively, patients were observed for preoperative antibiotics provision, and those who had no antibiotics were given them later. All participants underwent the same type of anaesthesia and surgical approach with uncemented implant fixation; perioperative precautions were given to all postoperative patients .

Postoperative control X-ray was taken, and instructions on proper handling of the operated limb were given to every patient. One day postoperatively, every patient was assigned to physiotherapy for gait training and possibly given a walking aid (such as an axillary crutch) until discharge; hence, the rehab pathway was standardized for all participants.

Post-operative assessment of elderly patients treated with unipolar hemiarthroplasty

In the 12th week CAS; this was the primary outcome assessed for all postoperative patients, which was the assessment of ambulatory status (**Table 1**).

Cumulative ambulation score tool adapted from reference [16].

NB; The CAS is a simple tool that measures the level of independence with basic activities that are considered the minimum criteria. Low CAS: 0 - 6 points

Table 1. Assessment of ambulation status.

Activity	Not able to despite human assistance or cueing	Able to with human assistance or cueing	Able to with no human assistance or cueing (can use gait aid)
Get in and out of bed	0	1	2
Sit-Stand-Sit from chair	1	1	2
Walking	0	1	2

daily in order for the patient to get home (activities assessed are getting in and out of bed, sit-stand-sit from chair, and walking). High CAS: 0 - 18 points over 3 days of assessment.

During the visit, the researcher was collecting CAS independently as the primary outcome and assessing the surgical wound. If the wound was infected and required debridement, it was scheduled by the doctor in the clinic. In case of prosthetic dislocation, the patient was planned for reoperation.

2.2. Data Processing and Analysis

The information obtained from the filled questionnaires was checked for quality before being entered into the Statistical Package for Social Studies (SPSS), and analyzed by the SPSS program version 23. Categorical variables were described by frequency distributions, and continuous variables were described by means and standard deviation.

Ethical clearance

Ethical clearance and study approval were received from the MUHAS Institutional Review Board and the MOI review board.

3. Results

A total of 33 participants were recruited during the study period of 10 months. During this study period, there were a total of 99 patients who were admitted at MOI with femoral neck fractures. Sixty-six patients underwent other treatment modalities. Of these, 33 fulfilled the inclusion criteria and were enrolled in the study and followed up (see **Figure 1**). Unfortunately, 3 patients died before completion of the study follow-up period.

3.1. Proportion of Femoral Neck Fractures in the Elderly Population Admitted at MOI with Femoral Fractures

The study found the proportion of femoral neck fractures to be 17.9%. This proportion was calculated from a total of 554 patients who sustained various types of femur fractures and were admitted at MOI during the study period. Since 99 elderly patients had femoral neck fractures during the study period, the proportion of femoral neck fractures was 17.9%. Out of all femoral neck fractures, 33 patients underwent hemi-arthroplasty. Loss to follow-up occurred in 3 patients, who were excluded late in the study during follow-up after being noted to develop metastatic

carcinoma; unfortunately, they later died. The remaining 30 patients completed 12 weeks of follow-up and were analyzed. The mean age of participants was 67.5 years (Table 2). There were more females, 18 (60%), than males, 12 (40%).

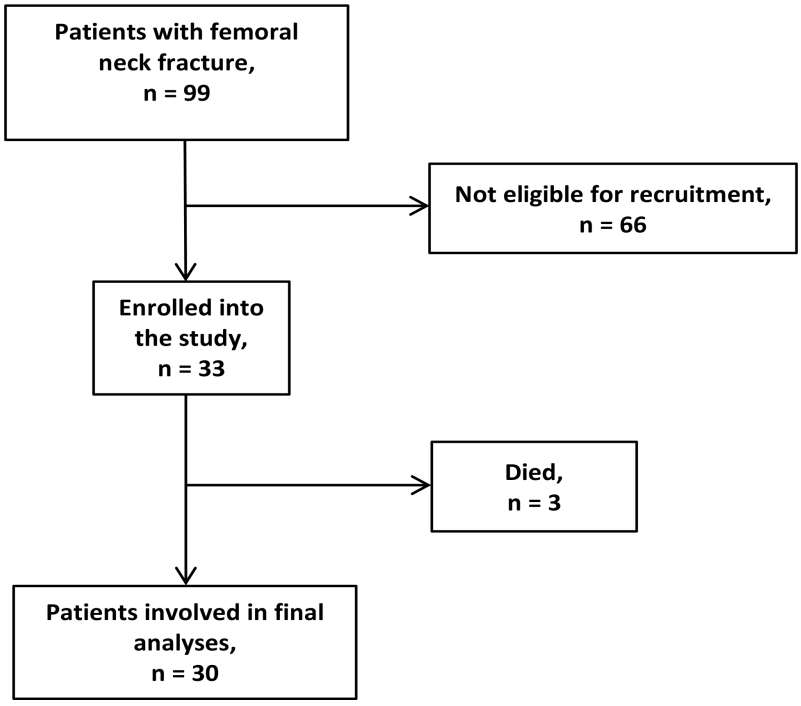

Figure 1. Patient flow showing recruitment and follow-up stages, including the number of participants involved in the final analyses.

Table 2. Socio-demographic and clinical characteristics of elderly patients who had femoral neck fractures admitted to MOI.

Characteristics	All, 30 (100%)	Male, 12 (40%)	Female, 18 (60%)
Age in years, mean age	67.5		
Comorbidity conditions, n (%)			
Hypertension	13 (43.3)	4 (30.77)	9 (69.2)
Diabetes mellitus	1 (3.3)	-	1 (100.0)
None	16 (53.3)	8 (50.0)	8 (50.0)
Preoperative antibiotics given, n(%)			
Yes	28 (93.3)	11 (32.62)	17 (60.7)
No	2 (6.6)	1 (50.0)	1 (50.0)
Surgical indication, n (%)			
Femoral neck fracture with high pre-mobility and high functional demand.	10 (33.3)	2 (6.7)	8 (26.6)
Femoral neck fracture with low pre-mobility and low functional demand.	20 (66.6)	10 (30)	10 (36.6)

Continued

Control X-ray taken, n (%)			
Yes	30 (100)	12 (40)	18 (60)
No	-	-	-
Wound status at follow-up, n (%)			
Delayed healing	2 (6.7)	1 (50.0)	1 (50.0)
Healed completely	28 (93.3)	11 (32.6)	17 (60.7)
Planned for reoperation, n (%)			
Yes	2 (6.7)	1 (50.0)	1 (50.0)
No	28 (93.3)	11 (32.6)	17 (60.7)
Cumulative Ambulation Score at 12th week post-surgery, n (%)			
High	26 (86.7)	11 (33.3)	15 (53.3)
Low	4 (13.3)	1(3.3)	3 (10)

3.2. The Indications of Unipolar Hemiarthroplasty in Elderly Patients with Femoral Neck Fractures Treated at MOI

Femoral neck fracture with a) low pre-fracture mobility and low functional demand and b) high pre-fracture mobility and high functional demand were the two indications for unipolar hemiarthroplasty found in all 30 patients of the study population. Femoral neck fracture with low pre-fracture mobility and low functional demand was the leading indication for surgery, which accounted for 20 (66.6%), followed by femoral neck fracture with high pre-fracture mobility and high functional demand, which was present in 10 (33.3%) patients.

Postoperative ambulatory status of elderly patients with femoral neck fractures treated with unipolar hemiarthroplasty at MOI.

Twenty-six (86.7%) patients had a high Cumulative Ambulation Score, meaning the majority of patients showed independence in mobilization through basic activities; these are getting in and out of bed, sit-stand-sit from a chair, and walking with or without a walking aid. The remaining four (13.3%) patients had a lower Cumulative Ambulation Score, meaning that these patients had poorer mobilization. The postoperative ambulatory status was assessed in all 30 participants using the Cumulative Ambulation Score (see **Figure 2**) below.

The secondary outcomes that were assessed postoperatively were infection rate, dislocation, and re-operation of elderly patients with femoral neck fractures treated using unipolar hemiarthroplasty at MOI.

Infection occurred in only 1 patient that accounted for 3.3%; who had a deep infection. However, the patient was treated by serial surgical debridement and the infection was controlled and healed.

Postoperative dislocation occurred in 2 patients (6.7%) (see **Figure 3**). These two patients experienced dislocation after sustaining a fall on slide surfaces at their homes. The participants were scheduled for reoperation.

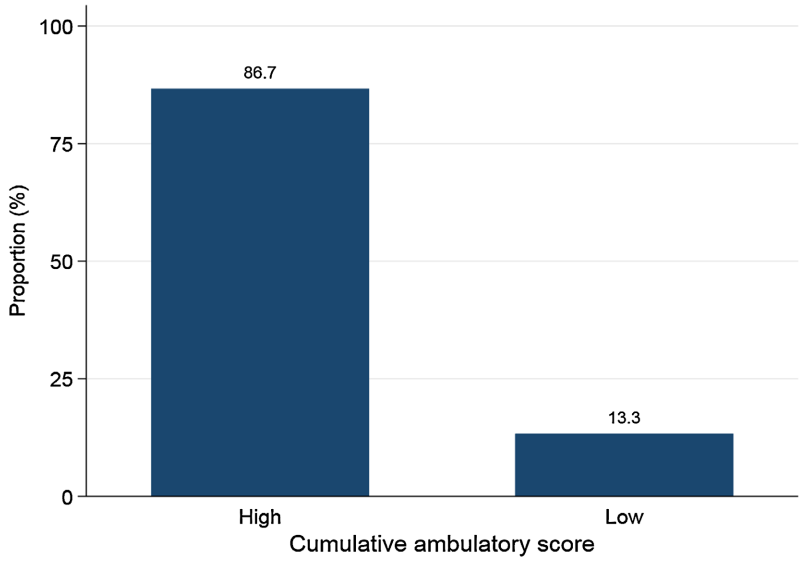

Figure 2. Bar plot showing the distribution of ambulatory status of participants assessed using the cumulative ambulatory score.

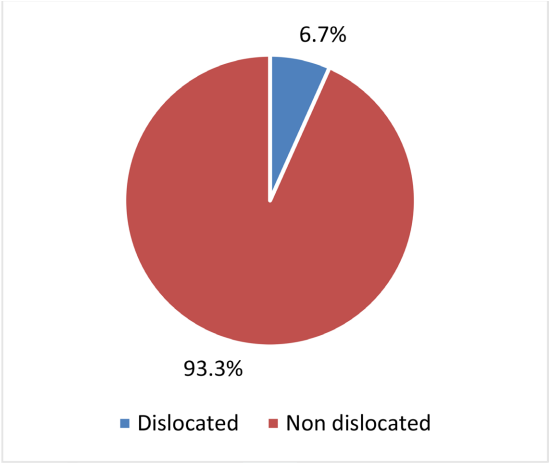

Figure 3. Pie chart showing the proportion of participants' dislocation status during follow-up.

4. Discussion

In this study, the proportion of femoral neck fractures in elderly patients among all patients with femur fractures attended at MOI during the study period was 17.9%. The proportion of femoral neck fractures tends to vary in different areas depending on many factors, including age, ethnicity, climatic characteristics, and living standards [2] [6] [7]. This study found that increased age was one of the factors contributing to the occurrence of femoral neck fractures due to the fact that the majority of study participants sustained a simple fall, as they had advanced age and co-morbidities. This finding is similar to that found in Bulgaria, which mentioned that traumatic femoral neck fractures increase with advanced age [2] [14] [17] [18]. This can be explained by the fact that as age increases, the bones become more osteoporotic with bone mineral content below the fracture

threshold, which predisposes to pathological femoral neck fractures [8] [9] [19].

This study found the mean age of patients who sustained femoral neck fractures to be 67.5 years. However, the study done in Germany reported a mean age of 83.6 years [13] [20] [21], and the study done in India reported a mean age of 83 years [2] [22]. These results concur with the prediction of the increased chance of fractures being doubled after fifty years of age [19] [23] [24].

The study showed the number of female patients 18 (60%) with femoral neck fractures is higher compared to male patients 12 (40%). This finding is similar to the study done in Germany, which reported the incidence of femoral neck fractures in female patients is higher than that of male patients [4] [25]. It has been reported that 50% of women from 65 years of age have bone mineral content below the fracture threshold, which increases the risk of pathological fracture [8] [26]-[28].

The majority of elderly patients in a study population had co-morbidities that predispose them to falls, such as gait instability secondary to hypertensive stroke. This finding concurs with the study reporting that a higher percentage of falls was due to gait instability caused by different co-morbidities like hypertensive stroke, visual disturbance, and depression, which resulted in hip fractures [16] [23] [26] [29].

Infection is one of the complications related to operation; this study showed a low post-operative infection rate of only 3.3%. The results of this study concur with another study that reported a lower rate of post-operative infection, such as the study done in Australia on hemi-arthroplasty-related infection, which reported that 1.1% of patients developed infection post-operatively [29]-[31].

This study found that dislocation was among the post-operative complications, where 6.7% of participants developed dislocation. This concurs with studies done in America and Finland, which reported that dislocation post unipolar hemiarthroplasty occurred in 6% and 5.6%, respectively [26] [32]-[37].

In this study, post-operative mobilization status was found to be higher (86.7%) according to the cumulative ambulation score. These results are higher compared to a previous study which was conducted in Germany and Malaysia that reported 73% of participants had good post-operative ambulatory status after surgery [4] [38]. This small difference could be explained by the method used to select study participants and the age difference between study participants [22] [24] [35] [39].

Authors' Contributions

Both authors contributed equally to the accomplishment of this work and have read and approved the final version of the manuscript.

Acknowledgements

The study was conducted at Muhimbili Orthopaedic Institute, so we are greatly indebted to the Executive Director of the Institute for allowing free use of institute infrastructure and resources due to limited financial support.

Also, sincere gratitude to all staff of Muhimbili Orthopaedic Institute and Singida Regional Referral Hospital for all the valuable assistance and support they offered during all the stages in the preparation of this work.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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