**EAS Journal of Orthopaedic and Physiotherapy**
*Abbreviated Key Title: EAS J Orthop Physiother*
ISSN 2663-0974 (Print) | ISSN 2663-8320 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-8 | Issue-1 | Jan-Feb, 2026 | DOI: https://doi.org/10.36349/easjop.2026.v08i01.001

**Original Research Article**

# The Occurrence of Knee Stiffness in Patients with Fractures of Femurs Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret, Uasin Gishu County, Kenya

Imbwaga Musimbi Chantell[1], Ayabei Henry Chepkwony[1], Barry R. Ayumba[2]*

[1]Physiotherapy Out-Patient Clinic at Moi Teaching and Referral Hospital, Eldoret
[2]Orthopaedics and Rehabilitation Department, Moi University, Eldoret, Kenya

**Article History**
**Received:** 04.12.2025
**Accepted:** 02.02.2026
**Published**: 07.02.2026

**Journal homepage:**
https://www.easpublisher.com

**Quick Response Code**

**Abstract:** ***Study Background*:** Management of knee stiffness includes both operative and nonoperative. In both cases, physical therapy is important. Nonoperative treatments include physical therapy and home exercise programs. These are used to treat and minimize the flexion and extension deformities. Physiotherapy may include manual stretching, prolonged stretching using a tilt table, sandbag or weight over the distal femur, mechanical traction, passive range of motion exercises and joint mobilization techniques. The effectiveness of a given treatment to reduce stiffness is a function of applied torque, as well as the duration and frequency of the treatment. ***Objectives*:** To describe the characteristics of patients, to determine the prevalence, and to establish the management factors associated with knee stiffness in patients with fractures of femurs attending physiotherapy out-patient services at Moi Teaching and Referral Hospital (MTRH), Eldoret, Uasin Gishu County, Kenya. ***Methods*:** The study was carried out in the Physiotherapy out-patient clinic at MTRH. A descriptive retrospective audit of 48 patients' folders (14 Females, 34 Males) during the period of July 2021 and June 2022 that fulfilled inclusion criteria was conducted, after approval by Institutional Research and Ethics Committee and Hospital Administration. Data was collected using prevalidated tool, and then analysis for the study variables was done using the Statistical Packages for Social Science (SPSS) computer software. The preliminary data was analyzed using descriptive statistics in the form of frequencies, means, and percentages and presented in the form of tables, pie charts and graphs. ***Results*:** Males (70.8%) exhibited higher prevalence of femoral fractures than females (29.2%) due to occupational hazards and high-risk activities. Middle-aged individuals (30-50 years) were most affected, primarily due to physically demanding jobs, while older patients (>50 years) experienced prolonged recovery due to degenerative changes and comorbidities. Road traffic accidents were the leading cause of fractures in younger patients, while occupational hazards and falls were predominant among older individuals. Prevalence was 17.78%. Delayed physiotherapy initiation and lower education levels were linked to increased knee stiffness, particularly among patients from remote areas with limited healthcare access. The length of hospitalization and the number of days between occurrence of injuries and medical and surgical intervention played a significant role in the development of knee stiffness among patient and subsequent outcomes. ***Conclusion*:** Early surgical intervention, timely physiotherapy, and adherence to rehabilitation programs significantly improved recovery. Socioeconomic factors, including education and healthcare access, play a crucial role in rehabilitation outcomes. ***Recommendations*:** Public health educations on injury prevention, improved access to physiotherapy, and targeted fall prevention strategies for older adults are essential. Strengthening hospital efficiency, implementing workplace safety policies, and promoting multidisciplinary care can further enhance patient recovery and reduce knee stiffness incidence.

**Keywords:** Fracture Femur, Knee Stiffness, Management, Medical Intervention, Physiotherapy, Rehabilitation, Surgical Intervention.



***Corresponding Author:** Barry R. Ayumba
Orthopaedics and Rehabilitation Department, Moi University, Eldoret, Kenya

# INTRODUCTION

Knee stiffness is a known complication of operative and nonoperative management of femoral fractures. The incidence of knee stiffness after a femoral diaphyseal fracture depends on a number of factors, such as the severity of the injury, the willingness of the patient to move the knee postoperatively, the state of the knee before injury, and whether a coexisting knee injury is present. A group of authors [1], concluded that age, preoperative state, fracture type, reduction quality, and whether or not functional training, postoperative complications factors may affect the knee joint function recovery. Adjustment to the patient's preoperative physical status, fractures anatomic reduction and firm fixation, early postoperative active and passive functional exercises, less postoperative complications can maximize the restoration of knee joint function.

The Arbeit gemeinschaft fur Osteosynthesefragen (AO) classification is not directly correlated with the soft tissue injury, significant displacement of fragments in type B and C fractures could lead to healing with significant muscle to bone adhesion that leads to stiffness**.** The femur is the longest, strongest, largest and heaviest tubular bone in the human body and one of the load-bearing bones in the lower extremity. Femoral shaft fractures are among the most common major injuries that an orthopedic surgeon will be required to treat, often resulting from high energy forces associated with possible multiple system injuries. Fractures of the femoral diaphysis can be life-threatening on account of an open wound, fat embolism, Adult Respiratory Distress Syndrome (ARDS) or resultant multiple organ failure [2, 3].

Femoral shaft fractures can lead to a major physical impairment, not because of disturbed fracture healing, but rather due to fracture shortening, fracture malalignment, or prolonged immobilization of the extremity by traction or casting in an attempt to maintain the fracture length and alignment during the early phases of healing. Even minor degrees of shortening and malalignment can eventuate in a limp and post-traumatic arthritis. The art of femoral fracture care is a constant balancing of the often-conflicting goals of anatomic alignment and early functional rehabilitation of the limb.

Knee stiffness, or a limitation in range of motion, is a potential complication after any intra-articular or extra-articular injury. It can be caused by a flexion contracture, an extension contracture or a combined contracture (affecting both flexion and extension) relative to the contra-lateral side (if healthy). It is important to determine the source of the stiffness, as this information will determine which procedures should be performed and the prognosis. Adhesion and bone impingement are the keywords. In all cases of post-traumatic stiffness, any fractures must be healed before release can be performed, thus, a 3–6-month waiting period is required. The surgeon must compromise between managing stiffness and obtaining bone union. Moreover, any Complex Regional Pain Syndrome (CRPS) must be detected. If the condition does not resolve spontaneously, surgery should only be performed during the quiet phase.

Most of the patients who sustain femoral shaft fractures are young, and any complication can have long-term effects. Complications necessitating prolonged time for recovery and secondary surgery imply considerable personal and financial losses, even if the ultimate radiographic and functional result would turn out satisfactory [4]. Historically, permanent disability has followed femoral shaft fractures in 25% of the adult patients.

Much on literature review on femoral fractures and their functional impact leading to knee stiffness can best be understood after brief review of the International Classification of Functioning (ICF), disability and health- a theoretical framework, and general information regarding the knee joint and the femur. According to this theoretical framework: epidemiological transition from infectious to non-communicable disease has made non-fatal health outcomes more relevant for low- and middle-income countries as well as for more affluent nations [5]. In light of this shift of focus to non-fatal health outcomes, the World Health Organization (WHO) endorsed the International Classification of Functioning (ICF), Disability and Health in 2001 [6]. This classification system was to be used to report on mortality and morbidity with information on health-related outcomes in terms of functioning and a comprehensive classification system designed to describe disability at different levels beyond the impairment. The first level was described at body (biological) level that incorporated physiological functions of the body systems. The second level described disability in terms of activity limitation. This explains the difficulties that the individual may experience in executing an activity. Finally, the third level described participation restrictions at a societal level. Participation restrictions were problems encountered with involvement in life situations.

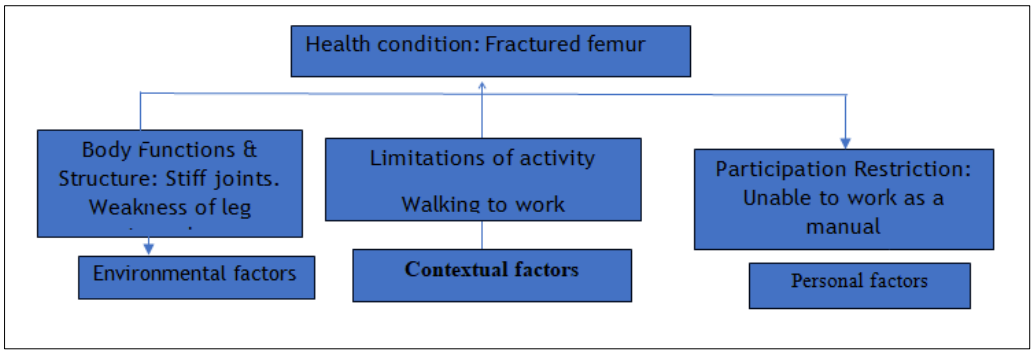


**Figure 1: The ICF model of disability for an individual with a fractured femur**
***(Source:** Eadie, 2003)*

It is important to review the anatomy of the knee region in order to understand the subject being discussed [7]. The knee joint is a complex hinge joint that connects three bones: the femur, tibia and patella in two articulations, the tibiofemoral and patellofemoral. The knee joint has one degree of freedom in extension and flexion but also allows slight medial and lateral rotation.

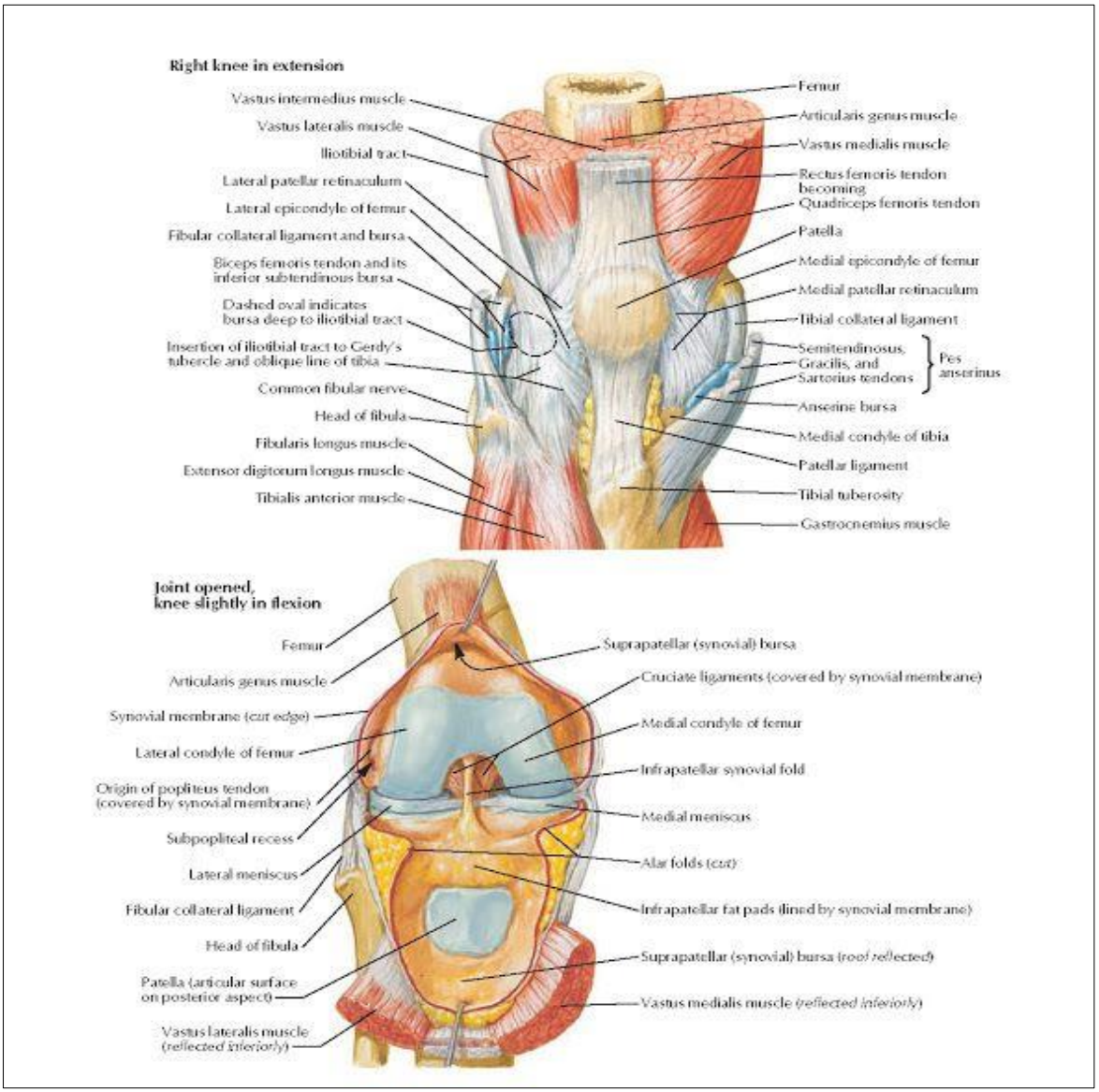


**Figure 2: Anatomy of the knee joint (Netter, 2014)**

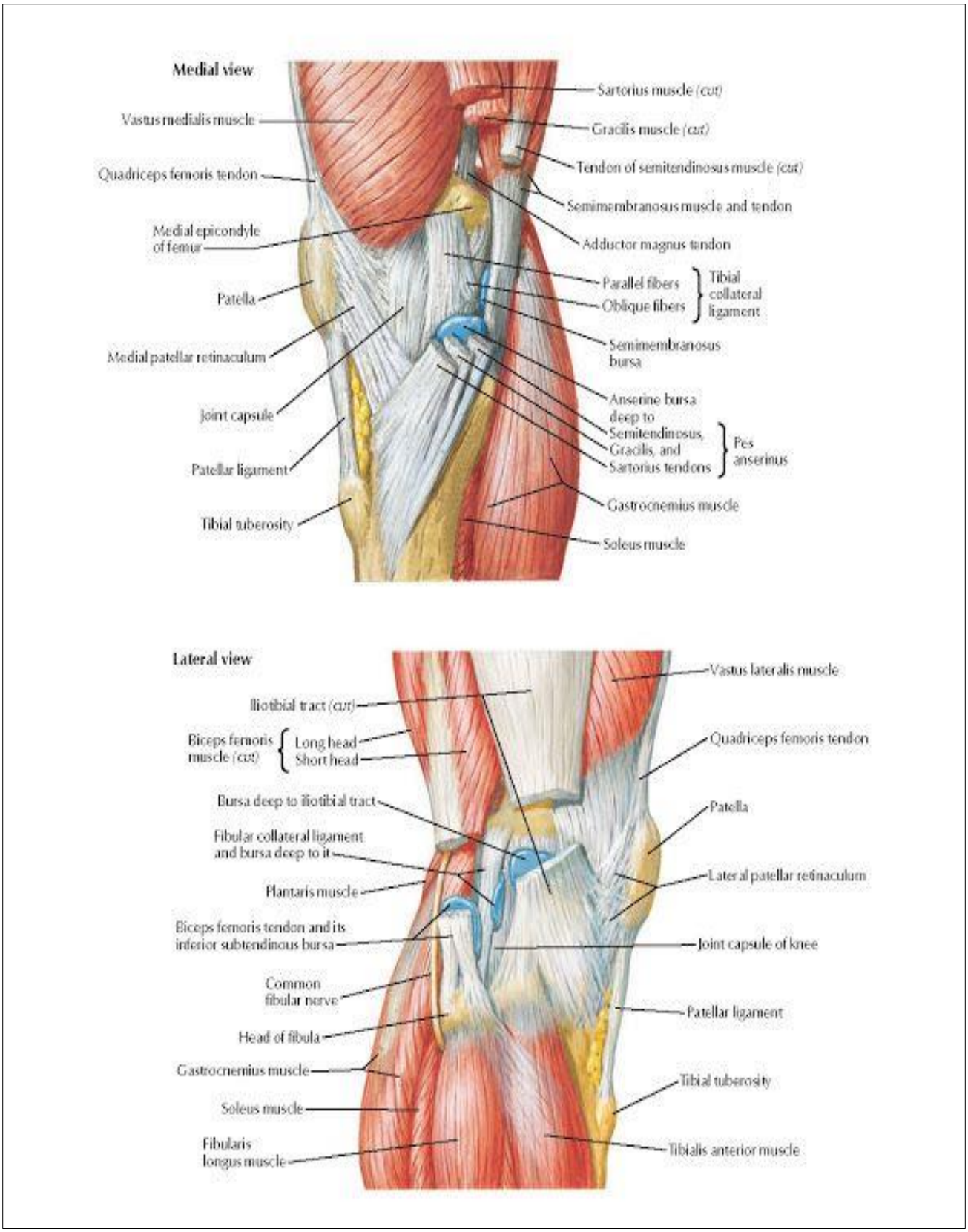


**Figure 3: Anatomy of the knee joint (Netter, 2014)**

The femur is a long and the strongest bone; it supports the weight of the body. The proximal end of the femur forms part of the hip joint while the distal end forms part of the knee joint together with the tibia and the patella. The femur is also known as the thigh bone.

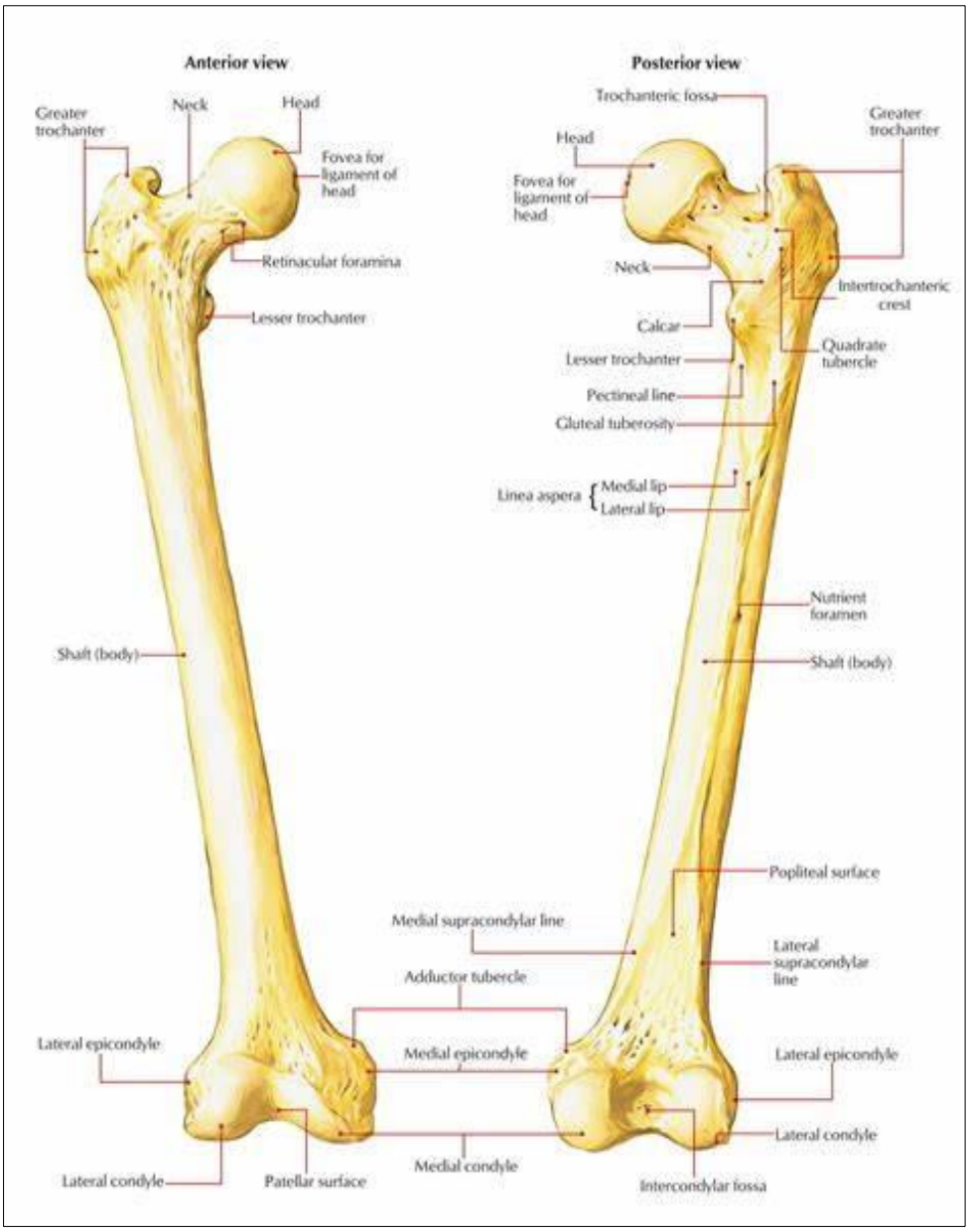


**Figure 4: The femur (Netter, 2014)**

The classification of femoral fractures is also discussed, as this serves as a guide to management of these fractures [8]. Many scholars have classified femoral fractures differently with different bases such as part of the femur involved (distal, proximal, condylar etc.), whether or not the skin is broken, whether or not the femur is displaced and so on.

Fractures of the femur are classified as simple and open by Atkinson and colleagues: simple fracture occurs when the skin overlying the fracture remains intact. In contrast, an open fracture has an open wound overlying the fracture site [9].

Femoral fractures are further classified according to fracture pattern [8], the position along the shaft of the bone [10], and the degree of comminution [11]. Femoral fracture patterns include spiral, transverse, oblique, comminuted and segmental patterns. Spiral fractures occur when a twisting force is transmitted through the femur while the foot is anchored. Transverse and oblique fractures are a result of an angular or direct force onto the femur. These fracture patterns are common following Motor Vehicle Accidents (MVA). Comminuted fracture patterns result from severe force or violence such as gunshot wound. Segmental fractures occur when the femoral shaft is fractured in more than one place [8]. The AO classification is used to denote the position of the fracture along the femoral shaft [10]. The shaft is divided into three parts, namely; the proximal third, the midshaft (or middle third) and the distal third of the femur. Comminution of fractures are categorized as Types I, II, III, or IV according to the degree of comminution as described by a team of authors [11].

**Table 1: Classification of femoral fractures according to degree of comminution (Winquist, Hansen Jr, & Clawson, 1984)**

| Category | Degree of Comminution |
|---|---|
| Type I | Only a small piece of bone broken away. |
| Type II | A fracture with a larger butterfly fragment but cortex is 50% intact allowing for control of rotation and length. |
| Type III | A fracture with a larger butterfly fragment precluding control of rotation or length or both. |
| Type IV | Severe comminution with no abutment of cortices level of the fracture to prevent shortening. |

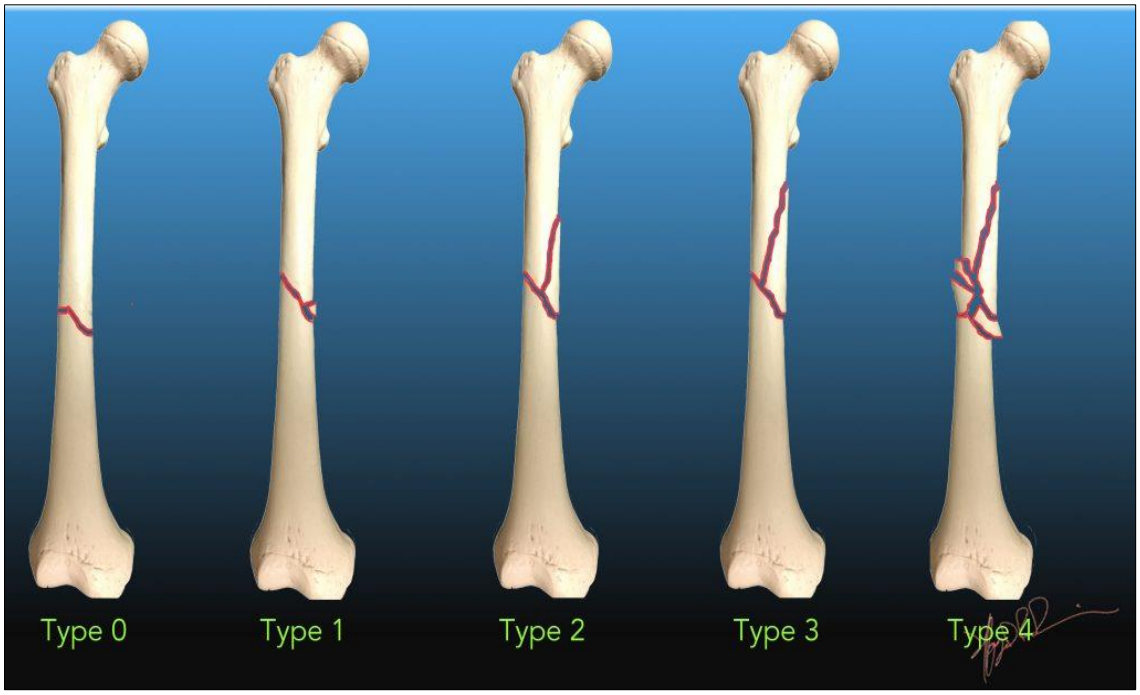


**Figure 5: Classification of femoral fractures according to degree of comminution (Winquist, Hansen Jr, & Clawson, 1984)**

In the year 2021 some authors [12], conducted a study in Sudan and discussed that knee stiffness is more frequent in male in a rate of eight folds to females. In an earlier study, the authors [9], suggested that physiotherapy rehabilitation should begin as soon as the femoral fracture has been surgically reduced, however patients from low-income socio-economic groups are likely to delay their first physiotherapy sessions for financial and other secondary factors such as nearness to health facilities.

In another study in the year 2018 [13], on the factors associated with lower quality of life after operative fixation of femoral shaft fractures in adult patients in a low-resource setting in Tanzania and several markers of recovery were associated with lower 1 year Quality Of Life, including pain, knee stiffness, delayed radiographic healing, complications requiring reoperation. Efforts to reduce perioperative complications may help improve post-operative quality of life.

Regarding the prevalence of knee stiffness in patients with fracture femur attending physiotherapy out-patient services, the majority patients with fracture femur develop knee stiffness even after complete fracture healing for many reasons. In a study conducted in Sudan in 2021, the authors [12], concluded that knee stiffness had high percentage in all modalities of fracture femur and in spite of being a common problem in that country, it had less attention in practice. The percentage of knee stiffness following fracture shaft of femur in this study was higher (64.7%); compared to other studies and the authors associated that to delay in surgery, physiotherapy and early mobilization. Knee stiffness in this study was found in 81.2% of patients with open fractures in comparison to 60.8% of closed fractures. Road traffic accidents was the more frequent mode of presentation of fracture femur but it came second to gun shot in causing knee stiffness. Knee stiffness was found with high percentage in the different modalities of treatment of fracture femur and was present in 100% of patients who had injuries in the contralateral limb. The lower third was found to be the most frequent type which led to knee stiffness.

In another study conducted in the year 2012, the authors [14], documented that 9% of their patients developed knee stiffness. The knee stiffness resolved in all cases with physiotherapy. The incidents of

complications, that is, infection, non-union and limb shortening are comparable with that of available data of recent reports of interlocking nailing in closed femoral shaft fractures. In an earlier study in the year 2008, the author [15], asserted that road traffic accidents are an "emerging disease" in low- to middle-income countries. In addition, he also suggested that the increase in long bone fractures is secondary to the rise in motor vehicle accidents.

The management factors associated with knee stiffness in patients with fracture femur attending physiotherapy out-patient service can be categorized as either operative or nonoperative. The surgical category can be operative and nonoperative, with the latter component inclusive of physiotherapy.

Regarding the Surgical management of femoral fractures, a team of authors [16], in 2013 studied functional outcome following intramedullary nailing of 124 patients who presented with femoral fracture at MTRH. The results were categorized as excellent (71.8%), good (23.4%) and poor (3.2%). These results were statistically significant ($p<0.001$) with a negative correlation for age and functional outcome ($p<0.001$). Knee pain following antegrade nailing was reported in 10.0% of patients while in retrograde it was 37.5%. Knee stiffness was reported as 3.0% and 40.6% following antegrade and retrograde nailing respectively.

In another study where authors [17], assessed the functional outcome and causes of persistent disability in patients with isolated femoral shaft fractures treated using locked antegrade intramedullary nailing, they noted the strongest correlations between knee pain and Western Ontario and McMaster Universities Osteoarthritis (WOMAC) pain ($\rho = 0.748$, $p < 0.001$), function ($\rho = 0.701$, $p < 0.001$) and Short Musculoskeletal Functional Assessment (SMFA) ($\rho = 0.733$, $p < 0.001$). They also noted weaker correlations between thigh, groin and buttock pain and functional outcomes, with scores ranging from $\rho = 0.2$ to $\rho = 0.55$. They were able to conclude that recovery from femur fractures occurs most rapidly in the first 6 months after injury. Residual deficits in functional outcome were still measurable 12 months after injury. Knee pain was the most common and most severe source of patient discomfort 12 months after isolated femur fractures, and demonstrated moderate to good correlation with general and joint-specific functional outcome measures.

While reviewing the minimally invasive internal fixation of distal femur in the year 2017, the authors [18], discussed that techniques had been developed to limit incidence of non-union, infection and stiffness and that a soft-tissue friendly approach is the key point, with minimally invasive surgery as the ultimate goal: its biological and anatomical advantages have been demonstrated, but clinical studies have been less convincing, being based on historical series. At present, retrograde nailing and minimally invasive percutaneous plate osteosynthesis (ideally by locking plate) are the two main techniques. Unfortunately, reports tend to compare implants rather than operative techniques, hindering solid conclusions. Lastly, the delineation of "distal femur fracture" is quite variable, sometimes situated well above the AO epiphyseal square. Meta-analyses find almost no difference between the two implants in minimally invasive procedures. The main advantage of the plate is its versatility, whereas nailing can be impossible in case of certain hip or knee prostheses, open articular fracture or medullary canal obstruction by fixation material (nail, stem, screw, etc.). The role of arthroscopy is limited. Only a few case reports describe its use in reduction of epiphyseal fracture. The authors further concluded that, the surgeon's experience is more relevant to outcome than any particular implant.

Some other authors [19], in the year 2018 also concluded that open tibial fractures, segmental fractures, intraarticular involvement, additional surgical procedures and initial external fixation application are the poor prognostic indicators of floating knee injuries as high-velocity injuries, complex fracture pattern and associated soft tissue/visceral injuries may have some impact on the functional outcome. In this particular study, there were 15 patients with malunited tibia, 6 with malunited femur, 10 with limb length discrepancy and 39 with knee stiffness. Some 28 (33.3%) patients underwent major additional procedures such as bone grafting, re-fixation or bone transport or tendon transfer. It was observed that open tibia fracture, segmental fracture, intra-articular fracture, additional surgical procedures, initial external-fixator (ex-fix) application were significantly associated with development of knee stiffness, limb shortening, malalignment and unsatisfactory (Karlstrom and Olegrud fair to poor) functional outcome. Some authors [20], in the year 2020 discussed that complications such as infection, deep vein thrombosis, knee stiffness, nonunion, malunion, and posttraumatic arthrosis after these injuries should be considered in the "floating knee" fractures because fracture complexity and severity of soft-tissue injury present challenges, with articular injuries potentially more debilitating in the long term.

Some authors [21], in the year 2009 studied the relationship between the magnitude of femoral lengthening and callus pattern, adjacent joint stiffness and fracture of the regenerate bone in 40 femoral lengthenings in 20 achondroplastic patients. The incidence of callus features, knee stiffness and regenerate bone fracture were analyzed in the two groups. They concluded that statistically, the incidence of stiffness in adjacent joints and regenerate bone fracture was significantly associated with the magnitude of lengthening. In another study in 2016, the authors [22] concluded that dynamic condylar screw is an easy, scientifically less difficult and satisfying method of

treatment for fractures of femur following their study in which mean age of the patients was 43.18±14.647 ranging from 20 to 70 years. Mean duration of hospital stay in days was 2.21±1.111 ranging from 1 to 6 days. Patients' follow-up assessment after 4 months of surgery for union of femoral fracture treated with dynamic condylar screw was found in 96 (94.1%), wound infection in 7 (6.9%), knee stiffness in 21 (20.6%) and limb shortening in 7 (6.9%). The objective of the study was to determine the frequency of different outcomes of distal femoral fracture treated with dynamic condylar screw.

As for the physiotherapy management of femoral fractures, the main objective (post-fracture) is to aid fracture healing, limit complications and to assist the individual to return to the pre-morbid state [9]. Physiotherapy rehabilitation should begin as soon as the femoral fracture has been surgically reduced. The immediate post-operative rehabilitation should include the assessment and management of respiratory and vascular status, bed mobility and an explanation of the rehabilitation process. Education regarding gait patterns and the use of a Mobility Assistive Device should be provided. Further physiotherapy management should include strengthening of the upper limbs in preparation for crutch walking and exercises to maintain muscle power and range of motion of the unaffected limbs.

Specific rehabilitation principles [23, 24], have been documented that have advocated treatment for hip and knee stiffness, weakness of the quadriceps, hamstrings and gluteal muscles as well as gait education post-femoral fracture.

Optimal rehabilitation is needed to assist in recuperation following intramedullary nailing of the femur [25, 26]. Similar to patients with femoral fractures, patients with total knee replacements present with quadriceps muscle weakness, loss of knee range of motion and gait abnormalities post-surgery. The authors selected an experimental study with clinical trial design to compare the benefits of initiating rehabilitation treatment within 24 hours versus 48-72 hours after total knee replacement in patients with osteoarthritis. The results indicated that early physiotherapy intervention contributed to improvements in pain, range of motion and muscle power. Further, the early intervention improved autonomy in activities of daily living, balance, gait, and reduced the length of hospital stay [26]. The effects of this early physiotherapy intervention could thus be beneficial in patients following intramedullary nailing.

In Austria in the year 2003 [27], investigation on the use of a clinical pathway for orthopaedic patients to assist physiotherapists to optimize service delivery and facilitate early patient discharge was conducted. This Australian-based study explored the effects of a pre-operative, post-operative and outpatient treatment plan in patients who received elective total knee replacements over a two-year period. This clinical pathway assisted in improving patient care and decreased the length of hospital stay.

The results of these studies [26, 27], indicated that regular and frequent physiotherapy treatments on an inpatient and outpatient basis appeared to optimize rehabilitation outcomes in orthopaedic patients. Management of femoral fractures therefore requires optimal surgical fixation [8], and physiotherapy rehabilitation [9-23]. Despite its good treatment outcomes, intramedullary nailing does result in impairments with subsequent activity limitations and participation restrictions. Patients have reported disability even in cases when surgery has had good technical success and bone union has been achieved [17].

Studies reporting on these impairments and their effect on function have been discussed by other researchers. A case report in the year 2022 [28], involved a 65-year-old male who presented with chief complaints of pain and severe stiffness in the left knee for 15 years. Radiographs of the left knee in anteroposterior and lateral views were taken, which showed united distal femur fracture with Grade 4 Kellegren Lawrence knee arthritis. Due to severe knee stiffness and with the patient demanding early mobilization and functional knee range of motion, total knee arthroplasty with intra-articular and extra-articular adhesion release was planned for the patient.

Factors associated with knee stiffness have been documented. In a study in the year 2017, the authors [29], documented that posttraumatic and/or postsurgical knee stiffness resulted from femoral fracture and further discussed that among the patients, 48% had a simple fracture and 51.9% had a segmental fracture. Considering the fracture site, 40.74% of patients had femoral shaft, 37.3% supracondylar and 22.2% had femoral supracondylar- shaft fractures. The authors further discussed that 88.9% of the fracture fixation was performed by internal (plate-70.37, intramedullary nail-18.51%), 7.4% by external, and 3.7% by Wagner fixation techniques. The mean range of motion before operation was determined to be 33.15° ± 24.73°, under anaesthesia-122.60°± 10.22°, and 3-months post operatively was 99.63° ± 16.52°, and 6-month post operation were 100.74° ± 15.67°. The mean changes in the ranges of motions were determined to be 79.2° ± 24.6° and 62.1° ± 19.7° in the cases with simple and segmental fractures, respectively. The mean changes in the knee ranges of motions were significantly higher in simple fractures in comparison with the segmental femoral fractures, with a *p*- value of 0.03. The knee joint extension was positive in 9(33.3%) and negative in 18(66.7%).

In a study to investigate the clinical effect of modified Judet quadricepsplasty combined with patella traction in the treatment of knee joint rigidity after a

femoral fracture, the authors [30], retrospectively reviewed the clinical data of 21 patients with stiff knee joint after a femoral fracture treated by Modified Judet (MJ) quadricepsplasty combined with patella traction designed by the author from May 2014 to January 2017. The age at revision surgery was 20-57 years. The time between fracture fixations to quadricepsplasty was five to 23 months, and the follow-up was 11-32 months. Pre-operative, intra-operative, post-operative and final follow-up range of motion, the total traction time, and complications were assessed. The authors found out that knee range of motion was 5°-60° pre-operatively, and 30°-80° after MJ an increase of 0°-30°. The duration of patellar traction was 10- 14 days. Knee range of motion after traction device removal was 90°-100° (92 ± 3)°, an increase of 10°-65° The follow-up duration was 11-32 (18 ± 6) months. Knee range of motion at final follow-up was 80°-130° (104 ± 12)°, an increase of 40°-100° (68 ± 16)°. Knee function was excellent in 67% of the cases, good in 28%, and fair in 5%. The authors concluded that the modified Judet plus patellar traction lengthens the contracted quadriceps femoris, thus restoring knee function within a short period of time.

In another study in 2023, the authors [31], discussed that non-union distal femur fracture is a challenging fracture to treat. Common treatment modalities for non-union distal femur fractures include dual plating, intramedullary nails, Illizarov, and hybrid fixators. Despite the availability of a wide armamentarium of constructs, the clinical and functional outcome of these modalities is often complicated by significant morbidity, joint stiffness, and delayed union. The augmentation of the intramedullary nail with a locking plate results in a robust architecture, improving the likelihood of union. The use of this nail plate construct improves biomechanical stability and restores limb alignment, which enables early rehabilitation and weight bearing and lowers the likelihood of fixation failure. Methodology: A prospective study was conducted at the Government Institute of Medical Science, Greater Noida, from January 2021 to January 2022 on 10 patients with non-union of the distal femur. All the patients were operated on with nail plate construct. The minimum follow-up period was 12 months. Results: a total of 10 patients with a mean age of 55 years were included. Six were earlier treated with an intramedullary nail and four with extramedullary implants. All patients were managed with implant removal and fixation with nail plate construct and bone grafting. The average duration of the union was 10.3 months. The International Knee Documentation Committee (IKDC) score improved from 30.6 preoperatively to 67.3 postoperatively.

A case report of a 16-year-old patient diagnosed with a left midshaft femur fracture was documented by some authors [32]. An open reduction internal fixation (ORIF) femur interlock nailing was performed to stabilize the fracture, and she was referred to physiotherapy after surgery for further management, discussed the role of kinesiophobia in patient outcomes post operatively. Kinesiophobia is an irrational and debilitating fear of physical movement and activity resulting from a feeling of vulnerability to painful injury or re-injury. According to the concept of avoidance of fear, pain is interpreted as threatening, which can trigger pain-related fears and anxiety leading to avoidance behavior. Avoidance action involves a process/period characterized by a person stepping back from undertaking daily tasks like exercise, socializing, and work, which increases the intensity of the painful experience. In hospital settings, kinesiophobia needs to be resolved to ensure a positive result in rehabilitation interventions. The femur is the lower extremity's primary weight-bearing bone. Early fracture fixation in the shaft of the femur allows for early mobilization, thereby reducing the risk of hip and knee stiffness as well as quadriceps and hamstring wasting. The comprehensive rehabilitation program was helpful in alleviating the severe kinesiophobia in the patient, and she was able to resume her Activities of Daily Living (ADLs) independently.

Some authors [33], in the year 2008 discussed that persistent knee stiffness is common after knee arthroplasties, cruciate ligament repairs, and trauma. Static progressive stretch protocols have shown success in treating contractures of the elbow, ankle, and knee in case reports and small case series. This study evaluated static progressive stretch as a treatment method for patients who had refractory knee stiffness, and compared the outcomes to published results of other therapeutic modalities. Forty-one patients who had knee stiffness and who had not improved with conventional physical therapy modalities were treated with a patient-directed orthosis that utilized the principles of static progressive stretch. After a mean of 9 weeks of use (range: 3- 27 weeks), the total arc of motion increased by a mean of 33 degrees (range: 0- 85 degrees). Forty of 41 patients had increased motion at a mean final follow-up time of 1 year (range: 6 months to 2 years), and 93% were satisfied with the results. The outcomes were comparable to other nonoperative treatments reported in the literature, but the results in the present study occurred in a shorter mean treatment time. The authors concluded that an orthosis that utilizes the principles of static progressive stretch may be a successful treatment for improving the range of motion and satisfaction of patients who have knee contractures.

A study in the year 2013 was conducted to determine whether the basic science evidence supports the use of continuous passive motion (CPM) after articular cartilage injury in the knee was conducted by some authors [34]. They concluded that current basic science evidence from rabbit studies has shown that CPM for the knee significantly improves motion and biological properties of articular cartilage. This may be translated to potentially improved outcomes in the

management of articular cartilage pathology of the knee. The authors further discussed that if the rabbit model is relevant to humans, CPM may contribute to improved knee health by preventing joint stiffness, preserving normal articular tissue with better histologic and biologic properties, and improving range of motion as compared with joint immobilization and intermittent active motion.

In another study in the year 2023, the authors [35], concluded that an acute bout of static stretching decreased passive stiffness in both young and older women in a study to assess the acute effects of static stretching on hamstring passive stiffness in young and older women and to compare hamstring muscle size and quality measurements. In another study in the year 2021, the authors [36], concluded that management of complex intra-articular distal femur fracture has always been a challenge. Anatomical reduction of articular fragments and rigid fixation of these fractures are a must. Distal femoral locking plate (DFLP) provides angular stability with multiple options to secure fixation of both metaphyseal and articular fragments with the restoration of the joint congruity, limb length, alignment and rotation, allowing early mobilization and aggressive physiotherapy without loss of fixation, resulting in gratifying functional outcome and low complication rate. Fractures of the distal femur account for 0.4% of all fractures. They involve about 7% of all femur fractures, with bimodal age distribution, commonly occur during high-velocity trauma of motor vehicle accidents in the younger group of patients and are frequently associated with other skeletal injuries. The treatment of distal femoral fractures has evolved from conservative treatment to more aggressive operative treatment. The aim is to achieve and maintain a good reduction of the joint to allow early active mobilization, thus minimizing the joint stiffness and severe muscular atrophy encountered in the conservative treatment.

In another study conducted in the year 2015 to assess the role of mental health in total knee replacement, the authors [37], concluded that patients with arthrofibrosis and psychological distress perceived themselves preoperatively as having worse knee and overall health status than those with arthrofibrosis but without distress. In view of this, expectations after Total Knee Arthroplasty (TKA) should be particularly addressed in those patients with poor function and psychological distress. Further investigations, making use of tools specifically designed to ascertain depression, are warranted. Another group of authors [38], later in 2027 documented that psychological distress has been associated with inferior scores for pain after TKA in their discussion based on their experience with management of complicated fractures using the Illizarov technique in the Nigerian setting concluded that Illizarov surgery is a good method of limb reconstruction in Nigeria. The major complications are the high rate of pin site infection and knee stiffness. Good pin site care and early physiotherapy is essential.

Some authors [39], in the year 2022 concluded that higher postoperative pain seems to predict manipulation under anaesthesia (MUA) risk. MUA performed 3 months postoperatively offers substantial ROM improvement and comparable patient-reported outcome measures (PROMs) to no-MUA patients 1 year after TKA in a study aimed at analysis of MUA as the first-choice treatment for stiffness following TKA unresponsive to pain management and physiotherapy. Some of the predisposing factors and PROMs following MUA remain poorly studied. Researchers retrospectively investigated the etiological risk factors and the outcomes of MUA. A retrospective chart review was conducted to ascertain relevant information that affected the participant's length of hospital stay at the Grady Memorial Hospital in Atlanta, Georgia. The mechanisms of injury included MVA, gunshot wounds (GSW), falls from a height and miscellaneous causes. The study concluded that the average length of stay was 3.9 days. Factors prolonging length of stay included medical conditions of the participant, time delay to surgery, time delay post-surgery to physiotherapy, waiting for radiological investigations and social issues delaying discharge to a patient's home.

Locally at Moi Teaching and Referral Hospital (MTRH), knee stiffness is a common problem that tends to lead to loss of functional range of motion which can be caused by flexion contractures, extension contractures or combined. Knee flexion contractures or stiffness have a lot of functional consequences such as weight-bearing activities and difficulties with bed or chair or general lower extremity positioning. Normal daily activities become more difficult because more energy and specific techniques are required to perform them.

Knee stiffness also leads to tension of muscles which causes pain while trying to elongate the affected muscles. Disability is one of the biggest challenges facing knee stiffness in femur fracture patients because of the type of gait and posture they acquire secondary to the stiffness which leads to activity limitation as well as participation restrictions. There are also quite a huge number of patients who get psychological breakdowns and mental issues, secondary to feeling ineffective in the society as well as feeling depressed which in turn affect their social life and social interactions with other individuals in the society.

Therefore, research in understanding the occurrence of knee stiffness and associated factors in fractures of femurs among patients attending Physiotherapy out-patient services at MTRH is important as it will aid in identifying these factors-intrinsic and extrinsic that can be counterproductive in management of patient, and hence institute appropriate corrective or remedial measures.

This study is Justified as it seeks to provide important information about disease trends and risk

factors, outcomes of treatment or public health interventions, functional abilities, patterns of care, and healthcare costs and use with a level of scientific evidence needed to serve as guidance to take a valid decision-making approach in routine health practice, besides being an essential component for advancing the Evidence-Based Practice (EBP).

Furthermore, this study seeks to lead to significant discoveries and a remarkable improvement in healthcare and public health. In addition, multidisciplinary approach is important for better understanding of clinical conditions and providing safest healthcare to the client. The goal of personalized medicine is to tailor prevention strategies and treatments to each individual based on his or her genetic composition and health history.

In this study, the Researchers attempt to provide answer to "how is the occurrence of knee stiffness in the patients with fractures of femurs attending physiotherapy out-patient services at MTRH, Eldoret?" The Researchers seek to address the broad objective "to describe the occurrence of knee stiffness in the patients with fractures of femurs attending physiotherapy out-patient services at MTRH, Eldoret". The specific objectives addressed by the Researchers include: "to describe the characteristics of patients, to determine the prevalence, and to establish the management factors associated with knee stiffness in patients with fractures of femurs attending physiotherapy out-patient services at MTRH, Eldoret, Uasin Gishu County, Kenya".

# METHODOLOGY

***The Research Design*:**

This was a hospital based retrospective descriptive study as it sought to explore the characteristics of patients, prevalence, and management factors associated with knee stiffness in patients with fracture femur attending physiotherapy out-patient services at MTRH, Eldoret. This kind of design saved time, effort and costs that would otherwise have been incurred in collecting data over several periods of time.

An in-depth investigation and description of the phenomena was undertaken to systematically classify the variables and describe the factors as accurately and correctly. Data was retrieved from patients' files from the records department.

***The Study Site:***

The study was conducted at Moi Teaching and Referral Hospital (MTRH), physiotherapy out-patient department, Eldoret in Uasin Gishu County, Kenya. MTRH is located along Nandi Road, about 1 kilometer by road from Eldoret town's Central Business District area. It is a multispecialty hospital excelling in healthcare, training and research, serving over 25 million people in the western and other region of Kenya (at least 22 counties) and neighboring countries. MTRH serves as a major training institution for several collages including Moi University [40].

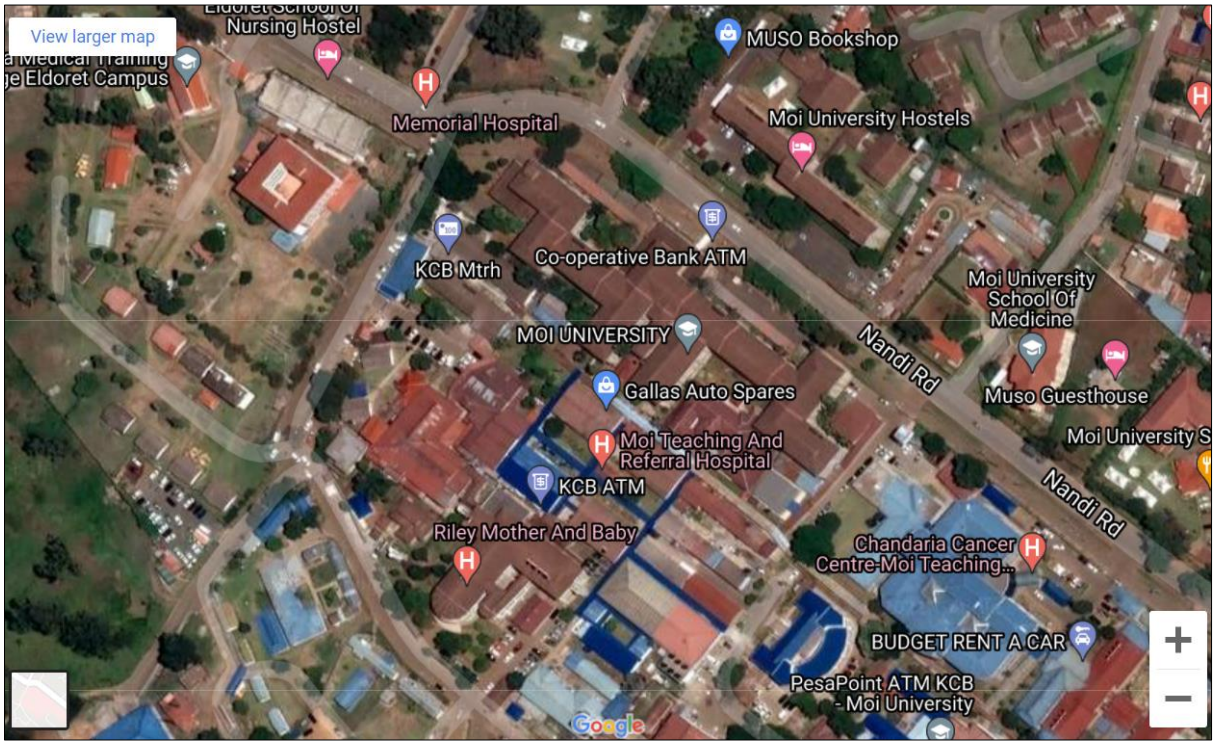


**Figure 6: Map showing location of the study area**

***The Target Population:*** This comprised of clients with knee stiffness secondary to fractures of femurs post-surgery at Moi Teaching and Referral hospital Eldoret.

***The Study Population:***

This comprised of all patients with fractures of femurs attending physiotherapy out-patient services. The list and number of respondents at MTRH were obtained from physiotherapy out-patient and records keeping department patient register. A total of 270 patients' folders were obtained.

***The Eligibility Criteria:***

The Inclusion criteria- folders of patients both males and females between the ages of 18 and 65 years, who had sustained a femoral fractures were included in the study. Exclusion criteria- folders of patients with comorbidities like cancer, hemophilia, deep venous thrombosis, mental illnesses, and files with incomplete records. The summaries of patients justifiably excluded on the basis of incomplete records are outlined in the table below after scrutinizing their folders.

**Table 2: Summary of co-diagnoses and comorbidities**

| ***Category*** | **Conditions/Findings** |
|---|---|
| *No chronic disease* | No chronic disease, no history of chronic illness, no history of chronic diseases, no known drugs and food allergies |
| *Osteoporosis and bone conditions* | Osteoporotic bones, bone cyst (distal metaphysis), chronic osteomyelitis, Infected implant |
| *Previous medical history* | No previous admission, no history of admission, no history of surgery |
| *Injuries and trauma* | Bladder injury, abdominal injury, head injury, epidural hematoma |
| *Surgical interventions* | Distal femur corrective osteotomy, craniotomy done |
| *Infections and systemic diseases* | Septicemia, pneumonia, COVID-19, septic arthritis (right knee) |
| *Blood disorders* | Bleeding disorder, Blood transfusion |
| *Cardiovascular issues* | Hypertension, deep venous thrombosis |
| *Previous accidents and surgeries* | Previous history of road traffic accident, mandibular fracture, humerus, patella symptomatic implants |
| *Other conditions* | Acute kidney Injury, genu valgus |

***Presence of Co-Diagnoses and Co-Morbidities among Patients Who Were Excluded:***

Various co-diagnoses and morbidities were documented among patients. Researchers categorized them based on disease type, previous medical history, injuries, surgical interventions, and other conditions. Understanding these factors helped in assessing patient health conditions, treatment complexity, and potential risks during hospitalization and impacts on development of stiff knee joints.

***No Chronic Disease Cases:***

Several patients had no history of chronic illness or diseases. This indicated a subset of patients without underlying medical conditions that could complicate treatment. The following cases were recorded: no chronic disease (mentioned twice), no history of chronic illness, no history of chronic diseases (mentioned twice), and no known drug and food allergies. This group likely had a relatively straightforward recovery process compared to those with pre-existing conditions. However, they were excluded due to incompleteness of documentations.

***Osteoporosis and Other Bone Conditions:***

Bone-related conditions were observed in some patients, which could impact fracture healing and postoperative recovery. These included: osteoporotic bones which might lead to fragile bones, increasing additional fracture risk, bone cyst (distal metaphysis), chronic osteomyelitis and infected implant suggesting prior surgery complications requiring further management.

***Previous Medical History:***

Some patients had no significant previous medical history, which might contribute to a faster recovery. Patients with no prior hospital stays or surgeries likely had no known risk factors, making them good candidates for standard treatment protocols. However, they were excluded due to incompleteness of documentations.

***Injuries and Trauma:***

Injuries were common among patients, requiring specialized care. This included bladder injuries which might have complicated recovery and required urological intervention, abdominal injuries which might have caused internal bleeding or organ damage, head injuries such as epidural hematomas which required neurological interventions and monitoring. Such injuries often required multidisciplinary care and extended hospital stays.

***Other Surgical Interventions***

Some patients underwent or required additional surgical procedures such as distal femur corrective osteotomies and craniotomies. Patients who underwent additional surgical procedures typically required longer hospital stays and physiotherapy post-surgery.

***Infections and Systemic Diseases:***

Certain infections and systemic conditions were observed, affecting treatment outcomes. These included septicemias, pneumonia, corona virus disease-19 (COVID- 19) and septic arthritis. Some of these infections were life-threatening and could lead to organ failure, others were hospital acquired and caused respiratory complications further prolonging hospitalization and impacting the occurrence of knee stiffness. In a few cases, additional surgical procedures such as debridement were performed.

***The Study Sample:***

A descriptive retrospective audit of patients' folders was conducted. All the folders of patients who attended the MTRH Physiotherapy out-patient department during the period between July 2021 and June 2022 and fulfilled the inclusion criteria were included in the study.

***The Sample Size Determination:***

The census method was employed. All patients' folders that fulfilled the inclusion criteria were included in the study, making a total of forty eight (48).

***Data Collection Tool and Procedure:***

A list of all patients who had been managed at MTRH Physiotherapy out-patient department with knee stiffness due to femoral fractures from July 2021 to end of June 2022 was obtained from the out-patient Physiotherapy Department register. This list was used to obtain the relevant folders from the Medical Records Department at the hospital. A total of 270 patients' folders were obtained and then data recorded in the data extraction tool (Table 3), and scrutinized according to the eligibility criteria. A total of 48 folders of patients that fulfilled the inclusion criteria were eventually analyzed and assessed on site in the Medical Records Department of MTRH.

***Data Analysis:***

The data collected from the patients' folders was edited to minimize inconsistencies and errors. This was followed by coding of the data. The analysis was done with the aid of the Statistical Packages for Social Science (SPSS) computer software. The preliminary data was analyzed using descriptive statistics in the form of frequencies, means, and percentages and presented in the form of tables, pie charts and graphs.

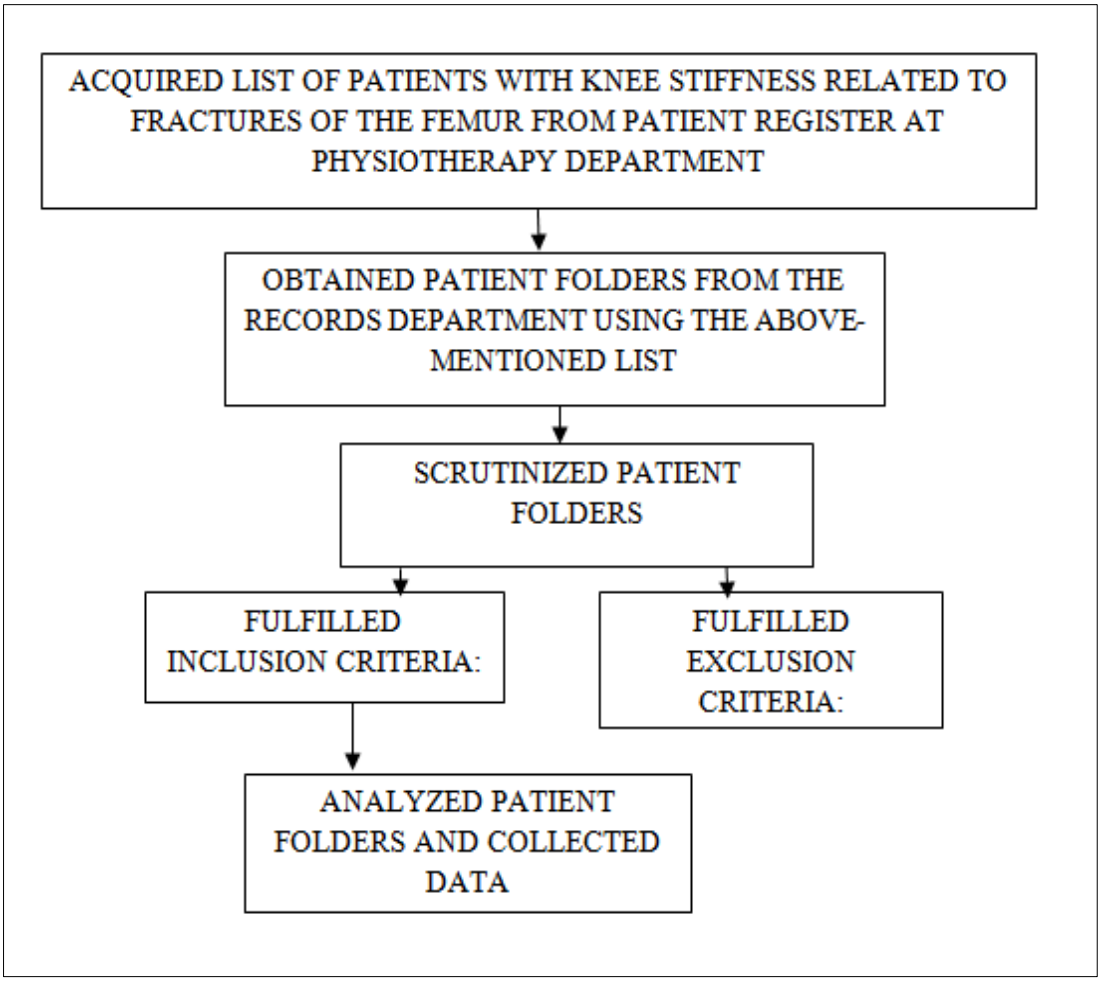


**Figure 7: Data collection schema**

**Table 3: Data extraction tool**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **SECTION 1** | | | | | | | | | |
| S/N | File Code Number | Gender | Age | Education status | Residence | Date of injury occurrence | Causes of injury | Date of admission | Date of discharge |
| **SECTION 2** | | | | | | | | | |
| S/N | Part of femur involved | Other leg bones affected | | Co-diagnosis/ comorbidities | Medical-Surgical management | Date of medical-surgical intervention | | Date of referral to physiotherapists | |
| **SECTION 3** | | | | | | | | | |
| S/N | First physiotherapy session | Physiotherapy management | | Total number of physiotherapy visits | Outcomes | Socioeconomic factors | | Other factors | |

***Ethical Considerations:***

Ethical approval was obtained from the MTRH/ Moi University Institutional Research Ethics Committee (IREC) (IREC/704/2023; Approval Number 0004688 dated 29th February, 2024) and Acting Chief Executive Officer (ELD/MTRH/R&P/10/2/V.2/2010 dated 8th March, 2024) before embarking on data collection. All data collected was treated with utmost confidentiality with no identifying details collected. Data was only disseminated to authorized personnel for purposes only intended to improve evidence-based physiotherapy practice.

***Assumptions and Scope of the Study:***

This study was based on the following assumptions: There were several patients with knee stiffness due to fracture femur attending physiotherapy out- patient services at MTRH in Eldoret, Uasin Gishu County were of varied characteristics (sociodemographic and clinical), the ailment was quite prevalent, and that there were several management factors associated with the ailment. The majority of these factors associated with knee stiffness could be prevented to reduce the prevalence of knee stiffness in the future. Some factors were difficult to control.

***Limitation to the Study and Mitigation Strategies:***

The study only focused on clients with knee stiffness secondary to fracture femur attending physiotherapy out-patient services at MTRH in Eldoret in Uasin Gishu County, meaning generalizations of the findings to other health institution in Uasin Gishu County and the rest of the country should be done with precaution. The study also utilized descriptive retrospective audit of patients' folders to collect data. The study was hospital based retrospective control study which means that the data was collected at one point in time. The researchers used various data in the hospitals to try to understand the trends and the effects of knee stiffness. Only folders with complete data were used.

## RESULTS

***Introduction:***

The detailed analysis of the findings related to knee stiffness in patients with femoral fractures attending physiotherapy out-patient services at Moi Teaching and Referral Hospital (MTRH) are presented through statistical data, tables, charts, and in-depth interpretations aligned with existing literature.

***The characteristics (sociodemographic and clinical) of patients with knee stiffness due to fracture femur attending Physiotherapy out-patient services at Moi Teaching and Referral Hospital, Eldoret***

***Gender Distribution****:* This included 14 (29%) female and 34 (71%) male, making a total of 48 patients in this study. Male dominated in each age class category.

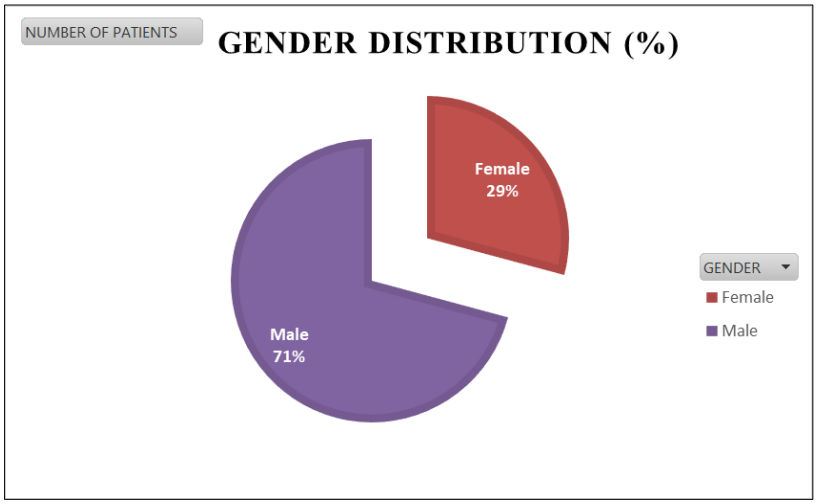


**Figure 8: Gender Distribution**

**Age Distribution:** Patients were categorized into three age groups: below 30 years (15 patients), 30-50 years (18 patients), and above 50 years (15 patients).

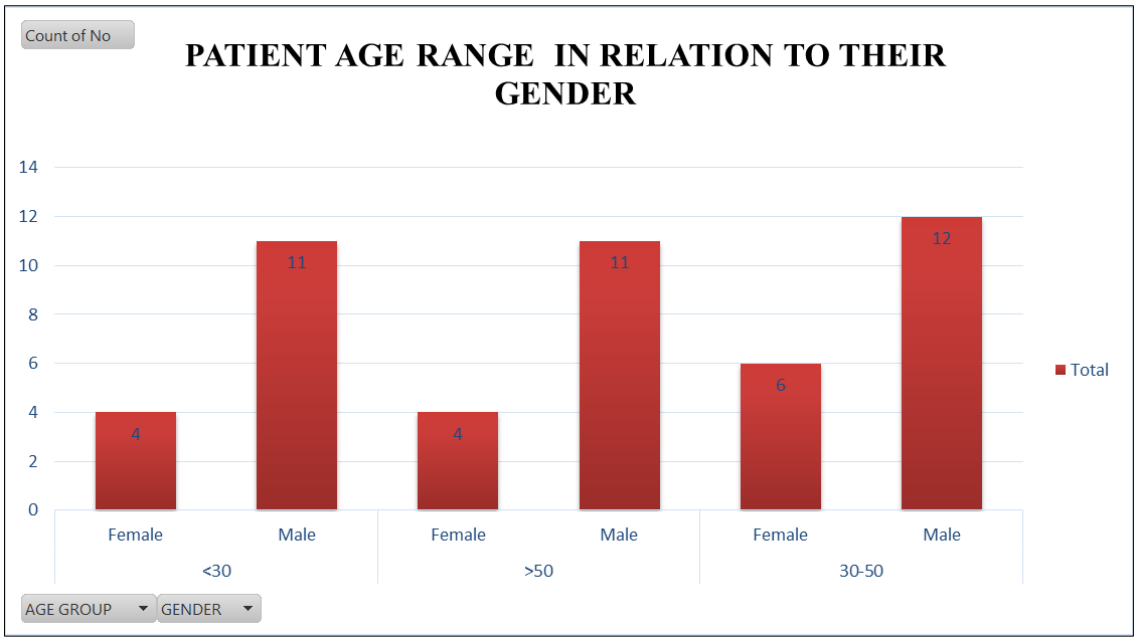


**Figure 9: Age distribution**

***County of Residence:***

Patients were drawn from different counties, with Uasin Gishu having the highest representation (27 patients, 56%), followed by Elgeyo Marakwet (6 patients), Nandi (3 patients), and other counties contributing smaller percentages.

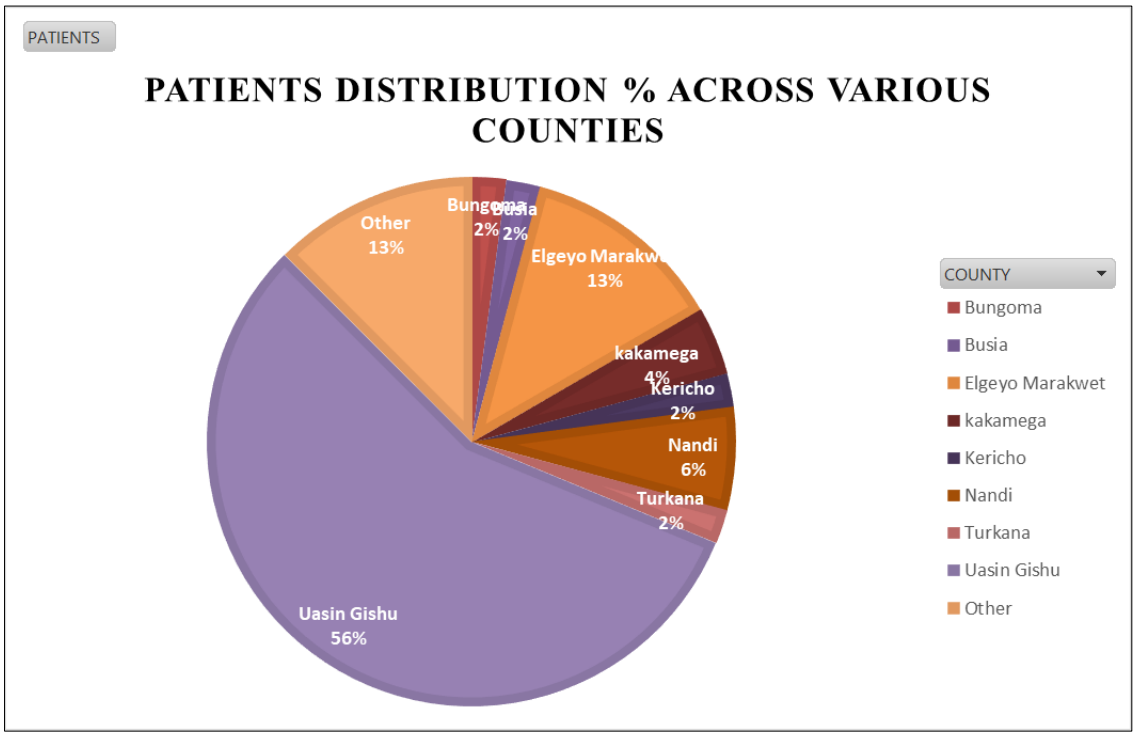


**Figure 10: Geographical distribution chart**

***Level of Education:***

The levels varied among patients, with the majority having secondary-level education. Among female patients, 6 had primary education, 4 had secondary education, and 1 had university-level education. Among male patients, 8 had primary education, 19 had secondary education, and 7 had unspecified education levels.

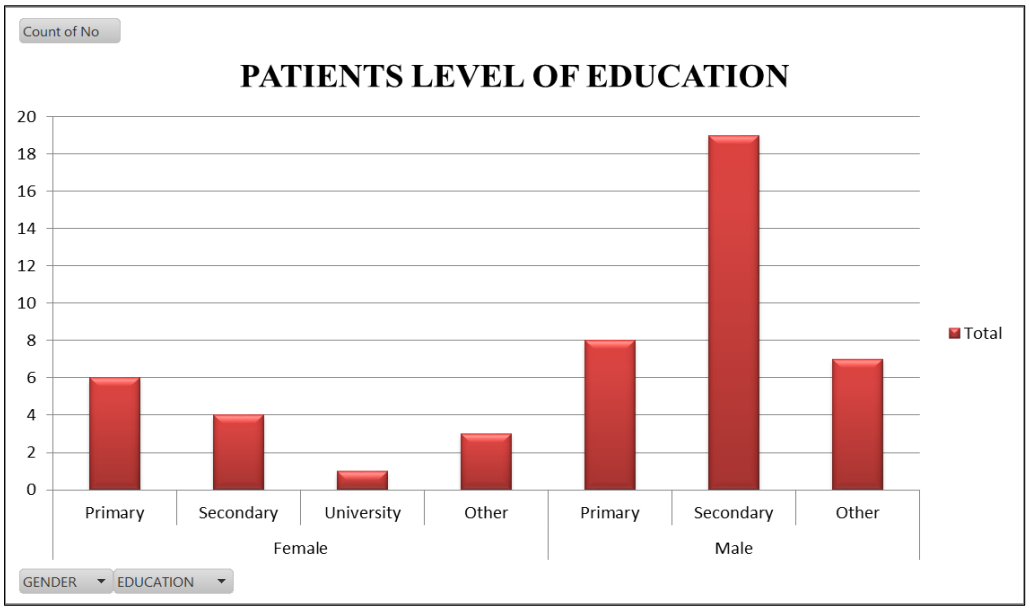


**Figure 61: Education levels**

***Causes of Injuries:***

The leading cause of femoral fractures among patients was road traffic accidents (RTA), accounting for 30 cases (62.5%). Falls were the second most common cause (9 cases), while domestic accidents (2 cases), gunshot injuries (1 case), and pyogenic arthritis (1 case) and others contributed to the remaining cases.

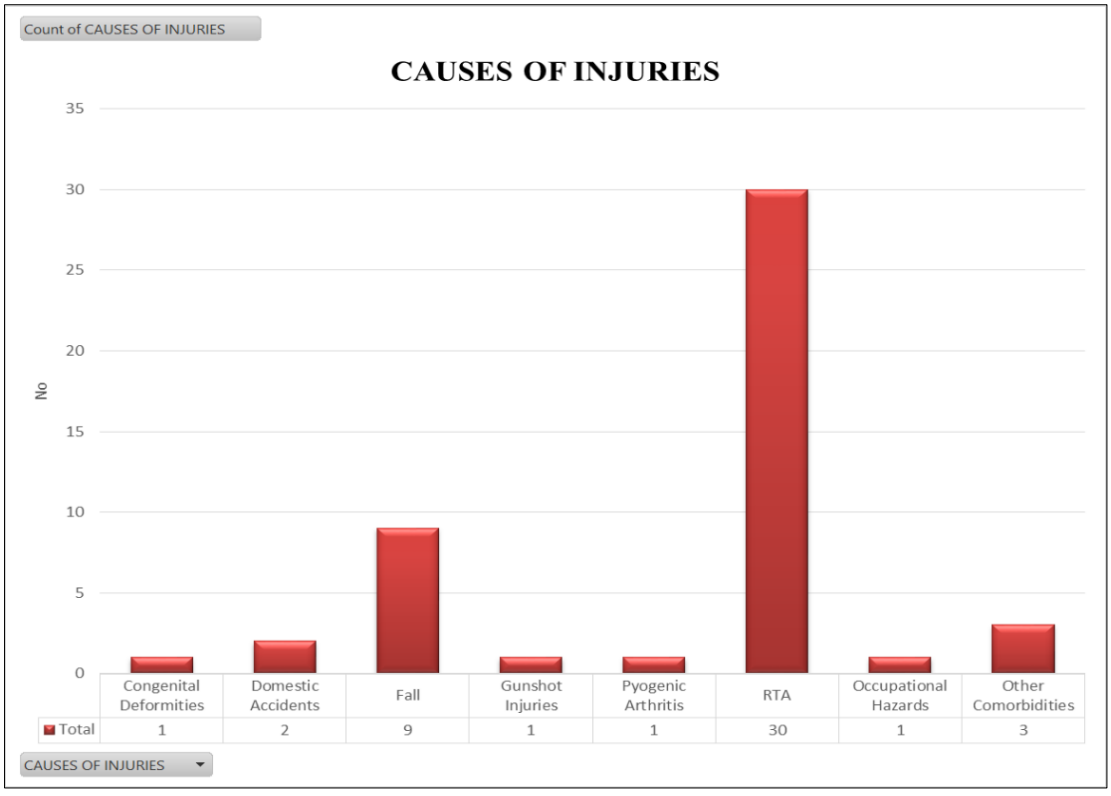


**Figure 7: Causes of injuries**

***Anatomical Site of Femur Fracture:***

The fractures were classified based on the affected part of the femur. Intertrochanteric fractures were the most common (18 cases), followed by distal femur fractures (15 cases, 31%). Mid-shaft femur fractures accounted for 8 cases (17%). Proximal shaft of femur fractures represented 3 cases (6%). Neck of femur fractures accounted for 3 cases (6%). Condylar fractures were the least common (1 case, 2%).

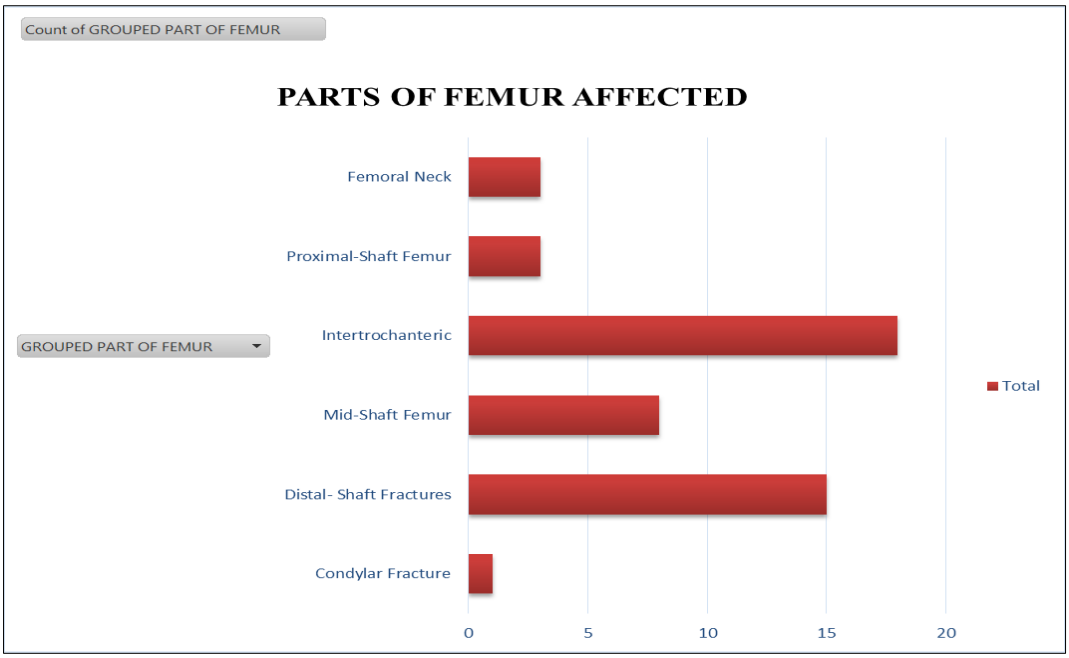


**Figure 8: Anatomical sites of fractures**

***Causes of Injuries in Relation to Age:***

The Road Traffic Accidents were the leading causes of injury across all age groups, with the highest occurrence in the 30-50 group, followed by <30, and then >50. Falls are more prevalent in the >50 group compared to the other age groups. Other causes of injury, including domestic accidents, gunshot injuries, occupational hazards, pyogenic arthritis, and congenital deformities, show lower frequencies in comparison to RTA and falls. Congenital deformities appear only in the <30 group, while gunshot injuries and occupational hazards are recorded only in the >50 and 30-50 groups, respectively. Domestic accidents are present in both the >50 and 30-50 age groups but are less frequent.

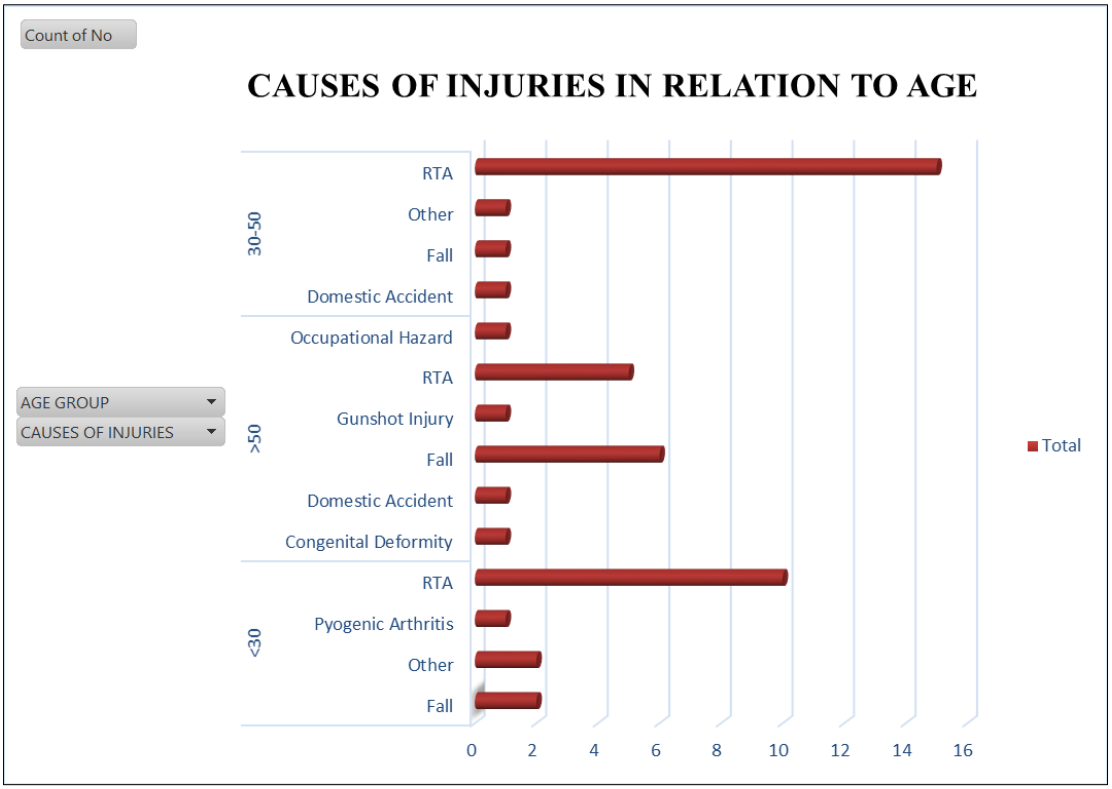


**Figure 9: Causes of injuries in relation to age**

***The Prevalence of Knee Stiffness in Patients with Fracture Femur Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret***

In the study period (1st July, 2021- 30th June, 2022), the total number of patients with knee stiffness due to fracture femur at the Physiotherapy Department of MTRH were recorded as 270. These patients attended out- patient clinic for physiotherapy services.

Out of 270 patients' folders, 48 met the inclusion criteria, the prevalence was calculated (48x100/270), giving a figure of 17.78%.

***The Management Factors Associated with Knee Stiffness in Patients with Fracture Femur Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret***

***Length of Hospitalization (Days Count):***

The distribution of hospital stays indicates that the majority of patients (17 out of 48) were hospitalized for 0-4 days, suggesting that most cases required short-term care. Another 10 patients had a hospital stay of 5-9 days, showing that a moderate proportion of patients needed longer observation or treatment. Longer hospital stays were less frequent, with 4 patients each in the 10-14 days and 20-24 days categories. Extreme outliers existed, with one patient each staying for 50-54 days, 80-84 days, 110-114 days and 370-374 days, highlighting cases with possible complications, chronic conditions, or the need for long-term rehabilitation.

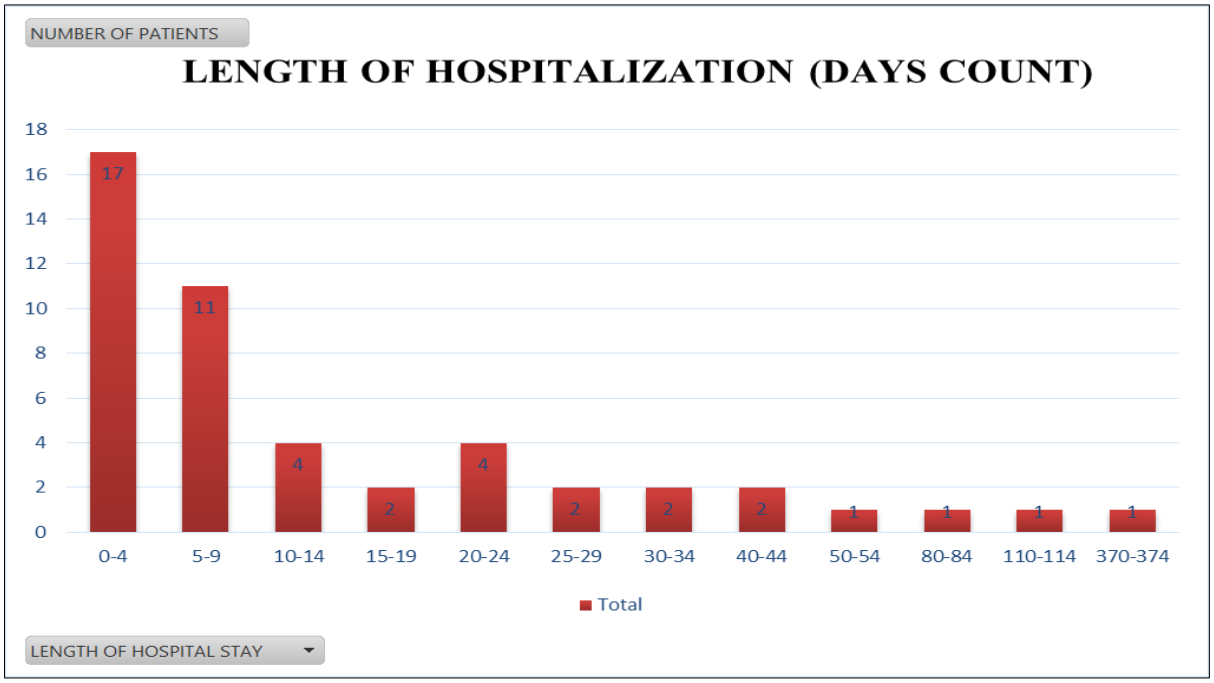


**Figure 10: Length of hospitalization**

***Number of Days between Injury Occurrence and Admission:***

The majority of patients (28 out of 48) were admitted on the same day of injury, reflecting an efficient emergency response system. Five patients experienced a 1-day delay, which could be attributed to logistical issues or delayed medical attention. Two patients had a 5-day delay, which might indicate delayed recognition of injury severity. Extreme delays were observed in 2 cases- one patient waited 192 days, while another waited 46 days before admission, which could have affected treatment outcomes. Nine patients were recorded as secondary admission, meaning they had been admitted to a different hospital prior.

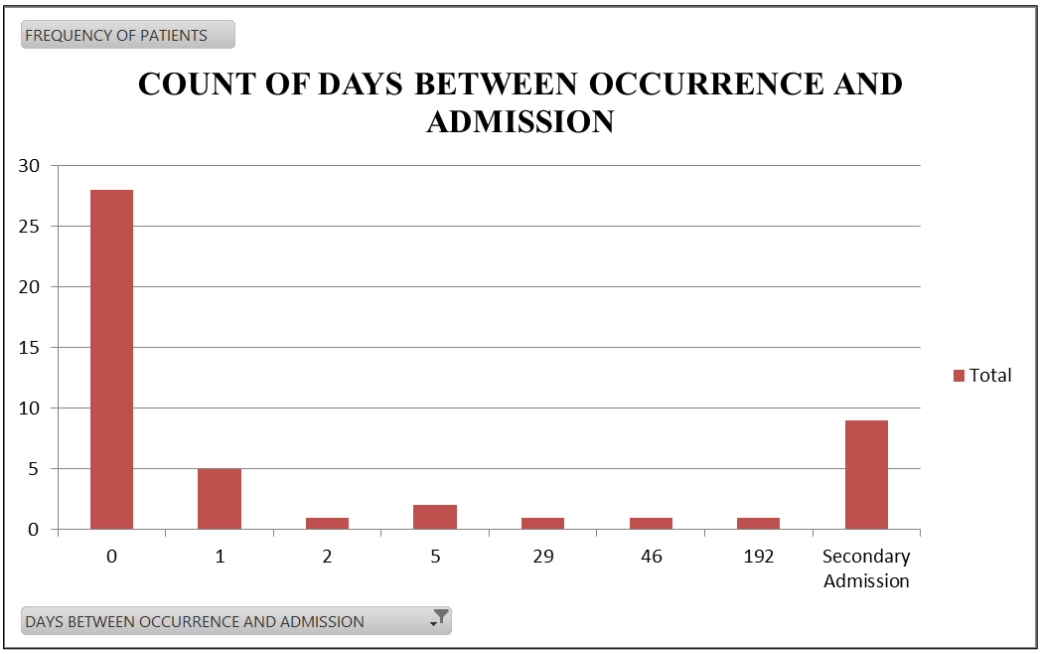


**Figure 11: Number of days between Injury occurrence and admission**

***Number of Days between Injury Occurrence and Surgical Intervention:***

Surgical intervention was performed on the same day as the injury for 10 patients. For 6 patients, the surgery took place one day after the injury, while 2 patients underwent surgery after two days. Three days post-injury, 5 patients received surgical intervention, and after four days, 2 patients had surgery. Between days 5 and 30, approximately one patient underwent surgery per day. A notable exception is a patient who waited 198 days for surgery, with around 6 cases falling into this category. Additionally, there were about 3 cases categorized as "N/A," where the exact timing of surgery was unclear.

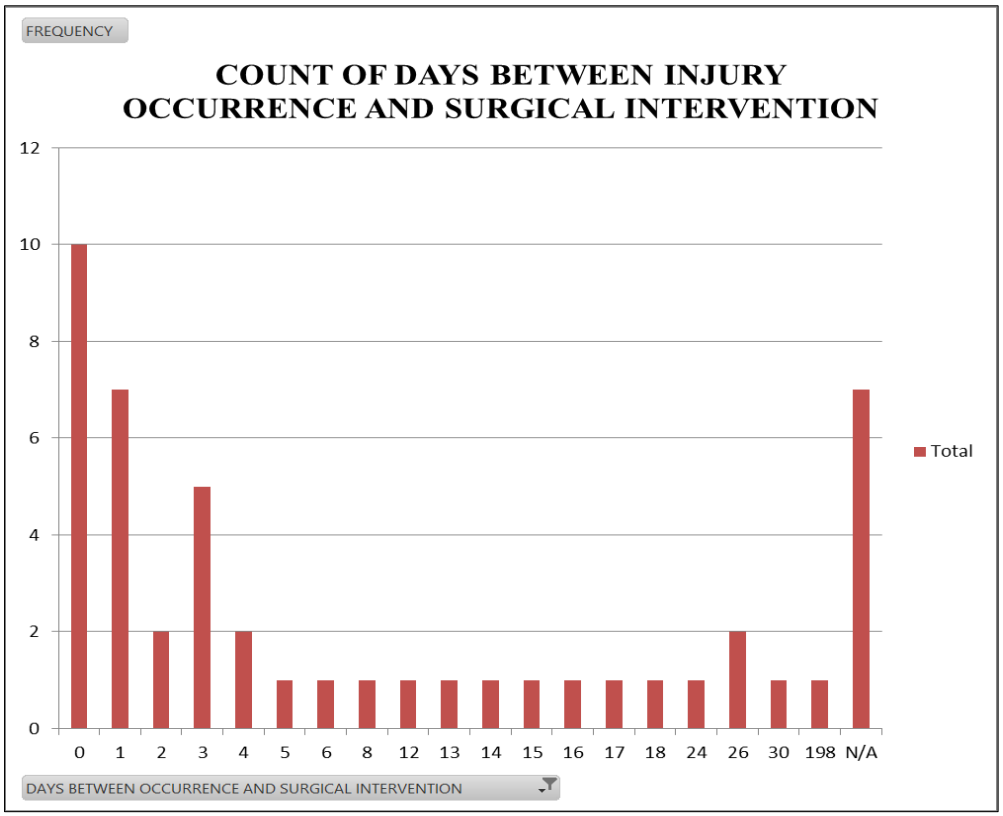


**Figure 12: Number of days between injury occurrence and surgical intervention**

***Number of Days between Admission and Surgical Intervention:***

Surgical intervention was performed on the same day of admission for 10 patients. For 8 patients, surgery occurred one day after admission, while 4 patients underwent surgery two days post-admission. Three days after admission, 6 patients received surgical intervention. From days 4 to 26, approximately one patient per day underwent surgery. Notably, one patient had surgery 890 days after admission. Additionally, about 10 cases fell into the "N/A" category, where the exact timing of surgery was not applicable because there was no surgical intervention, or the timing could not be traced.

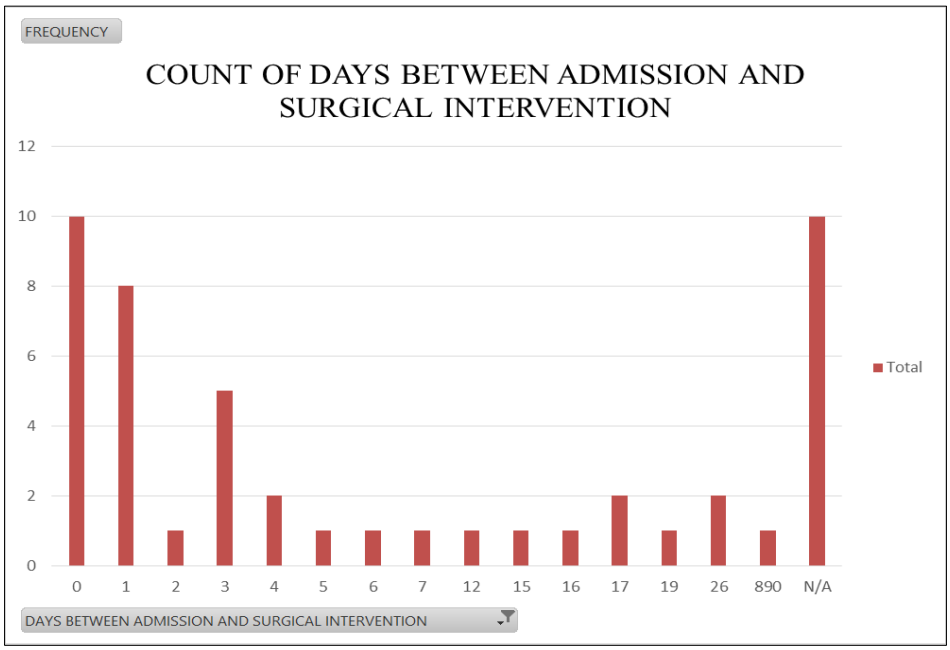


**Figure 13: Number of days between admission and surgical intervention**

***Number of Days between Surgical Intervention and First Physiotherapy Session:***

The first physiotherapy session took place within 0-1 days after surgery for approximately 16 patients. For about 5 patients, physiotherapy started between days 1-5 post-surgery. Beyond this, physiotherapy initiation was more scattered, with roughly 1 patient starting every few days up to around 469-479 days post-surgery. There were also consistent cases where physiotherapy began much later, with small but regular counts across the timeline, suggesting significant variation in rehabilitation timing.

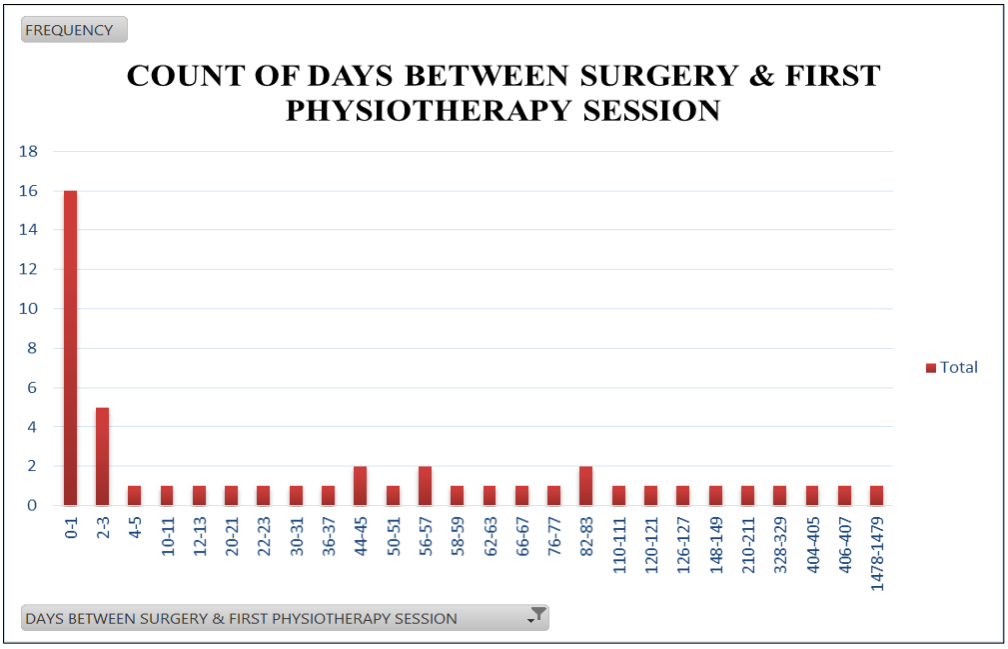


**Figure 19: Number of days between surgical intervention and first physiotherapy session**

***Part of Femur Involved in Relation to Length of Hospital Stay:***

Distal femur fractures (15 cases) accounted for the longest hospitalizations. Mid-shaft femur fractures (14 cases) and intertrochanteric fractures (8 cases) also represented significant portions of patient cases. Condylar fractures accounted for the shortest hospitalization (1 case). Proximal femur fractures (3 cases) and neck of femur fractures (4 cases) had moderate representation.

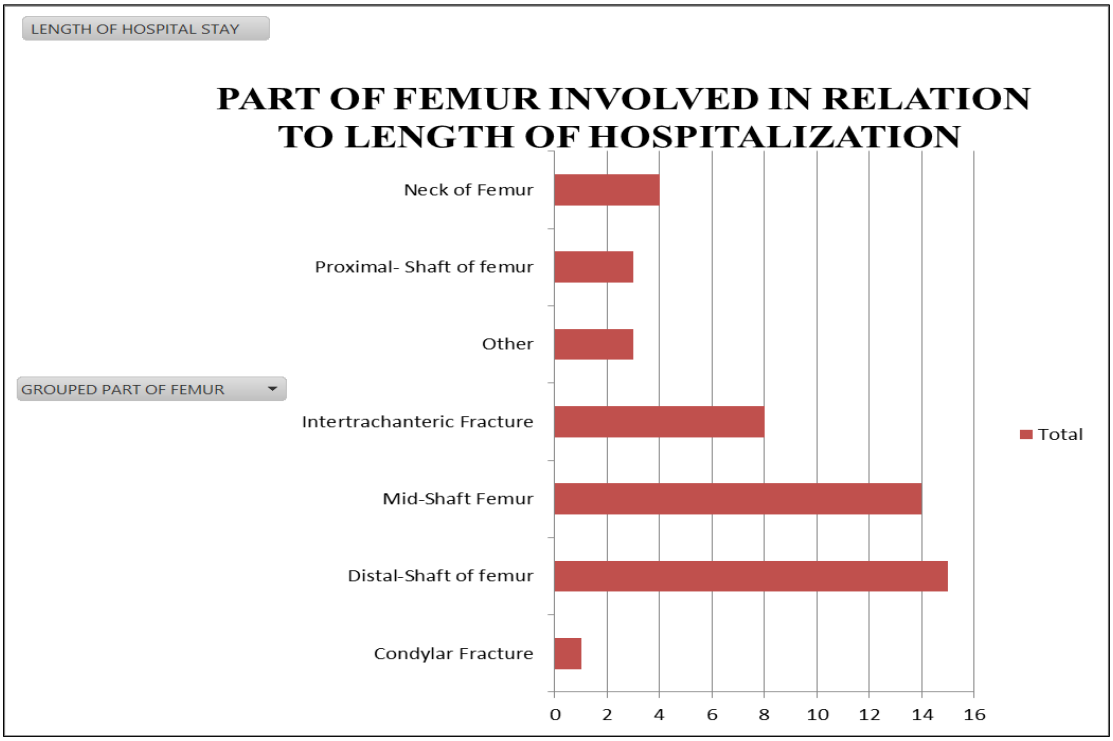


**Figure 20: Part of femur involved in relation to length of hospitalization**

# DISCUSSION

***The Characteristics (Sociodemographic and Clinical) of Patients with Knee Stiffness Due to Fracture Femur Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret***

The higher prevalence of femoral fractures among men aligns with studies indicating that males are more prone to trauma-related injuries due to occupational hazards, lifestyle choices, and engagement in high-risk activities. Studies have also suggested that males, due to their increased involvement in manual labor, have a higher probability of sustaining injuries that lead to knee stiffness. In a study in Sudan in 2012, some authors [12], discussed that knee stiffness is more frequent in male in a rate of eight folds to females. Females, although less affected, experience prolonged recovery times, possibly due to lower muscle mass and hormonal differences that impact bone healing. Additionally, gender-related disparities in healthcare access and compliance with physiotherapy regimens could further influence recovery outcomes.

The majority of patients fell within the 30-50 age range, indicating that middle-aged individuals are the most affected. This can be attributed to their increased exposure to physically demanding jobs, higher likelihood of being active road users, and potential pre-existing musculoskeletal conditions. Furthermore, older patients above 50 years demonstrated a higher likelihood of developing knee stiffness post-fracture due to age-related degenerative changes, reduced muscle mass, and slower recovery rates. Younger patients (<30 years), despite sustaining fractures, displayed better healing capabilities and improved rehabilitation outcomes. The influence of comorbidities, such as diabetes and osteoporosis, among older individuals also played a significant role in delayed recovery.

***Education:***

Lower education levels were associated with delayed hospital visits and non-compliance with physiotherapy recommendations. Patients with higher education levels demonstrated better adherence to rehabilitation protocols, possibly due to increased awareness of health-related practices and access to medical resources. Some authors [9], suggested that Physiotherapy rehabilitation should begin as soon as the femoral fracture has been surgically reduced, however patients from low-income socio-economic groups are likely to delay their first physiotherapy sessions for financial and other secondary factors such as nearness to health facilities.

***Geography:***

The dominance of Uasin Gishu can be linked to the presence of the health institution [40], being a major referral hospital serving a large population from neighboring regions. The distribution pattern suggests a high reliance on specialized physiotherapy services at MTRH. However, majority of patient who were recorded to be residents of Uasin Gishu County were from more remote regions and may have faced logistical challenges in accessing consistent physiotherapy sessions, potentially prolonging their recovery and increasing their risk of developing chronic knee stiffness.

***Causes of Injuries:***

The high prevalence of RTAs corresponds with national statistics indicating an upward trend in motor vehicle-related injuries. Additionally, falls were more common among elderly patients, often due to poor balance, osteoporosis, and reduced reaction times. Gunshot injuries were noted in a few cases, particularly in regions experiencing insecurity, highlighting the role of external factors in injury occurrence.

Further analysis indicated that patients involved in high-impact trauma, such as RTAs and falls from heights, exhibited more severe knee stiffness. This was attributed to increased joint trauma and extended immobilization periods.

Several authors [2-15], documented that among the causes of femur fractures, high- energy injuries as experienced in RTAs cases are attributed to motor vehicles accidents. Motorcycle accidents of late have also become rampant on roads.

***Causes of Injuries in Relation to Age:***

The data set revealed distinct patterns in the causes of femoral fractures across different age groups. Analyzing these trends provides insight into risk factors and preventive measures for each category.

In the age group below 30 years of age: Primary cause was road traffic accidents (RTA). Contributing factors attributed to this were increased mobility and engagement in high-risk activities such as motorcycling, cycling, or sports and higher likelihood of exposure to traffic accidents due to lifestyle and work-related travel. Some author [15], in the year 2008 asserted that road traffic accidents are an “emerging disease” in low- to middle-income countries. In addition, he also suggested that the increase in long bone fractures is secondary to the rise in motor vehicle accidents. Generally the young age groups are commonly involved in RTAs [4].

In the second age group of 30- 50 years of age: Primary cause was falls and occupational hazards. Contributing factors included engagement in manual labor-intensive occupations (e.g., farming, construction), increased fall risks and workplace injuries due to heavy lifting, slippery surfaces, or inadequate safety measures.

In the third age group of above 50 years of age: Primary cause was falls. The contributing factors were age-related conditions like osteoporosis, reducing bone strength, decreased balance and muscle strength, leading to a higher risk of falling and household hazards such as slippery floors, poor lighting, and uneven surfaces.

**Table 4: Summary- causes, contributing factors and preventive measures**

| Age Group | Primary Cause | Contributing Factors | Preventive Measures |
|---|---|---|---|
| <30 years | Road Traffic Accidents (RTA) | High mobility, motorcycling, cycling, sports | Road safety education, protective gear use, emergency response improvements |
| 30-50 years | Falls, Occupational Hazards | Manual labor, unsafe work environments | Workplace safety programs, ergonomic practices, SHIF/work insurance coverage |
| >50 years | Falls (Home-Related, Age-Related) | Osteoporosis, balance issues, unsafe home conditions | Fall prevention programs, osteoporosis screening, home modifications |

Table 4 gives the summary of primary causes of injuries in relation to age groups of patients, the contributing factors and the preventive measures in place (in charts) as advised by the physiotherapy teams in the out- patient clinic of MTRH.

***Pattern and Location of Fractures:***

The pattern [8], location or position [10], and even degree of comminution [11], have been documented in the literature. The predominance of distal femur fractures may be due to its vulnerability in high-impact trauma such as RTAs and falls. Mid-shaft fractures were also frequent, aligning with literature that identifies this region as a common site of breakage in high-energy injuries. Fractures of the femur are classified as simple and open by some authors [9] in the year 2005. A simple fracture occurs when the skin overlying the fracture remains intact. In contrast, an open fracture has an open wound overlying the fracture site [9]. Majority of patients had high impact fractures resulting from motorcycle related road traffic accidents causing open comminuted fractures with complex fracture patterns.

Additionally, fractures involving weight-bearing areas had prolonged recovery periods, contributing to persistent knee stiffness. Patients with multiple fracture sites also exhibited worsened knee mobility outcomes. It is therefore quite evident that knee stiffness posed a lot of challenges to those affected [6].

***The Prevalence of Knee Stiffness in Patients with Fracture Femur Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret***

The Researchers reviewed 270 patient files for patients who had a diagnosis of "knee stiffness" and had attended outpatient physiotherapy services at Moi Teaching and Referral Hospital. Out of these, 48 patients had knee stiffness resulting from fractures of the femur, giving a prevalence of 17.78%. This was higher than figures that were documented by some authors [14-16], elsewhere. However, some authors [12], in Sudan documented much higher figure. The latter could be explained due to difference in the methodology used.

The other patients had many other underlying factors that contributed to knee stiffness such as long standing osteoarthritis, total knee arthroplasty, fractures of the tibia among others. Their folders were however incomplete in terms of the records. These cases were eventually excluded.

***The Management Factors Associated with Knee Stiffness in Patients with Fracture Femur Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret***

***Length of Hospitalization:***

The length of hospital stay varied based on the fracture type, with some requiring extended hospitalization due to surgical complexity, patient condition, or complications. Short-term hospital stays dominated the data set, indicating that most cases were treated efficiently. Delayed admissions and surgical interventions in some cases might suggest challenges in emergency response, diagnosis, or resource availability. In the year 2021, some authors [12], in a study in Sudan found the percentage of knee stiffness following fracture shaft of femur to be high (64.7%) compared to other studies and the authors associated that to delay in surgery, physiotherapy and early mobilization. Patients with extended hospital stays require further review to determine if prolonged hospitalization was due to complications, rehabilitation, or inefficiencies in discharge planning. Fracture type directly impacts hospitalization duration, emphasizing the need for targeted treatment protocols based on the nature of the injury.

***Physiotherapy Management:***

The number of physiotherapy visits varied significantly among patients based on the severity of the fracture, site of injury, and individual recovery progress. Patients with fractures in the distal femur and mid-shaft femur required more physiotherapy sessions compared to those with fractures in other parts of the femur. Physiotherapy interventions included manual stretching, joint mobilization, muscle strengthening, soft tissue manipulation and gait training. Patients who attended more sessions showed notable improvement in joint flexibility and reduced stiffness, underscoring the importance of structured rehabilitation programs [9-27]. Furthermore, delays in seeking physiotherapy, especially among patients with low educational backgrounds or limited healthcare access and non-adherence correlated with prolonged knee stiffness and slower recovery rates. It is essential that physiotherapy should be started as soon as possible after surgery [9-23].

***Duration of Surgical Interventions in Relation to Occurrence of Injuries:***

Surgical intervention was performed on the same day as the injury for some patients, ensuring timely treatment. A gradual increase in delays was observed in a subset of patients, with some receiving surgery after several days. Significant delays were seen in a few cases, possibly due to factors such as patient stabilization, logistical constraints, or the need for additional diagnostic assessments. Delays exceeding a week were observed in a small fraction of cases, which could have impacted recovery times and patient outcomes.

For patients who were not immediately operated on, surgical intervention was generally performed within the first few days after admission. A small subset of patients experienced delays in surgery despite early admission, possibly due to medical evaluations, resource availability, or preoperative preparation. Extreme cases with significant delays highlight potential inefficiencies or complexities in patient management.

***Duration of Referral to Physiotherapy Services after Surgery:***

Early physiotherapy initiation (within a few days of surgery) was observed in many cases, indicating a focus on early mobilization for better recovery. A fraction of patients experienced delays before starting physiotherapy, which may have been due to pain management needs, patient stability, or logistical challenges. Extended delays in physiotherapy initiation were present in some cases, potentially impacting long-term rehabilitation outcomes. Physiotherapy rehabilitation should begin as soon as the femoral fracture has been surgically reduced [9-23]. The immediate post-operative rehabilitation should include the assessment and management of respiratory and vascular status, bed mobility and an explanation of the rehabilitation process. Optimization of physiotherapy has been associated with good outcomes [26, 27].

## CONCLUSION

The findings indicate that socio-demographic factors played a significant role in the occurrence and management of knee stiffness following femoral fractures. Males were more prone to fractures due to occupational hazards and engagement in high-impact activities, while females tended to experience prolonged recovery due to lower muscle mass and hormonal influences on bone healing. Middle-aged individuals (30-50 years) were the most affected due to physically

demanding jobs and frequent road usage, whereas older adults (>50 years) were more susceptible to knee stiffness due to age-related degeneration and comorbidities. Additionally, lower education levels correlated with delayed hospital visits and poor physiotherapy compliance, while patients from remote areas faced logistical barriers to rehabilitation, increasing their risk of chronic knee stiffness.

Among the 270 reviewed cases of knee stiffness, only 48 whose folders had complete medical records were directly linked to femoral fractures, but some of the cases were attributed to conditions like osteoarthritis, total knee arthroplasty, and tibial fractures. The causes of injuries varied by age group, with road traffic accidents being the primary cause among younger individuals (<30 years) due to high mobility and risk-taking behaviors. Middle-aged individuals (30-50 years) sustained injuries mainly from occupational hazards and falls due to physically demanding work environments. Among older adults (>50 years), falls were the most common cause of fractures due to osteoporosis, reduced muscle strength, and balance issues. These trends highlight the need for targeted preventive measures such as road safety education, workplace safety programs, and fall prevention strategies.

The relationship between age and injury emphasizes the need for age-specific preventive strategies. Younger individuals require traffic safety interventions, middle-aged individuals benefit from occupational safety measures, and older adults need fall prevention and osteoporosis management. Addressing these factors can significantly reduce the incidence of femoral fractures and improve overall health outcomes.

The location of fractures influenced recovery outcomes, with distal femur and mid-shaft fractures being the most common, primarily resulting from high-impact trauma. Fractures in weight-bearing areas and multiple fracture sites led to prolonged recovery times and persistent knee stiffness. The length of hospitalization varied depending on the severity of the fracture, surgical complexity, and patient condition. While most cases were treated efficiently, some experienced delayed admissions and surgical interventions due to logistical challenges, patient stabilization, or resource constraints, potentially affecting recovery outcomes.

Physiotherapy played a crucial role in recovery, with patients who attended regular sessions showing better joint mobility and reduced stiffness. However, delays in physiotherapy initiation- often due to limited healthcare access, financial constraints, or lack of awareness- correlated with prolonged recovery times. Patients with distal femur and mid-shaft fractures required more physiotherapy sessions compared to those with other femoral fractures, emphasizing the need for structured rehabilitation programs.

Comorbidities and co-diagnoses also influenced patient outcomes. Conditions such as osteoporosis, chronic osteomyelitis, and infected implants affected fracture healing and increased the likelihood of knee stiffness. Patients with previous injuries, systemic diseases, or multiple surgeries required extended hospital stays and multidisciplinary care. Infections such as septicemia, pneumonia, and COVID-19 further complicated recovery, leading to prolonged hospitalization and increased rehabilitation needs.

The timing of surgical interventions had a direct impact on recovery. While some patients received surgery on the same day of injury, delays were observed in other cases due to patient stabilization, additional medical evaluations, or resource limitations. Delayed surgeries, especially beyond a week, negatively affected recovery due to prolonged immobilization. Similarly, early physiotherapy referral improved rehabilitation outcomes, but some patients experienced delays due to post-surgical pain, patient stability, or logistical constraints, potentially worsening knee stiffness.

In conclusion, timely medical intervention, structured physiotherapy, and addressing socio-demographic barriers such as education, geographic access, and healthcare awareness were crucial in preventing and managing knee stiffness following femoral fractures. A multidisciplinary approach, incorporating early mobilization, rehabilitation strategies, and preventive measures tailored to different age groups, improved patient outcomes and enhanced recovery were crucial in the management of patients with knee stiffness at MTRH.

## RECOMMENDATIONS

To reduce the incidence and hence prevalence of knee stiffness following femoral fractures, it is essential to enhance awareness and education on injury prevention. Public health campaigns should focus on educating individuals, particularly younger adults, on road safety, proper use of protective gear, and workplace safety. Employers in labor-intensive industries should implement safety training programs and enforce protective measures to minimize occupational injuries.

There is a need for a multidisciplinary approach in dealing with patients with femoral fractures to reduce cases of delayed referrals. Physiotherapists need to be actively involved during orthopaedic consultations. Improving access to physiotherapy services is crucial in enhancing patient recovery. Many patients from remote areas struggle to attend regular physiotherapy sessions due to logistical challenges. Establishing mobile physiotherapy units, tele-rehabilitation services, and community-based rehabilitation programs can help bridge this gap. Additionally, financial support programs should be considered to ensure that rehabilitation services remain affordable and accessible to all patients. Optimize early physiotherapy initiation will enhance

recovery outcomes and reduce hospital stays. Researchers should analyze prolonged hospitalizations to determine whether they were medically necessary or if alternative care options could have been utilized.

Encouraging early medical intervention and timely physiotherapy referral is vital in preventing complications such as knee stiffness. Patients should be educated on the importance of seeking medical attention promptly following fractures. Healthcare providers should prioritize early referral to physiotherapy after surgery, as timely rehabilitation has been shown to improve recovery outcomes and reduce long-term disability. We should address delayed admissions and surgeries by identifying systemic constraints and further strengthening emergency response strategies.

For older adults, targeted fall prevention strategies should be implemented to minimize the risk of fractures. This includes home modifications such as installing grab bars, ensuring proper lighting, and removing tripping hazards. Additionally, osteoporosis screening and balance training exercises should be promoted to help reduce the likelihood of falls. Community awareness campaigns and family involvement in creating safe home environments can further enhance fall prevention efforts.

Strengthening hospital and surgical efficiency can significantly impact patient recovery. Delays in surgical intervention can contribute to prolonged immobilization and worsen knee stiffness. Hospitals should work towards minimizing delays by improving emergency response systems, optimizing resource allocation, and streamlining preoperative evaluations. Ensuring the timely availability of surgical equipment and staff can enhance treatment efficiency and improve patient outcomes.

Addressing socio-demographic barriers to healthcare compliance is essential in ensuring successful rehabilitation. Health education initiatives should be tailored to populations with lower education levels, emphasizing the importance of physiotherapy and adherence to rehabilitation protocols. Community outreach programs and multilingual resources can be utilized to improve patient compliance with treatment regimens, leading to better recovery outcomes.

A multidisciplinary approach is necessary for managing patients with comorbidities such as osteoporosis, systemic infections, and cardiovascular diseases. Hospitals should adopt integrated care models that involve orthopedic surgeons, physiotherapists, nutritionists, and other specialists. This comprehensive approach ensures that patients receive personalized treatment plans that address both their primary injuries and underlying health conditions.

Workplace safety policies and insurance coverage should be strengthened to protect individuals in high-risk occupations. Employers and policymakers must enforce strict workplace safety regulations, especially in industries such as construction and manufacturing. Modifying home environments to include non-slip flooring and handrails for added safety. Strengthening road safety awareness among younger individuals. Encouraging the use of protective gear like helmets and seat belts. Expanding the Health Insurance Fund (under the gazette Social Health Authority) and workplace injury insurance to cover rehabilitation costs would ensure that injured workers receive adequate care without financial constraints.

Community-based rehabilitation programs and patient support groups should be established to enhance recovery. These groups can provide peer support, education, and motivation for adherence to physiotherapy regimens. Collaborating with local health authorities and non-governmental organizations can facilitate the creation of these support systems, making rehabilitation services more accessible.

Finally, further research should be conducted on knee stiffness prevention and treatment. Healthcare providers should improve data collection and record-keeping to minimize missing values for more comprehensive future analyses. Studies should explore innovative rehabilitation techniques, the effectiveness of different physiotherapy interventions, and the long-term outcomes of patients with knee stiffness. Additionally, research should focus on developing cost-effective and accessible treatment options for underserved populations.

By implementing these recommendations, healthcare providers, policymakers, and communities can work together to reduce the incidence of knee stiffness, improve recovery outcomes, and enhance the quality of life for patients recovering from femoral fractures.

## ACKNOWLEDGEMENT

Researchers would like to appreciate the MTRH management for their support and guidance and appreciate the colleagues in Physiotherapy Department for the support and positive criticism.

Researchers give thanks to GOD Almighty for the gift of knowledge, wise counsel and good health to be able to undertake this task successfully.

## REFERENCES

1. Bei C, Wang R, Tang J, Li Q. Zhongguo xiu fu chong jian wai ke za zhi = & Zhongguo xiufu chongjian waike zazhi = Chinese journal of reparative and reconstructive surgery. 2009; 23(9): 1053–1057.

2. Keel M, Trentz O. (2005). Pathophysiology of polytrauma. Injury. 2005; 36(6): 691–709. https://doi-org.e.bibl.liu.se/10.1016/j.injury.2004.12.037
3. Zalavras C, Velmahos GC, Chan L, Demetriades D, Patzakis MJ. Risk factors for respiratory failure following femoral fractures: the role of multiple intramedullary nailing. Injury. 2005; 36(6): 751–757. https://doi-org.e.bibl.liu.se/10.1016/j.injury.2005.01.012
4. Böstman O, Varjonen L, Vainionpää S, Majola A, Rokkanen P. Incidence of local complications after intramedullary nailing and after plate fixation of femoral shaft fractures. The Journal of trauma. 1989; 29(5): 639–645. https://doi-org.e.bibl.liu.se/10.1097/00005373-198905000-00019
5. Cerniauskaite M, Quintas RUI, Boldt C, Raggi A, Cieza A, Bickenbach JE, Leonardi M. Systematic literature review on ICF from 2001 to 2009: its use, implementation and operationalisation. Disability and rehabilitation. 2011; 33(4): 281-309.
6. Eadie TL. The ICF: a proposed framework for comprehensive rehabilitation of individuals who use a laryngeal speech. American journal of speech-language pathology. 2003; 12(2): 189–197. https://doi-org.e.bibl.liu.se/10.1044/1058-0360(2003/065) Available at: www.ncbi.nih.gov>PMC9471391
7. Netter FH. Atlas of human anatomy. (6th ed.). Philadelphia, PA: Saunders/Elsevier, 2014.
8. Solomon L, Warwick D, Nayagam S. Surgical fixation of fractures. **In:** Apleys System of Orthopaedics and Fractures, 9th ed., CRC Press. 2010. Available at: https://doi.org
9. Atkinson K, Coutts F, Hassencamp AM. Management of fractures. **In:** Phyisiotherapy for Orthopaedics: A problem-solving approach. 2nd ed. Elsevier Churchill Livingstone, 89-132. 2005. Available at: www.ebay.co.uk
10. McRae R, Esser M. Practical fracture treatment. Elsevier Health Sciences. 2008.
11. Winquist RA, Hansen Jr ST, Clawson DK. Closed intramedullary nailing of femoral fractures. A report of five hundred and twenty cases. JBJS.1984; 66(4): 529-539.
12. Musaab MA, Mohammed E, Elhadi A. "The Incidence of Knee Stiffness Following Femur Shaft Fracture". Acta Scientific Orthopaedics. 2021; 4(9): 53-55. (ISSN: 2581-8635).
13. Ibrahim JM, Conway D, Haonga BT, Eliezer EN, Morshed S, Shearer DW. Predictors of lower health-related quality of life after operative repair of diaphyseal femur fractures in a low-resource setting. Injury. 2018; 49(7): 1330–1335. https://doi-org.e.bibl.liu.se/10.1016/j.injury.2018.05.021
14. Bhattacharjya B, Ghosh B, Mukhopadhyay K, Hossain ME. Evaluation of results of interlocking nail in the treatment of open fracture shaft femur due to high energy trauma. Journal of the Indian Medical Association. 2012; 110(11): 821–828.
15. Zirkle Jr LG. Injuries in developing countries- how can we help?: the role of orthopaedic surgeons. Clinical orthopaedics and related research. 2008; 466(10): 2443-2450.
16. Njoroge AN, Mwangi HR, Lelei LK. Functional Outcomes of the Knee after Retrograde and Antegrade Intramedullary Nailing for Femoral Shaft Fractures. The annals of African Surgery. 2013; Volume 10 Issue 2
17. Sanders DW, MacLeod M, Charyk-Stewart T, Lydestad J, Domonkos A, Tieszer C. Functional outcome and persistent disability after isolated fracture of the femur. Canadian journal of surgery. 2008; 51(5): 366.
18. Piétu G, Ehlinger M. Minimally invasive internal fixation of distal femur fractures. Orthopaedics & traumatology, surgery & research : OTSR. 2017; 103(1S): S161– S169. https://doi-org.e.bibl.liu.se/10.1016/j.otsr.2016.06.025
19. Kulkarni MS, Aroor MN, Vijayan S, Shetty S, Tripathy SK, Rao SK. Variables affecting functional outcome in floating knee injuries. Injury. 2018; 49(8): 1594- 1601. https://doi-org.e.bibl.liu.se/10.1016/j.injury.2018.05.019
20. Vallier HA, Manzano GW. Management of the Floating Knee: Ipsilateral Fractures of the Femur and Tibia. The Journal of the American Academy of Orthopaedic Surgeons. 2020; 28(2): e47–e54. https://doi-org.e.bibl.liu.se/10.5435/JAAOS-D-18-00740
21. Venkatesh KP, Modi HN, Devmurari K, Yoon JY, Anupama BR, Song HR.Femoral lengthening in achondroplasia: magnitude of lengthening in relation to patterns of callus, stiffness of adjacent joints and fracture. The Journal of bone and joint surgery. 2009; British volume, 91(12): 1612–1617. https://doi-org.e.bibl.liu.se/10.1302/0301-620X.91B12.22418
22. Razaq MNU, Muhammad T, Ahmed A, Adeel Ahmad S, Ahmad S, Sultan S. Outcomes Of Distal Femur Fracture Treated With Dynamic Condylar Screw. Journal of Ayub Medical College, Abbottabad : JAMC. 2016; 28(2): 259–261.
23. Paterno MV, Archdeacon MT, Ford, KR, Galvin D, Hewett TE. Early rehabilitation following surgical fixation of a femoral shaft fracture. Physical therapy. 2006; *86*(4): 558-572.
24. Paterno MV, Archdeacon MT.Is there a standard rehabilitation protocol after femoral intramedullary nailing? Journal of orthopaedic trauma. 2009; 23: S39-S46.
25. Kapp W, Lindsey RW, Noble PC, Rudersdorf T, Henry Pam. Long-Term Residual Musculoskeletal Deficits after Femoral Shaft Fractures Treated with Intramedullary Nailing. The Journal of Trauma: Injury, Infection, and Critical Care. 2000; 49(3):446-449.

26. Labraca NS, Castro-Sánchez AM, Matarán-Penarrocha GA, Arroyo-Morales M, Sánchez-Joya MDM, Moreno-Lorenzo C. Benefits of starting rehabilitation within 24 hours of primary total knee arthroplasty: randomized clinical trial. Clinical rehabilitation. 2011; 25(6): 557-566.
27. Thomas K. Clinical pathway for hip and knee arthroplasty. Physiotherapy. 2003; 89(10): 603-609.
28. Bhaskaran S, Gadod LL. Post-traumatic Arthritic Stiff Knee in a Malunited Distal Femur Fracture Treated with Total Knee Arthroplasty - A Case Report. Journal of orthopaedic case reports. 2022; 12(8): 85–88. https://doi-org.e.bibl.liu.se/10.13107/jocr.2022.v12.i08.2976
29. Mousavi H, Mir B, Safaei A. Evaluation of Thompson's quadricepsplasty results in patients with knee stiffness resulted from femoral fracture. Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences. 2017; 22(50):1-9. https://doi-org.e.bibl.liu.se/10.4103/1735-1995.205237
30. Shen Z, Deng Y, Peng A, Zhang Y.Modified Judet's quadricepsplasty plus patellar traction for knee stiffness after femoral fracture surgery. International orthopaedics. 2021; 45(5): 1137–1145. https://doi-org.e.bibl.liu.se/10.1007/s00264-020-04823- 3
31. Saxena V, Akshay V, Panwar A, Kumar S. Management of Non-union Distal Femur Fractures with Augmentation Nail Plate Construct. Cureus. 2023; 15(4): e37173. https://doi-org.e.bibl.liu.se/10.7759/cureus.37173
32. Wane M, Naqvi WM, Vaidya L, Kumar K.Kinesiophobia in a Patient With Postoperative Midshaft Fracture: A Case Report of Its Impact on Rehabilitation in a 16- Year-Old Girl. Cureus. 2020; 12(11): e11333. https://doi-org.e.bibl.liu.se/10.7759/cureus.11333
33. Bonutti PM, McGrath MS, Ulrich SD, McKenzie SA, Seyler TM, Mont MA. Static progressive stretch for the treatment of knee stiffness. The Knee. 2008; 15(4): 272–276. https://doi-org.e.bibl.liu.se/10.1016/j.knee.2008.04.002
34. Knapik DM, Harris JD, Pangrazzi G, Griesser MJ, Siston RA, Agarwal S, Flanigan DC. The basic science of continuous passive motion in promoting knee health: a systematic review of studies in a rabbit model. Arthroscopy: The journal of arthroscopic & related surgery: official publication of the Arthroscopy Association of North America and the International Arthroscopy Association. 2013; 29(10): 1722–1731. https://doi-org.e.bibl.liu.se/10.1016/j.arthro.2013.05.028
35. Farrow AC, Blinch J, Harry JR, Palmer TB. Short-term Effects of Static Stretching on Hamstring Passive Stiffness in Young and Older Women. Journal of musculoskeletal & neuronal interactions. 2023; 23(3): 290–298.
36. Amin TK, Patel I, Patel MJ, Kazi MM, Kachhad K, Modi DR. Evaluation of Results of Open Reduction and Internal Fixation (ORIF) of Fracture of Distal End of Femur with Intra-Articular Extension. Malaysian orthopaedic journal. 2021; 15(3): 78–83. https://doi-org.e.bibl.liu.se/10.5704/MOJ.2111.012
37. Lavernia CJ, Villa JM, Iacobelli DA. What is the role of mental health in primary total knee arthroplasty? Clinical orthopaedics and related research. 2015; 473(1): 159–163. https://doi-org.e.bibl.liu.se/10.1007/s11999-014-3769-5
38. Kayode MO, Adewole OA, Shoga MO, Giwa SO. Experience with managing complicated fractures using Illizarov principle in Lagos, Nigeria. Journal of the West African College of Surgeons. 2017; 7(3): 24–43.
39. Rantasalo MT, Palanne RA, Saini S, Vakkuri AP, Madanat R, Noora SK. Postoperative pain as a risk factor for stiff knee following total knee arthroplasty and excellent patientreported outcomes after manipulation under anesthesia. Acta orthopaedica. 2022; 93: 432–437. https://doi-org.e.bibl.liu.se/10.2340/17453674.2022.2272
40. Moi Teaching and Referral Hospital, (2024). *About us- Moi Teaching and Referral Hospital.* Available at: MTRH website: http://www.mtrh.go.ke).


**Citation:** Imbwaga Musimbi Chantell, Ayabei Henry Chepkwony, Barry R. Ayumba (2026). The Occurrence of Knee Stiffness in Patients with Fractures of Femurs Attending Physiotherapy Out-Patient Services at Moi Teaching and Referral Hospital, Eldoret, Uasin Gishu County, Kenya. *EAS J Orthop Physiother, 8*(1): 1-27.