MAKERERE  **UNIVERSITY**

COLLEGE OF HEALTH SCIENCES SCHOOL OF MEDICINE

DEPARTMENT OF ORTHOPAEDIC SURGERY

PREVALENCE OF NEGLECTED LONG BONE FRACTURES AND ASSOCIATED FACTORS AMONG PATIENTS WITH MUSCULOSKELETAL TRAUMA AT MULAGO NATIONAL REFERRAL HOSPITAL

PRINCIPAL

INVESTIGATOR:

DR.DEMBE MOSES MBChB (MUK)

REGISTRATION NUMBER:

2022/HD07/163U STUDENT

NUMBER:2200700163

SUPERVISORS

Dr. MUTANDA TONNY MBChB (MUK), MMED(MUK), Orthopaedic Surgeon, Mulago National Referral Hospital

Dr. SEKAMATTE YASIN MBChB (MUK), MMED(MUK), Orthopaedic Surgeon, Mulago National Referral Hospital

A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF MEDICINE IN ORTHOPAEDIC SURGERY OF MAKERERE UNIVERSITY.

JUNE, 2026

DECLARATION

I, **DEMBE MOSES**, hereby declare that the information presented in this dissertation is my original work and has never been submitted either in part or as a whole to any university for an award.

Signature:..... Date: 17/06/2026

DEMBE MOSES

APPROVAL

This dissertation, titled ***"Prevalence of Neglected Long Bone Fractures and Associated Factors Among Patients with Musculoskeletal Trauma at Mulago National Referral Hospital"***, submitted by Dembe Moses, has been reviewed and approved by the undersigned supervisors:

Signature ..... Date 17/06/2026

Dr. Mutanda Tonny MBChB (MUK), MMED (MUK)

Orthopaedic Surgeon, Mulago National Referral Hospital

Signature ..... Date 15/06/26

Dr. Sekamatte Yasin MBChB (MUK), MMED (MUK)

Orthopaedic Surgeon, Mulago National Referral Hospital

DEDICATION

I dedicate this work to my family and loved ones, whose unwavering support and encouragement sustained me throughout my medical training and research journey.

ACKNOWLEDGEMENT

I am sincerely grateful to my supervisors, Dr. Mutanda Tonny and Dr. Sekamatte Yasin, for their expert guidance, patience, and mentorship throughout the development of this dissertation.

I extend my appreciation to the staff of the Orthopaedic Trauma Clinic at Mulago National Referral Hospital for their cooperation and support during data collection.

I also thank the patients and caregivers who participated in this study for their time and willingness to share their experiences.

Finally, I acknowledge my colleagues and friends who provided encouragement, advice, and moral support throughout this research process.

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ABBREVIATIONS

AOR	**:**	Adjusted Odds Ratio
CI	**:**	Confidence Interval
COR	**:**	Crude Odds Ratio
IRB	**:**	Institutional Review Board
LMIC	**:**	Low- and middle-income countries
MNRH	**:**	Mulago National Referral Hospital
MoH	**:**	Ministry of Health
NIH	**:**	National Institutes of Health
OPD	**:**	Out-Patient Department
OR	**:**	Odds Ratio
PI	**:**	Principal investigator
SOMREC	**:**	School of Medicine Research and Ethics Committee
TBS	**:**	Traditional Bone Setter
UGX	**:**	Ugandan Shilling
WHO	**:**	World Health Organization

OPERATIONALDEFINITIONS

Long bones	**:**	Are bones that are longer than they are wide and have a shaft and two ends. For purposes of this study, these will be the ulna, radius, humerus, tibia, fibula, and femur.
Neglected Fracture	**:**	This is defined as a long bone fracture that has not been treated at all or by any formal orthopaedic locally approved guidelines and has presented later than 4 weeks from time of injury.
Associated factors	**:**	These are conditions that are likely to influence presence of neglect of the fracture.
Musculoskeletal trauma	**:**	Refers to injuries to bones, muscles, tendons, ligaments requiring definitive treatment by an orthopaedic surgeon.

ABSTRACT

Background: Neglected long bone fractures, defined as fractures presenting more than four weeks after injury without prior definitive orthopaedic management, are a major cause of preventable disability in low- and middle-income countries. Their burden in Uganda is poorly quantified, and the patient and health-system factors driving prolonged neglect at the Mulago National Referral Hospital (MNRH) have not been systematically described.

Objectives: To determine the prevalence of neglected long bone fractures among patients presenting with long bone fractures at Mulago National Referral Hospital (MNRH), and to identify factors associated with prolonged neglect among those patients.

Methods: A hospital-based, cross-sectional analytical study with a nested screening component was conducted at the orthopaedic outpatient clinic and accident and emergency unit of MNRH.

All long bone fracture patients presenting during the study period were screened and logged to provide the prevalence denominator. Patients meeting the criteria for neglect were enrolled consecutively until the target sample size of 105 was reached. Data were collected using a structured, pre-tested, bilingual (English/Luganda) questionnaire and a focused clinical and radiological assessment. The period prevalence was reported with a 95% confidence interval. Factors associated with prolonged neglect (≥90 days from injury to presentation) among neglected patients were examined using bivariate logistic regression for crude associations and Firth's penalized logistic regression for the multivariable model, with the final model built by backward elimination.

Results: During the study period, 843 patients with long bone fractures were evaluated, of whom105 had neglected fractures, giving a prevalence of 12.5%. The median duration of neglect was 62 days (IQR 38–150), with the majority (70.5%) delaying care for 1–3 months. Young adults experienced longer delays, with 38.9% presenting after 91–180 days, while children and the elderly presented earlier (30–90 days). Despite delays, all participants sought some form of care within the first 28 days, predominantly from traditional bone setters (73.3%), whereas only 26.7% visited local clinics. The tibia/fibula was the most commonly fractured bone (38.1%), with fractures occurring more frequently on the left side (63.8%), mainly in the distal segment (39.0%), and predominantly closed (90.5%). Multivariate analysis identified several factors independently associated with neglected fractures: male sex (AOR = 31.7, P=0.001), alcohol use (AOR = 11.8, P=0.007), residence >10 km from a health facility (AOR = 5.7, P=0.013), lack of prior medical advice (AOR = 6.4, P=0.007), and difficulty accessing orthopaedic care (AOR = 13.2, P=0.001).

Conclusion: Neglected long bone fractures are common at MNRH and disproportionately affect young adult men. Prolonged neglect is driven jointly by behavioural factors and by structural and informational barriers within the health system, and universal early contact with traditional bone setters represents the single most promising point of intervention. Targeted public-health messaging, structured engagement with traditional bone setters, expansion of regional orthopaedic capacity, and a dedicated rapid-triage pathway for late-presenting patients at MNRH are urgently needed.

CHAPTER ONE: INTRODUCTION

1.1 Background

Long bone fractures of the femur, tibia, fibula, humerus, radius, and ulna are a major source of disability worldwide and account for a substantial share of the global trauma burden, particularly in low- and middle-income countries (LMICs) where road traffic crashes, falls, and occupational injuries are common (Wu et al., 2021; Mock & Cherian, 2008). In Uganda, road traffic crashes account for an estimated 39% of all injuries in Kampala, and young men aged 16–44 years are disproportionately affected; motorcycle taxis (boda bodas), which are the dominant mode of urban and peri-urban transport, contribute to about 25% of these crashes and are a frequent cause of lower limb long bone fractures (Naddumba, 2008).

When long bone fractures are managed promptly, the great majority can be expected to heal with satisfactory functional outcomes. When definitive treatment is delayed, however, the natural history of the fracture changes substantially. By approximately three to four weeks after injury, the fracture haematoma has organised into a soft callus, early bridging callus is forming, and any reduction or fixation procedure becomes substantially more complex because the callus must be taken down before the fracture can be realigned. Beyond this window, malunion, non-union, joint stiffness, limb shortening, chronic pain, and long-term disability become progressively more difficult to prevent (Roshan & Ram, 2008; Vanderkarr et al., 2023). It is on this biological basis that a fracture presenting more than four weeks after injury without prior definitive orthopaedic management is described as a “neglected” fracture, and it is the four-week threshold that is used in this study.

Neglected long bone fractures impose a dual burden on patients and on health systems. Clinically, late presentation typically requires more invasive procedures — open reduction, osteotomy, bone grafting, distraction osteogenesis, or external fixation — with longer operative times, greater blood loss, longer hospital stays, and poorer functional outcomes than acute fixation (Kironde et al., 2019; Vanderkarr et al., 2023). Socially and economically, prolonged disability disrupts employment, household income, and educational opportunities, and frequently pushes families further into poverty.

A qualitative study of orthopaedic trauma patients at Mulago National Referral Hospital (MNRH) found that 74% of participants were the primary breadwinners for their households,

supporting an average of nearly six dependants, and that their inability to work after injury had pushed many families into food insecurity (O'Hara et al., 2014).

Despite this burden, the prevalence and determinants of neglected long bone fractures in Uganda remain poorly documented. Most published Ugandan trauma research has focused either on the broader epidemiology of injuries or on specific clinical sub-groups such as open fractures with traumatic bone loss (Kironde et al., 2019; Naddumba, 2008; Zheng et al., 2021), and the available data do not provide a clear contemporary estimate of how many patients reaching a national referral hospital meet the criteria for neglect, nor of which patient and health-system factors most strongly predict prolonged neglect. A clearer understanding of both the size of the problem and its principal drivers is needed to inform clinical practice, public-health messaging, and engagement with the informal providers — particularly traditional bone setters — who appear to dominate the early care-seeking pathway in this setting.

1.2 Problem statement

At Mulago National Referral Hospital, clinicians frequently encounter patients with long bone fractures who present several weeks or months after injury, often after an initial period of care from traditional bone setters or informal providers. By the time these patients reach definitive orthopaedic care, they typically require complex surgery, prolonged rehabilitation, and substantial health-system resources, and they face a significantly increased risk of long-term disability. A pilot review at MNRH suggested that approximately 9% of trauma patients with long bone fractures were neglected for more than four weeks before presentation, and that the majority of these had first been managed by traditional bone setters.

Despite the clinical impression that this is a common and consequential problem, there is no current, prospectively collected estimate of the prevalence of neglected long bone fractures at MNRH, and the specific patient, behavioural, and health-system factors that drive prolonged neglect in this setting have not been systematically examined. Without this information, clinicians, the hospital administration, and policymakers cannot reliably identify which groups of patients are most at risk, where in the care pathway intervention is most likely to be effective, or how scarce orthopaedic resources should be allocated to reduce the burden of preventable disability from late-presenting fractures.

1.3 Justification

This study addresses a clear and clinically important knowledge gap. By generating a contemporary, prospectively collected estimate of the period prevalence of neglected long bone fractures at MNRH, and by identifying the patient and health-system factors most strongly associated with prolonged neglect, the study provides an evidence base on which targeted clinical, educational, and policy interventions can be built. The findings will inform local clinical practice at MNRH, including the design of a dedicated pathway for late-presenting patients, and will support the Ministry of Health, district health authorities, and partner organisations in the development of public-health messaging and referral strategies. The findings will also contribute to the wider regional and global literature on neglected orthopaedic trauma in low-resource settings, where contemporary, locally generated data remain scarce. Ultimately, by clarifying who is most at risk of delayed care and why, the study aims to support practical strategies that reduce the long-term physical, psychological, and economic consequences of neglected long bone fractures for patients and their families in Uganda.

1.4 Research questions

1. What is the prevalence of neglected long bone fractures among patients with musculoskeletal trauma at Mulago National Referral Hospital?
2. What are the factors associated with neglected long bone fractures among patients with musculoskeletal trauma at Mulago National Referral Hospital?

1.5 Objectives

1.5.1 General objective

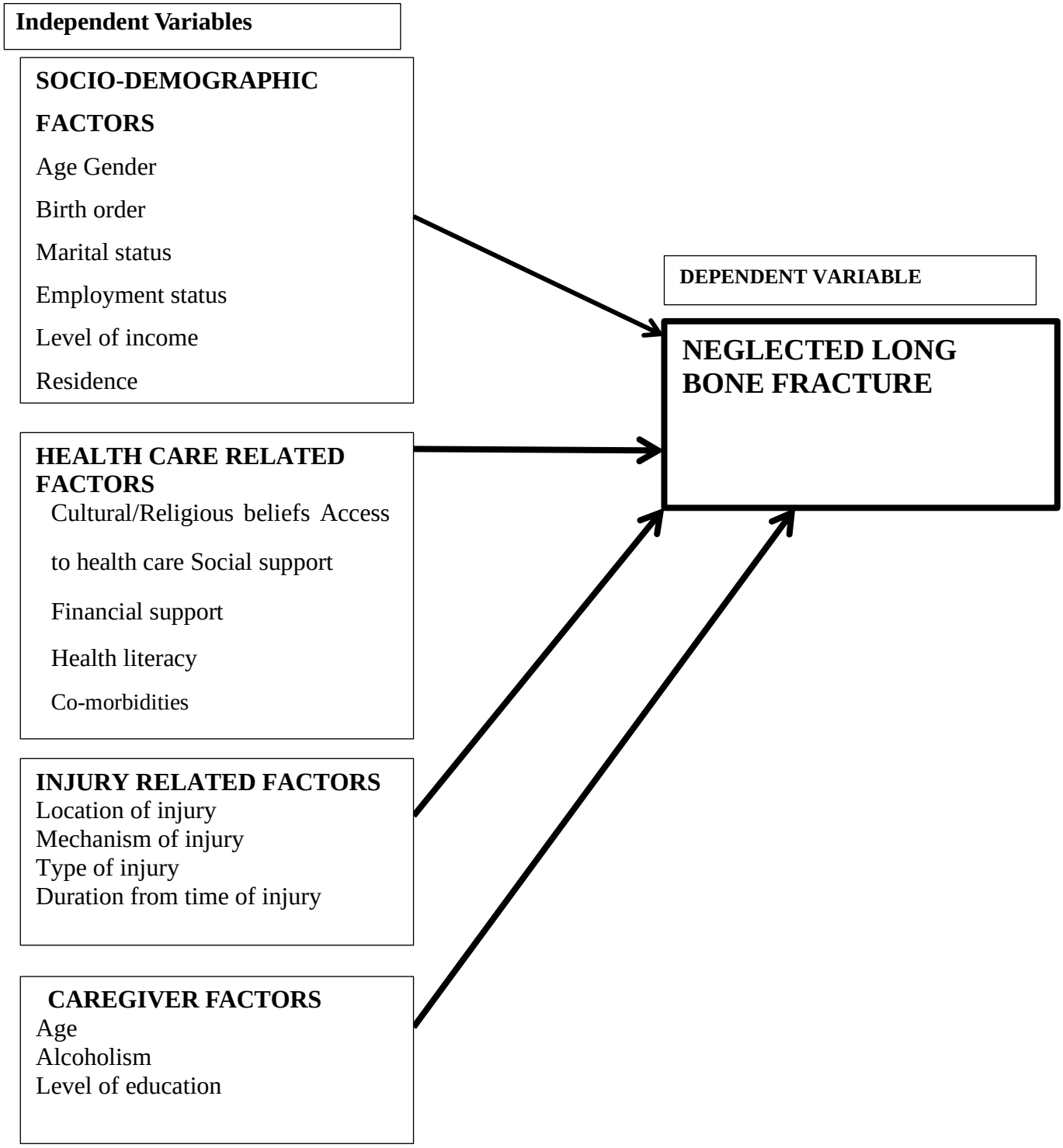
To determine the prevalence of neglected long bone fractures and associated factors among patients with musculoskeletal trauma at Mulago National Referral Hospital.

1.5.2 Specific objectives

1. To determine the prevalence of neglected long bone fractures among patients with musculoskeletal trauma at Mulago National Referral Hospital.
2. To determine the factors associated with neglected long bone fractures among patients with musculoskeletal trauma at Mulago National Referral Hospital.

1.6 Conceptual frame work

The conceptual framework represents the interrelation between the study variables and the outcome of neglected long bone fractures.



Narrative for the conceptual framework

This conceptual framework is designed to provide a comprehensive analysis of the prevalence of neglected long bone fractures and their associated factors among patients with musculoskeletal trauma in Mulago National Referral Hospital.

It categorizes the independent variables into socio-demographic factors like age, gender, birth order, marital status, employment status, level of income, residence. Health care related factors like cultural/religious beliefs, access to health care, social support, financial support, fear of surgery, health literacy, opportunity cost, co-morbidities. Injury related factors like, location of injury, mechanism of injury, type of injury, duration from time of injury. Caregiver factors like Age, Level of education; and socio-behavioural factors including Alcohol use, and systematically relating them to the dependent variable which is neglected long bone fractures. This conceptual framework demonstrates the relationship between these factors and how they collectively impact the prevalence, complications, and overall outcomes of neglected long bone fractures.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Musculoskeletal fractures are a leading cause of disability worldwide. The Global Burden of Disease Study 2019 estimated 178 million new fractures globally in that year, with fractures of the patella, tibia, fibula, or ankle the single most common type at an age-standardised incidence of 419.9 per 100,000 (Wu et al., 2021). Long bone fractures of the femur, tibia, radius, ulna, and humerus account for a substantial share of this burden because of their susceptibility to high-energy trauma and to age-related fragility. A prospective Norwegian series found that 87.9% of all fractures requiring hospitalisation involved long bones, with the femur, tibia, and forearm bones being the most frequently affected (Mock & Cherian, 2008).

The burden falls unevenly across age groups and regions. In high-income countries, older adults— particularly post-menopausal women — bear most of the fragility-fracture burden, with hip fractures alone carrying a one-year mortality of 20–24% (Mock & Cherian, 2008; Bergh et al.,2020). In LMICs, by contrast, the dominant pattern is high-energy trauma in young adults, driven largely by road traffic crashes; morbidity from such injuries is nearly twice that observed in high- income countries, a gap attributable mainly to limited access to timely orthopaedic care (Wu et al.,2021). Long bone fractures often require complex surgical reconstruction and prolonged rehabilitation, and carry substantial risks of non-union (5–10%) and infection, all of which place a heavy burden on already strained health systems (Mock & Cherian, 2008; Vanderkarr et al.,2023).

Definition and clinical consequences of neglected long bone fractures

There is no universally agreed definition of a “neglected” long bone fracture, but most authors use a threshold of presentation more than three to four weeks after injury without prior definitive orthopaedic management (Roshan & Ram, 2008; Tall et al., 2014). The four-week cut-off is biologically grounded: by approximately 28 days after injury, fracture haematoma has organised into a soft callus, early bridging callus is forming, and any reduction or fixation procedure becomes substantially more complex because callus must be taken down before the fracture can be realigned. Beyond this window, malunion, non-union, joint stiffness, limb shortening, chronic pain, and disability become progressively more difficult to prevent (Roshan & Ram, 2008; Vanderkarr et al., 2023).

The clinical consequences of neglect extend well beyond the affected limb. A scoping review of 19 studies of long bone fractures in adults found that delayed and complicated fractures disrupt employment, social roles, and mental health, with 21% of patients unable to return to work within six months of injury (Singaram & Naidoo, 2019). Vanderkarr et al. (2023) reported that the management of established non-union in high-income settings adds tens of thousands of dollars per case, and outcomes after late reconstruction remain poorer than after timely fixation. In young adults, neglected femoral neck fractures are particularly devastating, with rates of avascular necrosis of 6–17% even after surgical salvage (Kironde et al., 2019; Roshan & Ram, 2008).

2.2 Prevalence of neglected long bone fractures

The true prevalence of neglected long bone fractures is difficult to establish because most affected patients in LMICs never reach a referral hospital, and those who do are often counted only at the point of late presentation. As a result, estimates vary widely depending on setting and case definition. In LMIC trauma cohorts, neglect rates of 15–35% have been reported, driven by financial barriers, weak referral systems, and limited surgical capacity (Roshan & Ram, 2008). At the lower end of the spectrum, a Dutch multicentre series of femoral shaft fractures in children under six years estimated neglect at only 5.8%, reflecting a well-resourced trauma system with strong child-protection surveillance (Loos et al., 2022). At the higher end, sub-Saharan series have documented that the majority of neglected long bone fractures arriving at referral hospitals were initially managed by traditional bone setters, with figures as high as 77.8% reported from Mulago Hospital and 96.3% from Bandung, Indonesia (Putra & Ismiarto, 2023). Taken together, the existing evidence suggests that neglected long bone fractures are common in LMICs but are systematically under-counted, and that locally generated prevalence estimates are needed to guide service planning.

2.3 Patient and socio-demographic factors associated with neglect

Age and sex are consistently identified as determinants of both fracture occurrence and delayed presentation. Young adult men aged 20–40 years have the highest incidence of high-energy long bone trauma, while women over 50 dominate the burden of fragility fractures (Bergh et al., 2020). Men are also more likely than women to sustain open and complex fractures and to experience non-union; in one series, open Gustilo III fractures in men carried a 3.3-fold higher non-union risk than closed fractures (Sadat-Ali et al., 2015; Vanderkarr et al., 2023). Men are further reported to

delay care-seeking more often than women, possibly because of competing economic responsibilities and a culturally shaped reluctance to interrupt work for medical attention.

Marital and household status also matter. A large UK cohort found that unmarried, divorced, separated, or widowed individuals had a 35–58% higher risk of incident fractures than their married counterparts, with the disparity largest among men (Westbury et al., 2024). The authors attribute this in part to weaker social support networks and reduced encouragement to seek timely care. Education and income operate in the same direction: in LMICs, patients with lower levels of formal education and lower household incomes are more likely to delay presentation, to prioritise immediate survival needs over medical expenses, and to underestimate the severity of musculoskeletal injuries (Roshan & Ram, 2008; Singaram & Naidoo, 2019). Alcohol use is a further behavioural determinant; it has been linked both to the occurrence of trauma and to delayed care-seeking, plausibly through impaired judgement and competing priorities at the time of injury (Stanford-Moore et al., 2022).

Health system factors associated with neglect

Even where patients recognise the need for formal care, structural barriers within the health system often prevent them from accessing it in time. In most of sub-Saharan Africa, specialist orthopaedic services are concentrated in a small number of tertiary centres, and the ratio of orthopaedic surgeons to population remains far below the levels recommended by the World Health Organization (Mock & Cherian, 2008). High out-of-pocket costs for surgery, implants, imaging, and rehabilitation push many patients toward non-surgical or informal management (Vanderkarr et al., 2023).

Geographic distance compounds the problem: a Malawian study found that patients with travel times of twenty minutes or more to a health facility were significantly more likely to present late with musculoskeletal injuries than those living closer (Agarwal-Harding et al., 2019).

Weak referral systems further extend the delay. Patients often pass through several lower-level facilities before reaching a centre capable of definitive fracture care, and at each step they may receive only temporary splinting or analgesia. Health literacy gaps compound these structural problems; misconceptions that pain will resolve spontaneously, or that a closed fracture without obvious deformity does not require surgical attention, are common reasons for delayed hospital visits (Roshan & Ram, 2008; Tall et al., 2014). Co-morbid conditions — including mental illness,

neurological disorders such as cerebral palsy, and metabolic bone disease — can both predispose patients to fractures and delay their recognition and management (Fortin et al., 2020).

Cultural factors and the role of traditional bone setters

Across sub-Saharan Africa, traditional bone setters (TBS) remain the first point of contact for a substantial proportion of patients with long bone fractures. Their continued popularity reflects a combination of cultural, economic, and experiential factors. In Nigeria, 20.3% of patients seeking TBS care cited "greater faith" in bone setters than in hospitals, and 15.2% considered TBS more competent than biomedical practitioners (Abang et al., 2016). A Tanzanian study described TBS as deeply embedded in local tradition, often combining manipulation with herbal remedies and spiritual rituals perceived by patients as holistic (Card et al., 2021). In Ethiopia, 65.4% of trauma patients held positive attitudes toward traditional medicine, associating it with cultural identity, and 46.05% reported having used TBS for their injury (Endeshaw et al., 2023).

Cost and accessibility are equally important drivers. In Ghana, the average cost of a TBS course of treatment was approximately €13, compared with €300 for equivalent hospital-based care (Agarwal & Agarwal, 2010). Patients also cite negative experiences in formal facilities — long waiting times, perceived disrespect, and fear of amputation — as reasons for preferring TBS (Worku et al., 2019). Family and community networks reinforce these choices: in one Nigerian series, 49.4% of TBS patients had been referred by family members and 43% by friends (Abang et al., 2016). The clinical consequences, however, are often poor.

Delays caused by TBS treatment are consistently associated with infection, malunion, limb shortening, and, in some cases, the very amputations that patients sought to avoid (Naddumba, 2008; Kironde et al., 2019).

The Ugandan context

In Uganda, road traffic crashes account for an estimated 39% of all injuries in Kampala, with young men aged 16–44 years disproportionately affected; motorcycle taxis (boda bodas) alone contribute to about 25% of these crashes and are a frequent cause of lower limb long bone fractures (Naddumba, 2008).

A prospective trauma registry in rural eastern Uganda confirmed that the majority of injured patients are young, male, and economically active, and that delays of days to weeks before reaching definitive care are common (Zheng et al., 2021). At Mulago National Referral Hospital,

a pilot study and records review found that approximately 9.3% of trauma patients with long bone fractures had been neglected for more than four weeks at the time of presentation, and that majority of these had first been managed by traditional bone setters.

The downstream consequences in the Ugandan setting are well documented. A qualitative study of orthopaedic trauma patients at Mulago found that 74% of participants were the primary breadwinners for their households, supporting an average of 5.7 dependants, and that their inability to work after injury had pushed many families into food insecurity (O'Hara et al., 2014). Kironde et al. (2019) further demonstrated that traumatic bone loss following open long bone fractures is common at Mulago and is closely linked to delayed presentation and prior TBS care, generating substantial demands for complex reconstructive surgery in a system with limited capacity to provide it.

Summary and knowledge gap

The literature reviewed above establishes three points clearly. First, long bone fractures are a major and growing source of disability worldwide, with a particularly heavy burden among young adults in LMICs. Second, neglected long bone fractures are common in resource-limited settings and are driven by an interlocking set of patient, health-system, and socio-cultural factors, in which reliance on traditional bone setters plays a central role. Third, the consequences of neglect — chronic pain, malunion, non-union, complex reconstructive surgery, lost productivity, and household impoverishment — are severe and largely preventable with timely care.

What the literature does not yet provide, particularly for Uganda, is a contemporary, locally generated estimate of how common neglected long bone fractures are among patients reaching a national referral hospital, together with a clear account of which patient and health-system factors are most strongly associated with delayed presentation in this specific setting. Existing Ugandan studies have either focused on broader trauma epidemiology (Naddumba, 2008; Zheng et al., 2021), on specific sub-categories such as open fractures and bone loss (Kironde et al., 2019), or on the qualitative experience of trauma patients (O'Hara et al., 2014).

The present study addresses this gap by quantifying the proportion of long bone fracture presentations at Mulago National Referral Hospital that meet criteria for neglect, by characterizing the injury and care-seeking patterns of these patients, and by identifying the socio-demographic, injury-related, and health- system factors most strongly associated with prolonged neglect. The

findings are intended to inform targeted public-health messaging, service planning, and engagement with informal providers in order to reduce the preventable burden of neglected long bone fractures in Uganda.

CHAPTER THREE: METHODS

3.1 Study Design

This was a hospital-based, cross-sectional analytical study with a nested screening component. All patients with long bone fractures presenting to the orthopaedic services at Mulago National

Referral Hospital during the study period were screened to establish the period prevalence of neglected long bone fractures. Patients meeting the criteria for neglect were then recruited consecutively into the analytical component of the study, in which factors associated with prolonged neglect were examined.

3.2 Study Setting

The study was conducted in the Department of Orthopaedics at Mulago National Referral Hospital (MNRH), the principal teaching hospital of Makerere University College of Health Sciences. MNRH receives patients from Kampala and from districts and regional referral hospitals across Uganda, and is the main centre for definitive orthopaedic trauma care in the country. The orthopaedic department is located in the Old Mulago complex and is staffed by orthopaedic surgeons, residents, nurses, interns, orthopaedic officers, and orthopaedic technologists. It comprises four inpatient wards (Ward 7, the spine ward, the trauma ward, and Ward 3B) and an outpatient clinic that runs from Monday to Thursday each week. Patients are seen as referrals from lower-level public facilities, from private providers, and as self-referrals. Recruitment for this study took place at the orthopaedic outpatient clinic and the accident and emergency unit, which together constitute the principal entry points for fracture patients at MNRH.

3.3 Population

3.3.1 Target population

Patients with musculoskeletal trauma involving long bone fractures in Uganda.

3.3.2 Accessible population

Patients with long bone fractures presenting to the orthopaedic services at Mulago National Referral Hospital during the study period.

3.3.3 Study population

Patients with long bone fractures who presented to MNRH more than four weeks after injury without having received any prior definitive orthopaedic management, who met the inclusion criteria, and who provided informed consent (or whose caregivers consented, in the case of children).

3.4 Selection criteria

3.4.1 Inclusion criteria

Patients of any age who had sustained a fracture of the femur, tibia, fibula, humerus, radius, or ulna and who presented to MNRH more than four weeks after the date of injury without having received any definitive orthopaedic management (defined as closed reduction with appropriate immobilisation, open reduction and internal fixation, external fixation, or skeletal traction) were eligible for inclusion. Adult participants provided written informed consent; for participants under 18 years, written informed consent was obtained from a parent or legal guardian and assent was obtained from children aged 8 to 17 years.

3.4.2 Exclusion criteria

Patients with pathological fractures secondary to malignancy or primary bone disease**.**

3.5 Sample size estimation

3.5.1 For objective one

The minimum sample size required to estimate the prevalence of neglected long bone fractures with adequate precision was calculated using the Kish (1965) formula for a single proportion:

$n = Z^2 \times p \times (1 - p) / e^2$

Where n is the minimum sample size required; Z is the standard normal deviate at the 95% confidence level (1.96); p is the expected proportion of long bone fracture patients with neglected fractures, taken as 7.4% (0.074) based on a prior pilot review at MNRH; and e is the desired absolute precision, set at 5% (0.05). Substituting these values:

$n = (1.96)^2 \times 0.074 \times 0.926 / (0.05)^2 = 105$

A minimum of 105 neglected cases were therefore required.

3.5.2 For objective two

For the second objective, sample size adequacy was assessed using the events-per-variable (EPV) rule for logistic regression, which recommends a minimum of 10 outcome events for each independent variable entered into the multivariable model (Peduzzi et al., 1996). With approximately 10 candidate variables planned for the factor analysis, a minimum of 100 outcome

events was required. The 105 neglected cases obtained from the prevalence calculation therefore satisfied both objectives, and 105 were adopted as the final analytical sample size.

3.6 Sampling procedure

During the recruitment period, all patients presenting to the orthopaedic outpatient clinic and the accident and emergency unit at MNRH with a long bone fracture were screened by the principal investigator and trained research assistants using clinic records, A&E registers, and direct case identification. The total number of long bone fracture patients screened during the study period was recorded prospectively in a screening log; this served as the denominator for the prevalence calculation. Patients who met the criteria for neglect were enrolled consecutively into the analytical component until the target sample size of 105 was reached. Consecutive enrolment was used to minimise selection bias and to ensure that every eligible patient identified during the recruitment period had an equal opportunity to be included.

3.7 Study procedure and data collection

Patients identified as potentially eligible were approached in a private area of the clinic or A&E unit. The study was explained to them in English or Luganda using language they could understand, and written informed consent was obtained before any study procedures were undertaken. For paediatric participants, written informed consent was obtained from the accompanying parent or guardian, and assent was obtained directly from children aged 8 to 17 years.

Following enrolment, the principal investigator obtained socio-demographic information and a structured clinical history covering the mechanism and date of injury, the time and place of first care-seeking, the nature of any treatment received before presentation, and the patient's reasons for delay. A focused musculoskeletal examination was then performed to document the affected limb, the presence of deformity, step-off, crepitus, abnormal mobility, neurovascular status, and any improvised splints or walking aids in use.

Radiological confirmation of the fracture was obtained from existing imaging where available; participants without prior imaging were referred for plain radiographs of the affected limb at the principal investigator's expense. All findings from the history, examination, and imaging were recorded directly into a structured, coded questionnaire (Appendix III). After data collection, each participant's presenting complaint was addressed by the attending orthopaedic team, and a

definitive management plan was discussed with the patient. Participants were given a small monetary reimbursement for their time before continuing with their planned care.

3.8 Data collection Tools

A coded, structured questionnaire was used to collect data from study participants. The tool comprised sections capturing socio-demographic characteristics, injury-related details, factors contributing to delayed presentation (neglect), and caregiver-related factors where applicable.

3.9 Study variables

3.9.1 Dependent variable

The dependent variable was presence of a neglected long bone fracture, defined as a long bone fracture presenting more than four weeks after injury without prior definitive orthopaedic management. These were further sub classified into 28–90 days (1–3 months), 91–180 days (3–6 months), 181–365 days (6–12 months) and more than 365 days (>1 year).

Prolonged neglect among patients with neglected fractures, defined dichotomously as a delay from injury to presentation of 90 days or more (versus less than 90 days). The 90-day cut-off was selected on biological and clinical grounds: by three months after injury, fracture callus has matured and any reconstructive procedure typically requires more extensive surgery.

3.9.2 Independent variables

Independent variables were grouped into four categories. Socio-demographic variables included age, sex, marital status, level of education, employment status, and area of residence (urban, semi-urban, or rural). Alcohol use was included as a socio-behavioural independent variable for all adult participants, assessed by direct self-report; the established association between harmful alcohol use and impaired judgment, reduced health-seeking prioritisation, and socioeconomic instability makes this a patient-level behavioural determinant of fracture neglect. Average monthly income was collected but was excluded from the regression analysis due to extensive item non-response and sparse cell counts across categories.

Injury-related variables included the bone fractured, the side and region of the fracture, whether the fracture was open or closed, and the mechanism of injury; mechanism of injury was subsequently excluded from the regression because all categories were uniformly distributed and yielded zero discriminating events between the outcome groups. Health-system variables included distance from the patient's home to the nearest health facility, availability of transport to a

hospital, whether the patient had been advised by anyone to seek formal medical care, and self-reported difficulty in accessing orthopaedic services. For paediatric participants, caregiver-specific variables collected included caregiver age and level of education.

3.10 Data management

Data collected from the structured questionnaires and clinical assessments was checked for completeness and consistency by the principal investigator and research assistants on a daily basis. Each questionnaire was assigned a unique code to ensure participant confidentiality and facilitate proper data handling. The collected data were then entered into EpiData version 4.6 for cleaning, including verification of missing values, outliers, and logical consistency.

After cleaning, the data were exported to Stata version 17 for analysis. During the analysis process, categorical variables were coded appropriately, and continuous variables were checked for normality. All data were stored on a password-protected computer accessible only to the research team. Hard copies of questionnaires were securely stored in a locked cabinet at the principal investigator's office to maintain confidentiality and ensure traceability.

3.11 Data analysis plan

Data analysis was performed in Stata version 17. Continuous variables were summarised as means and standard deviations or as medians and interquartile ranges, depending on their distribution as assessed by the Shapiro-Wilk test and visual inspection of histograms. Categorical variables were summarised as frequencies and percentages.

For Objective 1, the period prevalence of neglected long bone fractures was calculated as the number of patients meeting the criteria for neglect, divided by the total number of long bone fracture patients screened during the recruitment period, expressed as a percentage with a 95% confidence interval. The duration of neglect was further described as a median with interquartile range and was categorised into four clinically meaningful groups: 30–90 days, 91–180 days, 181–365 days, and more than 365 days.

For Objective 2, the analysis examined factors associated with prolonged neglect (≥90 days) among the 105 neglected patients. Bivariate associations between each independent variable and prolonged neglect were assessed using binary logistic regression, and crude odds ratios with 95% confidence intervals were reported. Variables with a p-value below 0.2 in bivariate analysis, together with variables judged to be of clinical importance a priori, were entered into a

multivariable model. Because the dataset contained a cell with zero outcome events (female non-drinkers with prolonged neglect), standard maximum-likelihood logistic regression produced unreliable, inflated estimates; Firth's penalized logistic regression was therefore applied for the multivariable analysis, as this method is specifically designed to handle sparse data and near-separation and produces unbiased, finite estimates in such situations. Profile likelihood confidence intervals were used. The final model was built using backward elimination, and adjusted odds ratios with 95% confidence intervals were reported. Statistical significance in the final model was set at $p < 0.05$. Multicollinearity was checked using variance inflation factors. Categories with zero events in either the exposed or unexposed cell were collapsed or dropped from the regression, and this is reported transparently in the results chapter.

3.12 Quality control

The questionnaire was pre-tested and revised before the main study. Research assistants were trained and supervised by the principal investigator throughout data collection. Each completed questionnaire was reviewed for completeness on the day of collection. Data entry was double-checked against a 10% random sample of the original questionnaires to identify and correct entry errors.

3.13 Ethical considerations

Ethical approval for the study was obtained from the Department of Orthopaedics, the School of Medicine Research and Ethics Committee (SOMREC) of Makerere University, and the Institutional Review Board of Mulago National Referral Hospital prior to the commencement of data collection. Written informed consent was obtained from all adult participants and from the parents or guardians of children, after a clear explanation of the nature, purpose, procedures, risks, and benefits of the study in a language the participant understood.

Assent was obtained from children aged 8 to 17 years in addition to parental consent. Participation was entirely voluntary, and participants were informed that they could withdraw at any time without any effect on their clinical care.

Confidentiality was maintained throughout the study. No personal identifiers were recorded on the data collection tools. Hard copies were stored in a locked cabinet, and electronic data were stored on a password-protected computer accessible only to the research team. All clinically relevant

findings were communicated to the attending orthopaedic team to inform the patient's ongoing management.

3.14 Dissemination of results

The findings of the study will be disseminated to the Department of Orthopaedics at Mulago National Referral Hospital, the Makerere University College of Health Sciences, the Directorate of Research and Graduate Training, and the Sir Albert Cook Medical Library. The results will also be presented at relevant national and international research conferences and submitted for publication in a peer-reviewed journal. A summary of the findings will be made available to the orthopaedic outpatient clinic at MNRH to inform clinical practice and patient counselling.

CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of participants

A total of 105 patients with neglected long bone fractures were recruited. The median age was 33 years (IQR 11 – 46), the youngest was 7 years and the oldest was 87 years. Children below 18 years comprised 37.1% (n=39) while elderly (above 60 years) comprised 10.5% (n=11). The majority of the participants were male (76.2%, n=80), were not married (46.7%, n=49) and had

completed primary level of education (66.7%, n=70). The majority were rural (44.8%, n=47) or semi-urban (41%, n=43) residents.

Table 1: Socio-demographic characteristics of participants (n=105)

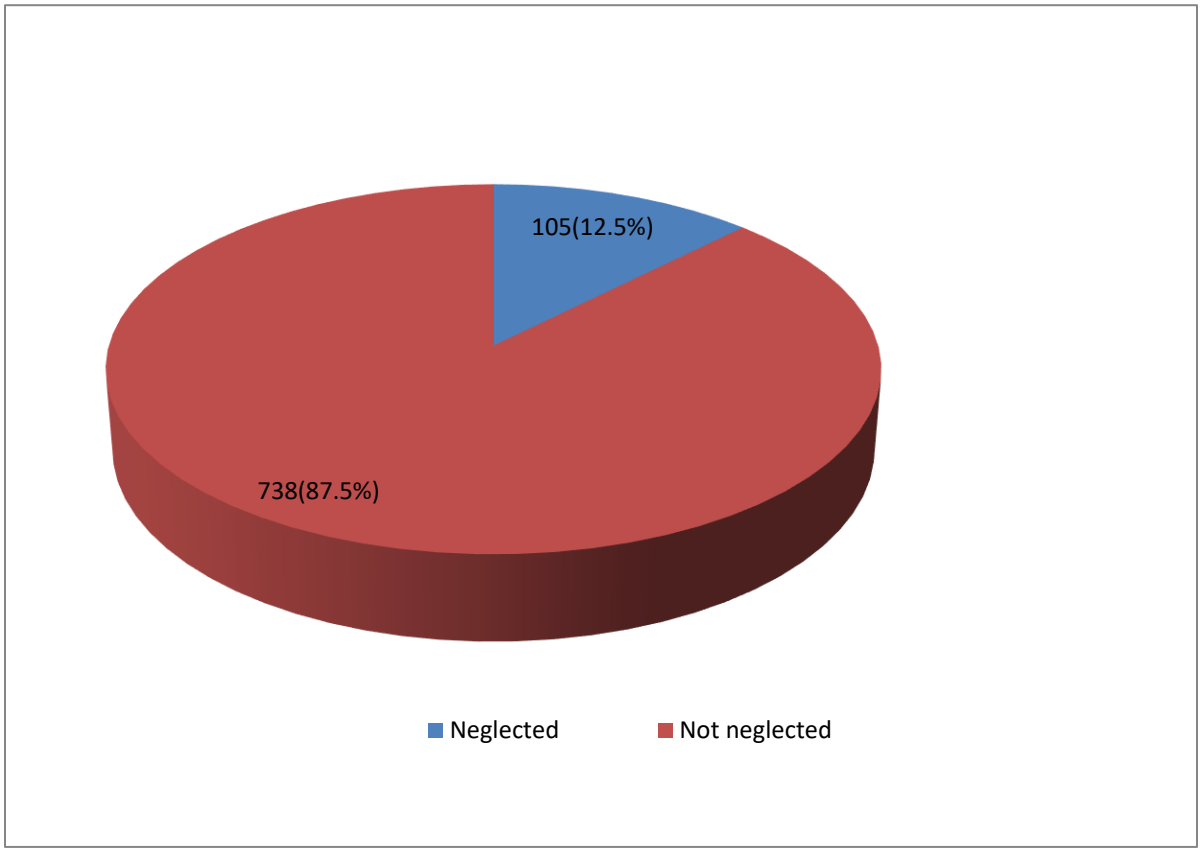
Variable	Frequency (n)	Percentage (%)
Age (years), median (IQR)	33 (11–46)	
7–17	39	37.1
18–60	55	52.3
61–87	11	10.5
Sex		
Female	25	23.8
Male	80	76.2
Marital status		
Single	49	46.7
Married	18	17.1
Not applicable (children <18 yrs)	38	36.2
Level of education		
No formal education	6	5.7
Primary	70	66.7
Secondary	19	18.1
Tertiary	10	9.5
Employment status		
Formal employment	13	12.4
Self-employed	40	38.1
Unemployed	25	23.8
N/A (children < 18 years)	27	25.7
Residence		
Urban	15	14.3
Semi-urban	43	41.0
Rural	47	44.8

4.2 Prevalence of neglected long bone fractures among patients with musculoskeletal trauma.

Prevalence of neglected long bone fractures

During the study period, a total of 843 patients with long bone fractures were screened at the orthopaedic outpatient clinic and accident and emergency unit at MNRH. Of these, 105 met the criteria for neglected long bone fractures, giving a period prevalence of 12.5% (95% CI 10.3–14.9%).

Figure 1: showing prevalence of neglected long bone fracture (n=843)



Duration of neglect

The median duration of neglect was 62 days (IQR 38–150), with the majority of participants (70.5%, n=74) having delayed care for between one and three months. The duration of delay varied significantly across age groups ($p<0.001$). Most children (79.5%) and middle-aged adults (75.7%) presented within 30–90 days of injury, and all elderly patients presented within this short-delay window. Young adults aged 18–35 years, in contrast, accounted for the largest share of medium-term delays, with 38.9% presenting between 91 and 180 days after injury and a further 27.8%

presenting between 181 and 365 days. These findings indicate that prolonged neglect was concentrated among young adults, while children and the elderly tended to present relatively earlier (Table 2).

Table 2: Duration of fracture neglect across age categories

Duration of neglect	**Frequency (%)**					**P-value**
	Children (7-17 years)	**Young adults (18-35 years)**	**Middle aged adults (36-60 years)**	**(Elderly) 61-87**	**ALL**	
30–90 days (1–3 months)	31 (79.5)	4 (22.2)	28 (75.7)	11 (100)	74 (70.5)	<0.001
91–180 days (3–6 months)	2 (5.1)	7 (38.9)	2 (5.4)	0	11 (10.5)	
181–365 days (6–12	3 (7.7)	5 (27.8)	4 (10.8)	0	12 (11.4)	
>365 days (>1 year)	3 (7.7)	2 (11.1)	3 (8.1)	0	8 (7.6)	
Median (IQR)	58 (35-	150 (135-	62 (50-135)	35 (31-90)	62 (38–150)	

Care-seeking patterns before presentation

All 105 participants reported having sought some form of care within the first 28 days following injury, despite the eventual delay in reaching definitive orthopaedic management. The majority (73.3%, n=77) had first consulted a traditional bone setter, while the remaining 26.7% (n=28) had first attended a local clinic. Among those who had attended a local clinic, most (71.4%, n=20) had received only oral analgesia, and a smaller proportion (28.6%, n=8) had been managed with a cast or splint. None of the participants had received closed reduction with formal immobilisation, internal fixation, external fixation, or skeletal traction at any health facility prior to presentation at MNRH (Table 3). When asked to identify the principal reason for delayed presentation, lack of money was the most commonly reported factor, followed by reliance on the bone setter and the perception that the injury was not severe enough to warrant hospital care.

Table 3: Place of first care-seeking and treatment received within 28 days of injury

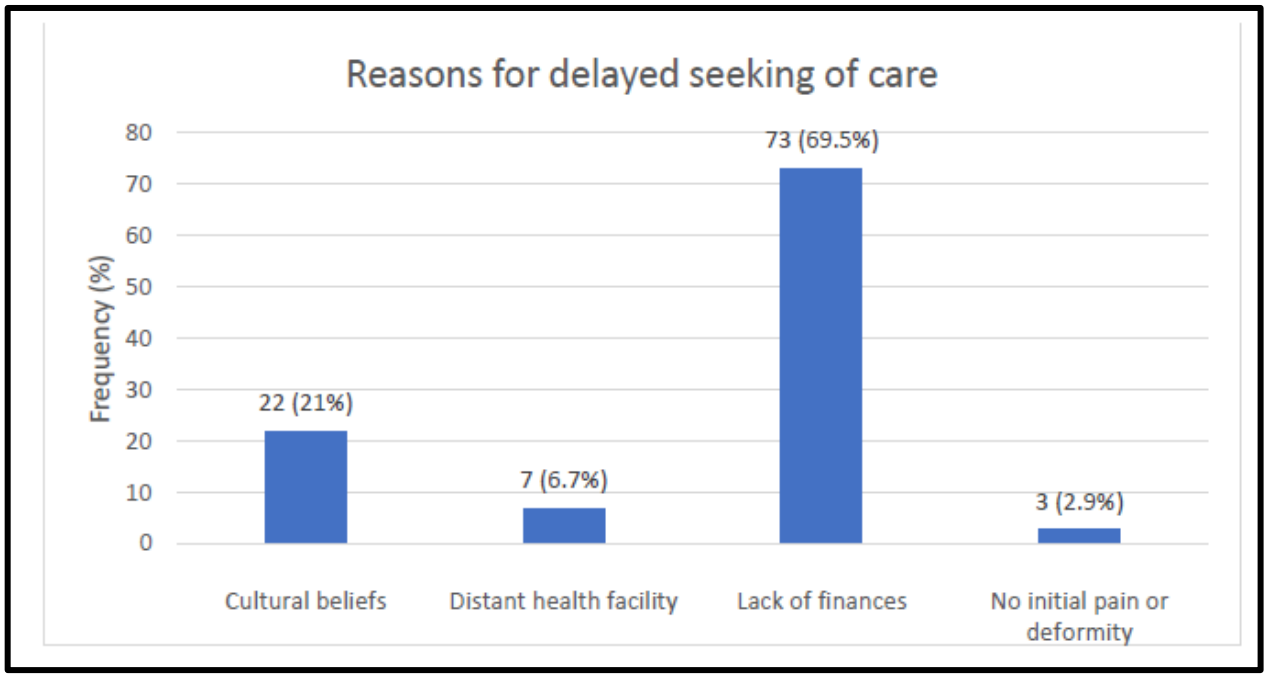
Variable	**Frequency**	**Percentage**
Place of first care-seeking		
Local clinic	28	26.7
Traditional bone setters	77	73.3
Treatment given at the clinic (n=28)		
Cast splint	8	28.6

Pain killers only	20	71.4

Reasons for delayed seeking of care

The lack of money was reported as the main reason for delayed to seek care.

Figure 2: showing reasons for delayed seeking of care



4.3 Injury characteristics of patients with neglected long bone fractures

Among the 105 participants, the tibia/fibula was the most commonly fractured long bone (38.1%, n=40), followed by the radius/ulna (23.8%, n=25), the humerus (22.9%, n=24), and the femur (15.2%, n=16). Fractures occurred more frequently on the left side of the body (63.8%, n=67) than on the right (36.2%, n=38). With regard to the region of the bone, distal fractures were the most common (39.0%, n=41), followed by diaphyseal fractures (33.3%, n=35) and proximal fractures (27.6%, n=29). The great majority of fractures were closed (90.5%, n=95), while a smaller proportion were open (9.5%, n=10). The injury profile is summarized in Table 4.

Table 4: Injury characteristics of patients with neglected long bone fractures

Variable	Frequency (n)	Percentage (%)
Bone fractured		
Femur	16	15.2
Tibia/Fibula	40	38.1
Humerus	24	22.9
Radius/Ulna	25	23.8
Side of fracture		
Right	38	36.2
Left	67	63.8
Region of fracture		
Diaphysis	35	33.3
Distal	41	39.0
Proximal	29	27.6
Type of fracture		
Closed	95	90.5
Open	10	9.5

4.4 Factors associated with prolonged neglect among patients with neglected long bone fractures

To identify factors associated with the duration of delay, the 105 neglected patients were dichotomized into those with a short delay (less than 90 days from injury to presentation) and those with a prolonged neglect (90 days or more). Bivariate associations between each independent variable and prolonged neglect were assessed using binary logistic regression, and variables with a p-value below 0.2 were considered for inclusion in the multivariable model. Categories with zero events in either cell were dropped from the regression and are shown as “omitted” in the tables below.

4.4.1 Bivariate analysis of the socio-demographic factors associated with neglected long bone fractures

Several socio-demographic factors were significantly associated with prolonged neglect in the bivariate analysis. Compared with children aged 7–17 years, young adults aged 18–35 years were almost fourteen times as likely to experience prolonged neglect (COR 13.6, 95% CI 3.50–52.63, p<0.001), while middle-aged adults showed no significant difference. The elderly group was dropped from the regression because none of the elderly participants experienced prolonged neglect. Male sex was associated with substantially higher odds of prolonged neglect than female sex (COR 6.5, 95% CI 1.44–29.75, p=0.015), although the wide confidence interval reflects the small number of female events (n=2). Compared with participants who had completed secondary education, those with only primary education were significantly less likely to experience prolonged neglect (COR 0.3, 95% CI 0.10–0.83, p=0.021); the "no formal education" and "tertiary" groups were dropped because of zero events. Participants who reported alcohol use were more than five times as likely to experience prolonged neglect as non-drinkers (COR 5.1, 95% CI 1.40–18.23, p=0.013). Marital status, residence, and employment status did not reach statistical significance, although both semi-urban and urban residence showed trends toward higher odds of prolonged neglect relative to rural residence. The full bivariate analysis is presented in Table 5.

Table 5: Bivariate analysis of the socio-demographic factors associated with neglected long bone fractures

Variable	**Prolonged neglect (≥90 days)**		**COR [95% CI]**	**P-Value**
	No	**Yes**		
Age (years)				
7-17	31	8	Ref	
18-35	4	14	13.6 [3.495 - 52.633]	**<0.001**
36-60	28	9	1.2 [0.423 - 3.671]	0.691
61-87	11	0	1 (omitted)	
Gender				
Female	23	2	Ref	
Male	51	29	6.5 [1.437 - 29.753]	**0.015**
Marital status				
Single	34	15	Ref	
Married	11	7	1.4 [0.468 - 4.446]	0.524
N/A children<18 years	29	9	0.7 [0.268 - 1.844]	0.474

Level of education				
No formal education	6	0	1 (omitted)	
Primary	50	20	0.3 [0.102 - 0.83]	**0.021**
Secondary	8	11	Ref	
Tertiary	10	0	1 (omitted)	
Employment status				
Formal employment	11	2	Ref	
Self employed	23	17	4.1 [0.795 - 20.787]	**0.092**
Still in school	21	6	1.6 [0.271 - 9.122]	0.614
Unemployed	19	6	1.7 [0.298 - 10.138]	0.54
Residence				
Urban	9	6	2.8 [0.796 - 9.953]	**0.108**
Semi-urban	27	16	2.5 [0.964 - 6.496]	**0.06**
Rural	38	9	Ref	
Take alcohol				
No	26	3	Ref	
Yes	48	28	5.1 [1.402 - 18.233]	**0.013**

4.4.2 Bivariate analysis of Injury related factors associated with prolonged neglected long bone fractures

None of the injury-related factors examined were significantly associated with prolonged neglect at bivariate analysis. Compared with radius/ulna fractures, femur fractures showed a non-significant trend toward higher odds of prolonged neglect (COR 2.5, 95% CI 0.64–9.49, p=0.190), as did tibia/fibula and humerus fractures. Diaphyseal and distal fractures showed non-significant trends toward higher odds of prolonged neglect than proximal fractures, and there was no meaningful difference between open and closed fractures in their association with prolonged neglect (Table 6).

Table 6: Bivariate analysis of Injury related factors associated with prolonged neglected long bone fractures

Variable	**Prolonged neglect (≥90 days)**		**COR [95% CI]**	**P-Value**
	No	**Yes**		
Bone fractured				
Femur	9	7	2.5 [0.64 - 9.485]	**0.19**
Tibia/Fibula	29	11	1.2 [0.38 - 3.796]	0.755
Humerus	17	7	1.3 [0.366 - 4.651]	0.683
Radius/Ulna	19	6	Ref	
Side of fracture				
Right	23	15	2.1 [0.88 - 4.909]	**0.095**
Left	51	16	Ref	

Region of fracture				
Diaphysis	23	12	2 [0.641 - 6.239]	0.232
Distal	28	13	1.8 [0.584 - 5.42]	0.31
Proximal	23	6	Ref	
Type of fracture				
Closed	67	28	Ref	
Open	7	3	1.01 [0.247 - 4.254]	0.972

4.4.3 Bivariate analysis of health system related factors associated with neglected long bone fractures.

Health-system factors showed the strongest and most consistent associations with prolonged neglect. Participants who lived more than 10 kilometres from the nearest health facility were over four times as likely to experience prolonged neglect as those living within 5 kilometres (COR 4.2,95% CI 1.47–12.16, p=0.008). Participants who reported that no one had advised them to seek formal medical care were three times as likely to experience prolonged neglect (COR 3.0, 95% CI 1.22–7.33, p=0.017), and those who reported difficulty in accessing orthopaedic services were over five times as likely to do so (COR 5.2, 95% CI 1.80–15.01, p=0.002). Lack of available transport to a hospital and intermediate distance (5–10 km) showed trends toward higher odds of prolonged neglect but did not reach statistical significance (Table 7).

Table 7: Bivariate analysis of health system related factors associated with neglected long bone fractures

Variable	**Prolonged neglect (≥90 days)**		**COR [95% CI]**	**P-Value**
	No	**Yes**		
Distance to nearest health facility				
<5 km	38	9	Ref	
5-10 km	23	9	1.7 [0.573 - 4.765]	0.353
>10 km	13	13	4.2 [1.466 - 12.16]	**0.008**
Availability of transportation to hospital				
No	13	10	2.2 [0.854 - 5.848]	**0.101**
Yes	61	21	Ref	
Advised to seek medical care				
No	16	14	3 [1.216 - 7.329]	**0.017**
Yes	58	17	Ref	
Difficulty accessing orthopedic care				
No	37	5	Ref	
Yes	37	26	5.2 [1.801 - 15.01]	**0.002**

1. 4.4.4 Multivariate analysis of factors associated with neglected long bone fractures

Variables with a bivariate p-value below 0.2 were entered into a multivariable model using Firth's penalized logistic regression, and the final model was built using backward elimination. Five variables were independently associated with prolonged neglect (Table 8). Male sex was associated with substantially higher adjusted odds of prolonged neglect than female sex (AOR 31.7, 95% CI 5.02–327.88, p=0.001). Alcohol use remained an independent predictor (AOR 11.8, 95% CI 2.42–102.09, p=0.007), as did residence more than 10 kilometres from the nearest health facility (AOR5.7, 95% CI 1.55–24.73, p=0.013). Among health-system factors, the absence of any advice to seek formal medical care was independently associated with prolonged neglect (AOR 6.4, 95% CI 1.84–29.63, p=0.007), and self-reported difficulty in accessing orthopaedic care showed the strongest independent association of all variables in the model (AOR 13.2, 95% CI 3.46–66.01, p=0.001). Intermediate distance (5–10 km) was retained in the model for completeness but was not statistically significant (AOR 1.1, 95% CI 0.26–4.72, p=0.905). Variance inflation factors were below 2 for all retained variables, suggesting no important multicollinearity.

Table 8: Multivariate analysis of factors associated with neglected long bone fractures

Variable	COR [95% CI]	P-Value	AOR [95% CI]	P-Value
Gender				
Female	Ref			
Male	6.5 [1.437 - 29.753]	0.015	31.7 [5.02 – 327.88]	**0.001**
Take alcohol				
No	Ref			
Yes	5.1 [1.402 - 18.233]	0.013	11.8 [2.42 – 102.09]	**0.007**
Distance to nearest health facility				
<5 km	Ref			
5-10 km	1.7 [0.573 - 4.765]	0.353	1.1 [0.26 – 4.72]	0.905
>10 km	4.2 [1.466 - 12.16]	0.008	5.7 [1.55 – 24.73]	**0.013**
Advised to seek medical care				
No	3 [1.216 - 7.329]	0.017	6.4 [1.84 – 29.63]	**0.007**
Yes	Ref			
Difficulty accessing orthopedic care				
No	Ref			
Yes	5.2 [1.801 - 15.01]	0.002	13.2 [3.46 – 66.01]	**<0.001**

CHAPTER FIVE: DISCUSSION

5.0 Introduction

This study set out to determine the prevalence of neglected long bone fractures among patients with musculoskeletal trauma at Mulago National Referral Hospital and to identify the factors associated with prolonged neglect among those patients. The principal findings were a period prevalence of 12.5%, a median duration of 62 days of neglect, and a marked concentration of prolonged neglect among young adult males, individuals who consumed alcohol, and patients facing geographic and structural barriers to orthopaedic care. Universal early contact with informal providers — predominantly traditional bone setters — was a striking feature of the care-seeking pathway. Taken together, these findings expose both behavioral and health-system drivers of delayed fracture care in Uganda and have direct implications for clinical practice, public-health messaging, and engagement with informal providers.

5.1 Socio-demographic profile of patients with neglected long bone fractures

The median age of participants was 33 years, with young and middle-aged adults forming the bulk of the sample, children accounting for 37.1% and the elderly for only 10.5%. This age distribution is consistent with trauma epidemiology across sub-Saharan Africa, where musculoskeletal injury and fracture burdens fall disproportionately on economically active adults. A Tanzanian series of patients with open long bone fractures reported a comparable mean age of 34.9 ± 15.1 years and found that 48.5% of participants were aged 18–34 years (Mwanga et al., 2024). Studies from

elsewhere in the region have shown similar patterns and have linked them to the high exposure of young adults to road traffic crashes and occupational injury (Agarwal-Harding et al., 2019; Naddumba, 2008). The relatively high proportion of children in the present sample is notable and probably reflects local care-seeking behaviour, in which families frequently consult traditional bone setters before considering hospital care, irrespective of the patient's age.

More than three-quarters of the participants were male (76.2%), a finding that mirrors the Tanzanian series cited above, in which approximately 73% of fracture patients were men, and is consistent with broader Ugandan trauma data showing a strong male predominance among patients with road traffic and occupational injuries (Naddumba, 2008; Zheng et al., 2021). Most participants had attained no more than primary education and lived in rural or semi-urban areas, a profile that is closely associated with limited health literacy, restricted access to formal services, and reliance on community-based care (Roshan & Ram, 2008; Singaram & Naidoo, 2019).

5.2 Prevalence of neglected long bone fractures and duration of neglect

The prevalence of neglected long bone fractures at MNRH was 12.5% (95% CI 10.3–14.9%), indicating that approximately one in eight patients presenting with a long bone fracture during the study period had delayed seeking definitive care for more than four weeks. This figure is substantially higher than the 5.8% neglect rate reported in a Dutch multicentre series of femoral shaft fractures in children under six years (Loos et al., 2022), but this comparison must be interpreted with caution: the Dutch study examined a paediatric, single-bone subset within a high-income trauma system, whereas the present study captured adults and children with fractures of any of the major long bones in a tertiary referral setting in a low-income country. A more appropriate comparator is the earlier Mulago pilot, which estimated the prevalence of neglected long bone fractures at approximately 9.3%; the somewhat higher figure obtained in the present study may reflect more complete case ascertainment through prospective screening, ongoing strain on referral pathways, or both. The estimate is also broadly compatible with the 15–35% range reported across LMIC trauma cohorts (Roshan & Ram, 2008), and reinforces the view that neglected long bone fractures remain a substantial and largely preventable burden in resource-limited settings.

The median duration of neglect was 62 days, with 70.5% of participants delayed for one to three months and a further 29.5% delayed beyond three months. The duration of delay varied

significantly across age groups, with prolonged neglect concentrated among young adults aged 18–35 years. This pattern is consistent with qualitative work from Uganda showing that economically active adults often postpone formal care because of competing financial and household responsibilities, and that men in particular tend to prioritise income-generating activity over personal injury management until function is severely compromised (O'Hara et al., 2014). The relatively earlier presentation of children and the elderly observed in this study probably reflects greater dependence on caregivers and family members, who in turn may be more willing than working-age men to abandon other responsibilities and seek formal care.

5.3 Injury characteristics of patients with neglected long bone fractures

The tibia/fibula was the most commonly fractured long bone (38.1%), followed by the radius/ulna, humerus, and femur. The predominance of tibia/fibula fractures is well described in the trauma literature and is attributed to the subcutaneous course of the tibia, the limited soft-tissue envelope around it, and its frequent involvement in road traffic and fall-related trauma (Mabrouk & Jahangir, 2025). Distal fractures were the most common region affected, and the great majority of fractures were closed. The combination of distal location and closed pattern is clinically important: such fractures often produce less immediate disability and less obvious external deformity than proximal or open injuries, and patients may therefore underestimate their severity and defer formal care, a phenomenon that has been described in studies of fracture-related care delay in other low-resource settings (Singh et al., 2024). The left side was affected more often than the right, but this finding has no clear clinical or epidemiological interpretation and most likely reflects chance variation in a sample of this size.

5.4 Factors associated with neglected long bone fractures among patients with musculoskeletal trauma.

Five variables were independently associated with prolonged neglect in the multivariable model: male sex, alcohol use, residence more than 10 kilometres from the nearest health facility, the absence of any prior recommendation to seek formal medical care, and self-reported difficulty in accessing orthopaedic services. The pattern suggests that prolonged neglect is driven jointly by behavioural factors (sex roles, alcohol use, individual decision-making) and structural factors

(geography, information, service availability), and that addressing one set of drivers without the other is unlikely to be effective.

The strong association between male sex and prolonged neglect (AOR 31.7) is consistent with both regional epidemiology and qualitative evidence. In northern Tanzania, men accounted for over 70% of patients with open long bone fractures, a pattern attributed to occupational and behavioural exposures common among working-age males (Mwanga et al., 2024). In Uganda specifically, qualitative research has shown that male trauma patients frequently postpone formal care because of their position as primary household earners; in one study, 74% of orthopaedic trauma patients at Mulago were the main breadwinner for their household, supporting an average of nearly six dependants, and inability to work after injury was associated with food insecurity for the entire family (O'Hara et al., 2014). These pressures plausibly help explain why men in the present study were more likely than women to remain at home or with traditional providers rather than seek timely hospital care.

Alcohol use was independently associated with more than a tenfold increase in the adjusted odds of prolonged neglect (AOR 11.8). This finding is in keeping with work from Rwanda showing that patients reporting alcohol consumption at the time of injury were approximately five times more likely to present late to hospital following craniomaxillofacial trauma than those who had not been drinking (Stanford-Moore et al., 2022). Plausible mechanisms include impaired judgement at the time of injury, reduced prioritisation of medical care, and the social and economic instability that often accompanies harmful alcohol use, all of which may delay both the recognition and the management of fractures.

Two health-system variables distance to the nearest health facility and self-reported difficulty in accessing orthopaedic care were among the strongest predictors of prolonged neglect in the present study. Patients living more than 10 kilometres from a health facility had nearly sixfold higher adjusted odds of prolonged neglect compared with those living within 5 kilometres (AOR 5.7), and patients reporting difficulty in accessing orthopaedic care had more than thirteenfold higher odds (AOR 13.2). These findings echo the Malawian study by Agarwal-Harding et al. (2019), which found that musculoskeletal injury patients with longer travel times to a health facility were significantly more likely to present late, and that geographic and logistical barriers were among the most important predictors of delayed presentation. The present study extends those findings by

showing that, even within a population that had eventually reached a national referral hospital, geographic and structural barriers continued to differentiate those with short delays from those with very prolonged neglects.

The absence of any prior advice to seek formal medical care was independently associated with more than sixfold higher adjusted odds of prolonged neglect (AOR 6.4). This is an actionable finding: it suggests that information itself, separate from physical access to care, is an important determinant of how long patients remain outside the formal system. In the present sample, all 105 participants sought some form of care within the first 28 days of injury the great majority from traditional bone setters yet none received definitive orthopaedic management before presentation at MNRH. The implication is that the first contact with an informal provider is a critical missed opportunity: a clear recommendation to attend a hospital at that point, even from a traditional bone setter, might substantially shorten the time to definitive care.

5.5 Study limitations

The study was conducted at a single tertiary referral hospital in Kampala, and the findings may not be fully generalizable to other regions of Uganda or to lower-level facilities, where both the prevalence and the determinants of neglect may differ. Regional referral and district hospitals serve populations with distinct access profiles, and the pattern of factors associated with prolonged neglect at those levels may not mirror those identified here.

The study captured only patients who eventually reached MNRH; those who never sought formal care, or who died or were permanently disabled before reaching the hospital, are not represented. The true population-level burden of neglected long bone fractures in Uganda is therefore likely to exceed the 12.5% reported here, and the present estimate should be interpreted as a hospital-based period prevalence rather than a community prevalence.

The analysis of factors associated with neglect was conducted within the group of neglected patients, comparing those with prolonged neglect (≥90 days) to those with shorter neglect (<90 days). This design identifies factors that distinguish more severe from less severe neglect, but it cannot directly identify factors that distinguish neglected from non-neglected patients overall, for which a comparison cohort of acute presenters would be required.

Information on the date of injury, the reasons for delay, and the use of traditional and informal providers was based entirely on patient self-report and is therefore subject to recall bias and social-desirability bias. Participants with very long-standing injuries some presenting more than one year after fracture may have difficulty accurately reconstructing the timeline or sequence of care-seeking, and may underreport behaviors perceived as socially undesirable, including reliance on traditional providers and alcohol use.

Several covariates contained sparse cells, with zero outcome events in some categories notably the elderly age group, participants with no formal education, and those with tertiary education and these categories had to be excluded from the regression. The resulting effect estimates for retained categories should be interpreted with appropriate caution, particularly for variables with wide confidence intervals such as male sex.

Several variables collected during data collection including birth order, average monthly income, mechanism of injury, and caregiver marital status could not be meaningfully included in the regression analysis. Birth order had no basis theoretical justification as a predictor of delay and was not analyzed. Income was excluded due to extensive item non-response. Mechanism of injury was excluded because its distribution across outcome categories contained no discriminating events.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This study found that neglected long bone fractures remain a substantial clinical and public-health problem at Uganda's principal referral hospital. During the recruitment period, 12.5% of all patients presenting with long bone fractures at Mulago National Referral Hospital met the criteria for neglect, with a median duration of delay of 62 days. Almost three in ten neglected patients had been delayed for more than three months by the time they reached definitive orthopaedic care.

The tibia and fibula were the most frequently affected long bones, distal fractures predominated, and the great majority of injuries were closed. Universal early contact with informal providers — predominantly traditional bone setters was a defining feature of the care-seeking pathway: every participant had sought some form of care within the first 28 days of injury, yet none had received definitive orthopaedic management before presentation at MNRH.

Prolonged neglect among neglected patients was independently associated with male sex, alcohol use, residence more than 10 kilometres from the nearest health facility, the absence of any prior advice to seek formal medical care, and self-reported difficulty in accessing orthopaedic services. Taken together, these findings indicate that delayed fracture care in this setting is driven jointly by behavioural factors and by structural and informational barriers within the health system, and that no single intervention is likely to be sufficient on its own.

6.2 Recommendations

The findings of this study point to five actionable domains.

1. Establish a Dedicated Triage Pathway for Late-Presenting Fractures at MNRH

One in eight fracture patients at MNRH met neglect criteria; nearly three in ten had delayed over three months. The orthopaedic department should establish a formal rapid-triage protocol for patients presenting more than four weeks after injury, ensuring same-day imaging and senior review outside of routine outpatient flow.

2. Embed Brief Alcohol Counselling into Orthopaedic Trauma Consultations

Alcohol use was the second strongest predictor of prolonged neglect (AOR 11.8). Orthopaedic trauma consultations at all levels should include a brief standardised alcohol screen, with onward referral where indicated. Public-health messaging aimed at young adult men should embed alcohol-harm and injury-prevention content, delivered through workplaces, and trading centres.

3. Formalise and Scale Up Engagement with Traditional Bone Setters

All 105 participants sought care from an informal provider within 28 days, yet none received definitive management before reaching MNRH. Traditional bone setters are the universal first contact and the single most actionable intervention point in the care pathway. District health authorities should pilot structured TBS engagement programmes covering fracture recognition, safe initial splinting, and timely referral experience from comparable LMIC settings shows engagement is consistently more effective than prohibition.

4. Address Geographic and Structural Barriers to Orthopaedic Access

Difficulty accessing orthopaedic care (AOR 13.2) and residence more than 10 km from a health facility (AOR 5.7) were the two strongest predictors overall, implicating structural failure rather than patient indifference. The Ministry of Health should invest in orthopaedic capacity at regional and general hospital level and strengthen transport-support mechanisms like district ambulances.

5. Institutionalise the Provision of Fracture Management Advice at Every Clinical Contact

Absence of advice to seek formal care independently predicted prolonged neglect (AOR 6.4). All 105 participants sought some care within 28 days, meaning early contacts existed at which referral advice could have been given but was not. Every clinician managing a musculoskeletal injury at any facility level should provide and document a clear recommendation for definitive orthopaedic review.

6. Future Research Priorities

Three priorities emerge: multi-centre studies to assess generalisability of these findings across Uganda's health system; a prospective cohort comparing neglected to acute presenters to identify predictors of neglect itself; and implementation research evaluating the TBS engagement programmes and rapid-triage pathway proposed above.

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APPENDICES

APPENDIX I: INFORMED CONSENT OF THE STUDY-ENGLISH VERSION.

Participant Identification Number……

TITLE: PREVALENCE OF NEGLECTED LONG BONE FRACTURES AND ASSOCIATED FACTORS AMONG PATIENTS WITH MUSCULOSKELETAL TRAUMA AT MULAGO NATIONAL REFERRAL HOSPITAL

Investigator:

Investigator's name	Contact	Institution
1. Dr. Dembe Moses **2.** (Principal investigator)	**0776569228**	Makerere University College of

Background and rationale for the study:

Neglected long bone fractures which are those that are not managed within 4 weeks are a major cause of severe disability, especially in resource-limited settings. Patients often live with chronic pain, deformity, and an inability to work, creating a significant personal and socioeconomic burden.

Despite this, the scale of the problem is poorly understood. This study is crucial to quantify the prevalence of this condition within a specific patient population, establishing its local importance. Furthermore, merely documenting cases is insufficient; we must identify the underlying

factors leading to the neglect such as poverty, use of traditional healers, or lack of access to care. Understanding these root causes is the critical rationale for the research. The findings will provide an evidence base to develop targeted public health strategies, guide clinical resource allocation, and ultimately prevent the long-term consequences of these treatable injuries.

Sponsors: Self (Dr. Dembe Moses)

This research project is an independent, self-sponsored initiative led by Dr.Dembe Moses, as the Principal Investigator (PI), a senior house officer in the Department of Orthopaedic Surgery at Mulago National Referral Hospital, which will serve as the primary site for this study.

Purpose:

This study seeks to provide information on the prevalence of neglected long bone fractures and the associated factors among patients with musculoskeletal trauma in Mulago national referral hospital. Thus, bridging the knowledge gap that exists and forming a basis for preventive measures that can be taken to prevent neglect of long bone fractures.

The estimated duration the research participant will take in the research project:

You will be identified by the research assistant in the orthopaedic trauma OPD clinic. Informed consent will be sought and then you will be taken through an interview to fill in the questionnaire. This will take about 20 minutes.

Procedures

Permission to conduct the study will be sought from the orthopaedic trauma clinic in-charge. If you meet the eligibility criteria, you will be enrolled and a face to face interview will be conducted and the neglected long bone injury determined as well as the associated factors.

Who will participate in the study?

Patients with neglected long bone fractures who consent to be part of the study. Children with neglected long bone fractures whose caregivers give informed consent. to be part of the study.

Risks/Discomforts:

The physical exam to assess the fracture (e.g., palpating the fracture site, assessing range of motion, assessing limb deformity) may cause some pain or discomfort. X-rays which will be requested for those without imaging pose a minimal radiation exposure risk.

Benefits:

The findings of this study will be disseminated to the Department of Orthopaedics of Makerere University College of Health Sciences; Albert Cook Medical Library and the Directorate of Research and Graduate Training. Your participation in the study will enable the researcher to achieve an academic milestone.

If you are found to have a neglected long bone fracture, you will be referred to an orthopaedic surgeon in the clinic to decide the next plan of management.

Participants who will not be having x-rays will have them done at the cost of the principal investigator

Confidentiality:

All the Information you give will be treated with the utmost confidentiality. Therefore, your name and other personal information is not required for the study. Further, access to the data collection tools will be limited to only the research team members, the school of medicine research and ethics committee and the Uganda National Council for Science and Technology since these bodies are responsible for research in the country. The researcher will endeavor to see that summarizing the findings of the study is done in such a way that doesn't reveal specific identifiers of the study respondents.

Alternatives

You are under no obligation to participate in this study. You should only participate if you are interested.

Cost of being a participant:

As a study participant, you will not incur any costs during the study.

Compensation for participation in the study:

The researcher will afford a humble compensation of 10,000/-for your time which will be given to you in cash from the research assistant.

Questions about the study:

If you have any questions about the study, please contact Principal investigator (PI):

Dr. Dembe Moses. Tel. No. +256776569228 Email: dembe1moses@gmail.com

Questions about participant's rights:

In case you have questions about your rights as research participants you can contact the chairperson School of Medicine Research and Ethics committee (SOMREC) . Prof. Ponsiano

Ocama, Tel: +256772421190. The chairperson will have answers for any questions you might have.

Statement of voluntariness:

Participation in the proposed study is voluntary. Any one has a right to withdraw from the study at any time without penalty.

Dissemination of results:

The study participants will get feedback of the findings and progress of the study. Any new information affecting the study or data with clinical relevance to research participants including incidental findings will be available to the participants and health care providers.

Ethical approval:

This research has been approved by the Makerere University School of Medicine Research and Ethics Committee.

STATEMENT OF CONSENT FOR ADULTS

..... has thoroughly informed me about the procedures, risks, benefits, and my rights pertaining to this study by the researcher. I acknowledge that my choice to participate will not affect my regular medical care. I understand that my identity will be kept confidential when using this information. I am fully aware that I can withdraw my participation at any point. By signing this document, I do not relinquish any of my legal rights; rather, I affirm that I have been briefed on the research study and iam voluntarily choosing to take part. All my queries and apprehensions have been satisfactorily addressed. I will be given a copy of this form for my records

Name……

Signature/ thumbprint of participant……..……

Date…… Name……....

Signature of witness (if applicable) ……

Date…… Name……...

Signature of interviewer/Person obtaining informed consent ……...……

Date…….

STATEMENT OF CONSENT FROM GUARDIANS/PARENTS OF CHILDREN

..... Has described to me what is going to be done, the risks, the benefits involved and my child's rights regarding this study. I understand that my decision for my child to participate in this study will not affect the care my child receives at the hospital. In the use of this information, my child's identity will be concealed. I am aware that I may withdraw my child at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing for my child to participate. A copy of this form will be provided to me.

Name of Caregiver……...Signature……Date…….
Name of Person obtaining informed consent …….
Signature ……. Date ……

STATEMENT OF ASSENT FORM CHILDREN 8 TO 17 YEARS

..... has described to me what is going to be done, the risks, the benefits involved and my rights regarding this study. I understand that my decision to participate in this study will not alter my usual medical care. In the use of this information, my identity will be concealed. I am aware that I may withdraw at any time. I understand that by signing this form, I do not waive any of my legal rights but merely indicate that I have been informed about the research study in which I am voluntarily agreeing to participate. A copy of this form will be provided to me.

Name ……Signature/thumb print of participant ……Date ……
Name of Person obtaining assent……. Signature ……Date …….

APPENDIX II: INFORMED CONSENT OF THE STUDY-LUGANDA VERSION.

OBUNGI BW'OKULAGAJALILA AMAGUMBA AGAMENYESE N'ENSONGA EZIBUKWATAKO MU BALWADDE BAMAGUMBA KU MULAGO NATIONAL REFERRAL HOSPITAL.

Omukugu akulembeddemu	**Essimu:**	**Ekitongole**
Dr. Dembe Moses	0776569228	Makerere University College

Ekigendererwa ky'okunoonyereza:

Okunoonyereza kuno kugenderera okufuna amakulu ku bungi bw'okulagajalila amagumba agamenyese n'ensonga ezibukwatako mu balwadde bamagumba ku Mulago National Referral Hospital. Kino kigenderera okuziba amabanga mubukugu n'okufuna engeri y'okwewala obuvune obwobutalabirirwa mu budde.

Omuwagizi: Nze (Dr.Dembe Moses)

Okunonyeleza kuno kuwagidwa nze kenyinni Dr.Dembe Moses ela nga nze mukugu akulembeddemu okunonyeleza. Ndi muyizzi mu kitongole ekijanjabba amagumba e mulago national referral hospital ela nga okunonyeleza wekugenda okukolebwa.

Obudde omulwadde bw'anaamala mu kunoonyereza:

Ojja kumala akaseera nga kaddakiika abiri (20) ng'oddamu ebibuuzo ku foomu yo kunoonyereza nga oyambibwako n'omukozi w'okunoonyereza.

Engeri gye kijja okukolebwamu:

Omukozi w'okunoonyereza ajja kulondawo omulwadde alina obuvune obutakoleddwaako okusoba mu wiiki nya okuva lwebaamenyeka, amubuze ebibuuzo ebili ku foomu.

Abagenda okwetaba mu kunoonyereza:

Abantu abalina obuvune obw'omagumba nga tebakwoledwako okusoba mu wiiki nya okuva lwebaamenyeka.

Obulabe/Okunyigirizibwamu:

Okunoonyereza kuno kujja kwebuuza ku bintu eby'obuntu ebyekusifu naye nga bino bijja kutwalibwamu obukuumi obusinga.

Emiganyulo omulwadde gy'anaafunamu:

Ebiva mu kunoonyereza bino bijja kuyamba mu kutondawo enkola ez'esigamiziddwa ku bujulizi okuyambako mu kukendeeza oba okwewala obuvune obutakoleddwaako mu budde.

Obukuumi bwebikwata kumulwadde:

Ebikwata kumulwadde bijja kukuumibwa mu kyama ng'ekiragiro ky'amateeka bwe kiteesa. Abakulembeze okuva ku Makerere University School of Medicine Research and Ethics Committee bayinza okufuna obuyinza okulaba amakulu ago mu kukakasa obukuumi bw'okusunsulamu kuno.

Ekirala:

Okwetaba mu kunoonyereza kuno sikwa buwaze. Omuntu alina eddembe okuwummula mu kunoonyereza wonna wayagalira, nga kino tekigenda kukosa kuwangala kwe ku ddwaliro newankubadde ku bujanjabi bw'afuna.

Omuwendo/Ensawo:

Tewali ssente zosasula mu kunoonyereza kuno. Abetabye bajja kuweebwa 10,000/= (Shs. Omutwalo gumu ogwa Uganda) okubalilira ku budde bwe bamaze mu kunoonyereza.

Ebibuuzo ku kunoonyereza:

Bw'oba olina ebibuuzo ku kunoonyereza kuno, oyinza okukubira omukugu akulembeddemu okunoonyereza:

Dr. Dembe Moses

Essimu: +256776569228

Email: dembe1moses@gmail.com

Ebibuuzo ku ddembe ly'omwetabye mu kunoonyereza:

Bw'oba olina ebibuuzo ku ddembe lyo ng'omwetabye mu kunoonyereza, oyinza okukubira ssaabawandiisi wa School of Medicine Research and Ethics Committee:

Assoc. Prof. Ponsiano Ocama

Essimu: +256772421190

Okukkiriza okw'eyawandiisiddwa:

Okwetaba mu kunoonyereza kuno si kwa buyinza. Olina eddembe okuvamu mu kunoonyereza wonna lw'osaba, nga tewali kibonerezo kyonna.

Okutambuza ebyavaamu:

Ojja kufuna amawulire agakwata ku byavaa mu kunoonyereza wamu n'enkulaakulana yaakwo okuva ku mukugu akulembeddemu.

Okukkirizibwa kw'okunoonyereza:

Okunoonyereza kuno kukkiriziddwa era kwaweereddwa olukusa okuva ku Makerere University School of Medicine Research and Ethics Committee ne Mulago Ethics Committee.

EKITABO KY'OKUKKIRIZA KWABAKULU

…… annyonnyodde ekigenda okukolebwa, akabi, emigaso egizingirwa n'eddembe lyange erikwata ku kunoonyereza kuno. Ntegedde nti okusalawo kwange okwetaba mu kunoonyereza kuno tekijja kukyusa bujjanjabi bwange obwa bulijjo. Mu kukozesa amawulire gano, endagamuntu yange ejja kukwekebwa. Nkimanyi nti nnyinza okuvaamu essaawa yonna. Ntegedde nti bwe nssa omukono ku ffoomu eno, sivaako ddembe lyange lyonna ery'amateeka wabula ntegeeza bulaga nti ntegeezeddwa ku kunoonyereza kw'okunoonyereza kwe nzikirizza okwetabamu kyeyagalire. Kopi ya foomu eno ejja kumpeebwa.

Erinnya ly'Omuntu afuna olukusa.....

Omukono .....Olunaku .....

Erinnya ly'omujulizi/omulabirira…… ..Olunaku olw'omweezi…….....

Errinya lyomunonyeleza…….. Olunaku olw'omweezi…….....

EKITABO KY'OKUKKIRIZA OKUVA MU ABALABILILA/ABAZADDE B'ABAANA ABATO

……..... annyonnyodde ekigenda okukolebwa, akabi, emigaso egiri mu n'eddembe ly'omwana wange ku bikwata ku kunoonyereza kuno. Ntegedde nti okusalawo kwange omwana wange okwetaba mu kunoonyereza kuno tekijja kukosa ndabirira omwana wange gy'afuna mu ddwaaliro. Mu kukozesa amawulire gano, ebikwata ku mwana wange bijja kukwekebwa. Nkimanyi nti nnyinza okuggyayo omwana wange essaawa yonna. Ntegedde nti bwe nssa omukono ku ffoomu eno, sivaako ddembe lyange

lyonna ery’amateeka wabula ntegeeza bulaga nti ntegeezeddwa ku kunoonyereza kw’okunoonyereza kwe nkiriza omwana wange okwetabamu kyeyagalire. Kopi ya foomu eno ejja kunweebwa.

Erinnya ly’Omulabirira.....Omukono.....Olunaku.....
Erinnya ly’Omuntu afuna olukusa olutegeerekese
Okutekako omukono ……. Olunaku olw'omweezi……..

EKITABO KY’OKUKKIRIZA ABAANA ABEMYAKA 8 OKUTUUKA KU 17

…….annyonnyodde ekigenda okukolebwa, akabi, emigaso egizingirwa n’eddembe lyange erikwata ku kunoonyereza kuno. Ntegedde nti okusalawo kwange okwetaba mu kunoonyereza kuno tekijja kukyusa bujjanjabi bwange obwa bulijjo. Mu kukozesa amawulire gano, endagamuntu yange ejja kukwekebwa. Nkimanyi nti nnyinza okuvaamu essaawa yonna. Ntegedde nti bwe nssa omukono ku ffoomu eno, sivaako ddembe lyange lyonna ery’amateeka wabula ntegeeza bulaga nti ntegeezeddwa ku kunoonyereza kw’okunoonyereza kwe nzikirizza okwetabamu kyeyagalire. Kopi ya foomu eno ejja kumpeebwa.

Erinnya ly’Omuntu afuna olukusa..... Omukono .....Olunaku .....
Erinnya ly’omujulizi/omulabirira…… Olunaku olw'omweezi…….....

APPENDIX III: QUESTIONNAIRE.

Section A: Socio-Demographic Information

1. What is your age?

……

2. What is your gender?

A. Male

B. Female

3. What is your birth order?

……

4. What is your marital status?

A. Single

B. Married

C. Divorced

D. Widowed

5. What is your level of education?

A. No formal education

B. Primary

C. Secondary

D. Tertiary

6. What is your employment status?

A. Unemployed

B. Self-employed

C. Formal employment

7. What is your average monthly income?

A. Less than UGX 100,000

B.UGX 100,000-500,000

C.UGX 500,000-1,000,000

D. Above UGX 1,000,000

8. What is your residence?

A. Urban

B. Semi-urban

C. Rural

Section B: Injury Details

9. Which bone was fractured?

A. Femur

B. Tibia/fibula

C. Humerus

D. Radius/Ulna

10.On which side of the body was the fractured bone?

A. Right

B. Left

11.Which region of the bone was fractured?

A. Proximal

B. Diaphysis

C. Distal

12. What type of fracture is it?

A. Open

B. Closed

13. How many days after the injury did you seek medical care?

……..

14. Where did you first seek treatment? A.

Traditional healer

B. Local clinic

C. Hospital

D. Traditional Bone setter

E. Church/Mosque

15. Did you receive any treatment from a health centre initially? A.

Cast/splint

B. Surgery

C. Pain relief medication only

D. No treatment

Section C: Factors Contributing to the Neglect.

16. What was the main reason for delayed treatment? A.

Lack of finances

B. Lack of transport

C. Distant health facility

D. No initial pain or deformity

E. Cultural beliefs

17. Have you been managed by a traditional bone setter for bone fractures? A.

Yes

B. No

18. How far is the nearest health facility from your home? A.

Less than 5 km

B.5-10 km

C. More than 10 km

19.Do you take alcohol?

A.YES

B.NO

20. Do you have to transportation to a hospital? A.

Yes

B. No

21. Were you advised by anyone to seek formal medical care for your injury? A.

Yes

B. No

22. Did you experience difficulty getting an orthopedic care giver? A.

Yes

B. No

Section D: Caregiver factors

23. Age

……

24. Do you take alcohol? A.

Yes

B. No

25. What is your level of education? A.

No formal education

B. Primary

C. Secondary

D. Tertiary

Thank you for your participation

APPENDIX IV: ETHICAL APPROVAL LETTER

MAKERERE UNIVERSITY
P.O. Box 7072 Kampala, Uganda
E-mail: rresearch9@gmail.com
Phone: 256 414 533541
Fax: 256 414 541036/0414 532204
COLLEGE OF HEALTH SCIENCES
SCHOOL OF MEDICINE
RESEARCH ETHICS COMMITTEE

20/11/2025
To: Dembe Moses
MakerereUniversityKampala

Review Type: Initial Review

Re: Mak-SOMREC-2025-641: PREVALENCE OF NEGLECTED LONG BONE FRACTURES AND ASSOCIATED FACTORS AMONG PATIENTS WITH MUSCULOSKELETAL TRAUMA AT MULAGO NATIONAL REFERRAL HOSPITAL

I am pleased to inform you that at the **209** convened meeting on **14/10/2025**, the MAK School of Medicine REC (Mak-SOMREC) meeting voted to approve the above referenced application. Approval of the research is for the period of **20/11/2025** to **20/11/2026.**

As Principal Investigator of the research, you are responsible for fulfilling the following requirements of approval:

1. All co-investigators must be kept informed of the status of the research.
2. Changes, amendments, and addenda to the protocol or the consent form must be submitted to the REC for rereview and approval **p rior** to the activation of the changes.
3. Reports of unanticipated problems involving risks to participants or any new information which could change the risk benefit: ratio must be submitted to the REC.
4. Only approved consent forms are to be used in the enrollment of participants. All consent forms signed by participants and/or witnesses should be retained on file. The REC may conduct audits of all study records, and consent documentation may be part of such audits.
5. Continuing review application must be submitted to the REC **eight weeks** prior to the expiration date of **20/11/2026** in order to continue the study beyond the approved period. Failure to submit a continuing review application in a timely fashion may result in suspension or termination of the study.
6. The REC application number assigned to the research should be cited in any correspondence with the REC of record.
7. You are required to register the research protocol with the Uganda National Council for Science and Technology (UNCST) for final clearance to undertake the study in Uganda.

	Luganda clean copy			
3	Assent form for children aged 8-17 years English clean copy	English	1	2025-11-19
4	Consent form for adults Luganda clean copy	Luganda	1	2025-11-19
5	Protocol clean copy Mak-SOMREC-2025-641	English	1	2025-11-19
6	COVID-19 & EBOLA risk management plan	English	1	2025-11-19
7	Data collection tools	English	English	2025-11-03

Yours sincerely,

MAKERERE UNIVERSITY
SCHOOL OF MEDICINE
INITIAL APPROVAL
VALID UNTIL
★ 20 NOV 2026 ★
RESEARCH & ETHICS COMMITTEE
P.O. BOX 7072,KAMPALA

Prof. Ponsiano Ocama
For: MAK School of Medicine REC (Mak-SOMREC)

APPENDIX V: ADMINISTRATIVE CLEARANCE FROM MULAGO NATIONAL REFERRAL HOSPITAL

TELEPHONE: +256-414554008/1
FAX: +256-414-5325591
E-mail: admin@mulago.or.ug
Website: www.mulago.or.ug

IN ANY CORRESPONDENCE ON THIS SUBJECT PLEASE QUOTES NO.....

MULAGO NATIONAL REFERRAL HOSPITAL
P. O. Box 7051
KAMPALA, UGANDA

11th December 2025.

Dr. Dembe Moses
Principal Investigator
Department of Orthopedic Surgery
Makerere University

Dear Dr. Dembe,

RE: ADMINISTRATIVE CLEARANCE TO CONDUCT A STUDY AT MULAGO NATIONAL REFERRAL HOSPITAL.

The Mulago Hospital Management is pleased to inform you that you have been offered clearance to conduct the study titled **MHREC 3070: "Prevalence of Neglected Long Bone fractures and associated factors among patients with musculoskeletal trauma at Mulago National Referral Hospital".**

The above clearance is granted to you on the following conditions;

- That you will follow the research ethical processes
- Agreed to comply with all institutional policies and regulations of Mulago National Referral Hospital
- Agreed to provide end of study report and acknowledge Mulago hospital in all publications
- Submit a copy of filled in participant compensation log after recruiting one quarter of the approved research sample size.

Administrative clearance is valid for one (1) year effective from 10th December 2025 to 9th December 2026.

By copy of this letter, we reiterate our commitment to support this study.

DR. BYANYIMA ROSEMARY
EXECUTIVE DIRECTOR
MULAGO NATIONAL REFERRAL HOSPITAL

Copied to;
1. **Incharge – Orthopedic department**

Vision: "To be the leading centre of Health Care Services"