Predictors of loss to follow up among patients with open tibia shaft fracture treated at Muhimbili Orthopedic Institute: Aretrospective cohort study

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PREDICTORS OF LOSS TO FOLLOW UP AMONG PATIENTS WITH OPEN TIBIA SHAFT FRACTURE TREATED AT MUHIMBILI ORTHOPEDIC INSTITUTE: A RETROSPECTIVE COHORT STUDY

By

Baraka M. Mponda

A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree of Master of Medicine (Orthopaedics and Traumatology) of

Muhimbili University of Health and Allied Sciences
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CERTIFICATION

The undersigned certifies that he has read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **''Predictors of loss to follow up among patients with open tibia shaft fracture treated at Muhimbili Orthopedic Institute: a retrospective cohort study''**, in (partial) fulfillment of the requirements for the Degree of Master of Medicine (Orthopaedics and Traumatology) of Muhimbili University of Health and Allied Sciences.

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Date

DECLARATION AND COPYRIGHT

I, **Dr Baraka M. Mponda**, declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award**.**

Signature:…… **Date:**……..

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Above all, I thank the Almighty God for protection throughout my study.

DEDICATION

I dedicate this dissertation to my late beloved mother, my wife Magdalena Joshua; through their support and encouragement, I managed to do and complete this study.

ABSTRACT

Background: Loss to follow up (LFTU) of postoperative patients in orthopedic clinics is a common problem and brings challenges to management of patient and planning for career developments of attending Surgeons and Hospital. Geographic, socioeconomic and clinical factors may impede follow-up after lower extremity trauma. We sought to identify barriers that may predict loss to follow-up in orthopedics for patients with open tibia shaft fracture after treatment.

Objective: To evaluate the incidence and reasons for patient's loss to follow up after six months post operative treatment of open tibia shaft fractures at MOI Dar Es Salaam between January 2016 and June 2017.

Methods: A retrospective cohort hospital based study was carried out on patients who were treated for open tibia shaft fracture between January 2016 and June 2017. The study was conducted between August 2018 and February 2019 to ascertain predictors of LFTU six months and later clinics. Data were obtained from hospital records and through structured questionnaires administered by phone call to study participants. Extra questions were asked to lost patients to ascertain reasons for attrition.

Results: In this study there were 253 participants, 188(74.3%) completed clinic follow up with 65 (25.7%) LFTU. Among the participants 219 (86.6%) were males and 34 (13.4%) were females with mean age of 32.4 years (SD 10.7). Logistic regression showed that having none to primary level of education ($p < 0.001$), living more than 100km from hospital ($p = 0.005$) and depending on relatives for hospital bills payment ($p = 0.016$) were significantly associated with LTFU. Among 65 loss to follow up 43.1% stated attrition was due to shifting to another region after injury or living far from the hospital, 33.8% lack of money for transport, 16.9% felt good and healed and said there was no reason to continue attending the clinic, 27.7% forgot and travelled during the follow up and didn't reschedule the appointment, 10.7% were unsatisfied with treatment offered to them and attended other hospitals.

Conclusions: LFTU among patients with open tibia shaft fractures treated at MOI is a problem among young uneducated patient with predisposing factors being socio-demographic and economical.

Recommendation: Addressing LTFU and maximizing clinic attendance of patients. This can be through; establishing a follow up program in the hospital, calling patients days before and educating patients on the importance of follow up.

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LIST OF ABBREVIATIONS

AOR	Adjusted Odds Ratio
ART	Anti-retroviral therapy
COR	Crude Odds Ratio
GA	Gustillo-Anderson
HIV	Human Immunodeficiency Virus
IMN	Intramedullary Nail
LTFU	Loss to follow up
MOI	Muhimbili Orthopedics Institute
MTC	Motor Traffic Crash
MUHAS	Muhimbili University of Health and Allied Sciences
POP	Plaster Of Paris
P value	Pearson Chi-Square value
RCT	Randomized Controlled Trials
SD	Standard Deviation
SPSS	Statistical Package for Social Science
TB	Tuberculosis

DEFINITIONS OF KEY TERMS

Adult: A skeletally mature individual. The minimum age of an adult for this study is 18 years.

Gustilo-Anderson classification: a system of long bones open fracture classification and grading according to wound size, energy involved, soft tissue injury, bone injury, cleanliness of the wound and neurovascular involvement.

Loss to follow up: in this study it will be considered as patient not attending scheduled outpatient clinicafter sixth months and later clinics since injury for complete healing and functional outcome evaluation.

Open Fracture: a fracture associated with a wound which communicates directly with a fracture site or in which the wound communicates indirectly with the fracture site through a hematoma.

Union of a fracture: radiological presence of bridging callus in at least three cortices on both antero-posterior and lateral views of x ray picture. This is by using Radiographic union score for tibia (RUST)

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Patient's loss to follow up and effects

Clinic follow-up is essential for the postoperative patients for the delivery of comprehensive care in surgical disciplines. In Orthopedic and Trauma, the visits enable the treating surgeons to identify complications early in order to adjust postoperative treatment and rehabilitation as needed to optimize successful treatment for the patient. Due to nature of injuries and nature of operations it is critical for orthopedic trauma patient to adhere to post-operative clinic appointments. For long bones fractures it is postulated that at least 6 months follow up and observation is enough to assess for complete healing of the fracture[1] and one year follow up for functional outcome evaluation after the injury

Noncompliance with scheduled clinic follow-up remains a common problem in orthopedic and trauma settings and is inevitable despite the importance of being continued necessary care after being discharged. Patients lost to follow up after surgery have higher risk of developing postoperative worse outcomes and complications than those who continue to attend scheduled clinics[2].

Tibia shaft fractures have been reported to be the commonest among lower limb injuries[3] and in most cases they are open fractures[4,5]. Being open and with devoid of soft tissue coverage complicating the process of healing postoperatively[6], it is crucial to have a close follow up due to the importance of the lower limb in daily functioning as most of them occur in young and productive age groups[4,5,7,8]. Loss to follow up in patients with open tibia fractures after surgery is more likely to result into more complication due to the fact that tibia fracture healing is associated with unfavorable outcomes. These fractures have high chances of post operative infections[9,10] that may be severe enough necessitating amputation[11] if unattended well. Late diagnosis of postoperative infection which was initially superficial and can be managed with antibiotics[1] results into deep infection increasing risks of reoperation to the

patient to help clear the infection[12]. They also have high chances of non union [13] which if diagnosed late due to loss to follow up in orthopedic clinic may require extensive reoperation surgeries which are expensive[14] to the patients and the health system too. Patients with open tibia fractures treated with an external fixator are very likely to develop malunion[15] which needs earl diagnosis and correction centrally to patients lost to follow up from orthopedic clinics this complication cannot be assessed or even dealt with.

If most of patients attend post operative clinics most of these complications requiring revision surgical procedures that delay return to activity or work for the patient, increase healthcare expenditures, and draw medical resources (e.g. personnel, equipment, and theatre time) from an already strained system[13,16]will be taken care early in the stages of care. Patient's loss to follow up is not random as age, gender and other socio-demographic factors may predict their drop out from clinics. Understanding of both the risk factors for and the reasons behind this noncompliance may facilitate the development of methods aimed to address this problem[17].

In this study conducted LTFU was considered as missing clinic appointments after 6 months since injury as is for assessment of complete healing of the fracture[1]

1.2 Literature Review

Several studies have been done globally to investigate the rate of LTFU, relationship between patient's demography; clinical settings and non compliance with the clinic/study follow up in different areas and location. It has been suggested a loss to follow-up to 20% is usually of little concern especially in clinical outcomes and trials investigating drugs and other therapies[18,19]. Within the surgical and orthopedic literature, LTFU rates vary with limited data coming from Africa.

A retrospective review by Yoon RS et al on patients with tibia shaft fracture treated with IMN and plate between 3 Level 1 Trauma Centre in USA found a loss to follow up by 10%[20]. A prospective randomized study by Chan DS et al between on functional and clinical outcome of suprapatela and infrapatela IMN insertion on patient with tibia shaft fracture at Level 1 Trauma Centre in USA reported a LTFU of 39% among 41 patients[21]. A LTFU of 10% among 50 patients with tibia shaft fracture treated with IMN at Aalborg University Hospital, Denmark was reported in a prospective cohort study by Larsen P et al on quality of life and muscle strength after fracture fixation[22]. A multicentre RCT on open tibia fracture treated with IMN plus soft tissue coverage or absorbable collagen sponge implant containing Recombinant Human Bone Morphogenic Protein-2 by Aro H et al, a LTFU of 16.2% was reported among 277 patients[23]. In a randomized trial done in Canada Tanner SL et al on predicting and preventing loss to follow in adult trauma patients found that 6.7% were lost to follow-up[24].A research study done at the University of Virginia by Casp AJ et al found that 8.5% of 480 patients did not receive or complete the surgeon-recommended postoperative follow-up plan and were deemed lost to follow-up[25]. In Africa few studies have been published on LTFU in trauma, one study reported patients loss to follow up in trauma of 14% in Uganda[26]and another published LTFU rates of 17.2% and 7.4% have been reported for patient with femoral and open tibia fractures respectively treated in Dar Es Salaam, Tanzania[27,28].

Females were reported to be more lost to follow up in a research study done by Josh AB et alon patient LTU after knee replacement found that more women (31%) were lost to follow-up than men (14%) of the lost patients[29]. Similarly a research done by Tejwan NC et al in USA on LTFU among 54 lost to follow up and 61.1% were females after distal radius fracture treatment[30].This is contrary to a research done on loss to follow up by Tanner SL et al in Canada where male gender was found to be one of the risk factors for LTFU, 78.5% among 163 patients lost to follow up[24]. Bo Langhoff Hønge et al in a retrospective cohort done in Guinea Bissau on diagnostic and follow-up period among HIV-infected patients more loss to follow up were males[31]. These finding are supported with findings from NAMWEZA prospective intervention cohort study done by Siril et al in Dar Es Salaam, Tanzania and male gender was an independent risk factors for LTFU from the study[32]. However sex difference was not observed in patients who were lost to follow up in a research done by Casp AJ et al[25]in a research done at the University of Virginia.

Low level of education was a risk factor for loss to follow up and drop out reported by Tejwani NC et al among 337 patients treated for distal radius fracture study done in orthopedics in USA[30]. This is supported by a retrospective review research done in Canada by Murnaghan ML et al which reported that loss to follow up in trauma patient was more on unskilled workers than skilled workers[33]. In a retrospective cohort done in Guinea Bissau by Langhoff Hønge et al on diagnostic and follow-up period among HIV-infected patients more loss to follow up were reported among participants with low level of education[31].

Young age was a predictor of missing to the follow up clinic as reported by Tanner SL et al in an RCT (Flow Trial) done in Canada, US and some European countries[24]. Similarly, Becker JES et al in a randomized placebo controlled trial done in 104 patients with various orthopedic diagnoses in Harvard Medical School USA reported that being young was a risk factor for not completing clinic follow up[34]. A cohort study by Menendez ME et al in Massachusetts hand clinic, USA, young age was found to be an independent factor for non clinic attendance[35].However another study done by Casp AJ et al at the University of Virginia, no age difference of patients was reported among patients lost to follow up[25].A retrospective

cohort research on HIV conducted in Guinea Bissau Langhoff Hønge et al reports that age below 30 years at inclusion was a risk factor for LTFU at all stages of HIV program[31]. This was also reported by findings from NAMWEZA prospective intervention cohort study done in Dar Es Salaam, Tanzania by Siril et al where it was noted that; being younger than 40 years was independent risk factors for LTFU from the study[32].

A large number of patients who were lost to follow up from trauma, surgical clinics and research reported not seeking further follow-up care because of symptom improvement, feeling well.A study done at the university of Virginia by Aaron J Casp et al found that 46.3% of patients lost to follow up reported not seeking further follow-up care because of feeling well and not having a need to be seen[25]. Also supported by a study done in Brazil on 143 patients lost to follow-up after midurethral sling surgery, Myong Kim et al reported 62.7% of the lost to follow patients did not attend the scheduled visit because of symptom improvement[36].

Distance from patient's residence to the facility was the reason for failure to attend the appointments and complete clinic follow up in trauma and medical patients. A study done at the University of Virginia by Casp AJ et al found that 12% among 480 patients lost to follow up reported distance from their home to the facility was the reason for failure to attend the appointments[25].Similarly Whiting et al in a retrospective chart review on factors influencing LTFU among orthopedic patients undergone operative management between in Urban Level I Trauma Center, living more than 100 kilometers from the clinic site was significantly associated with loss to follow up of patients[37]. A prospective study by Hoffmann MF et al between on patients with tibia plateau fractures who underwent internal fixation at a Level 1 Trauma Centre in USA, it was found that 16.7% of 120 patients lost to follow up because of distance from hospital to their residence[38]. Mccormick NM et al in a prospective cohort study on HIV infected pediatric patients enrolled in care and treatment in Dar Es Salaam, Tanzania reported that receiving treatment from hospital which is far from home instead of health center was one of the reasons for patient's loss to follow up[39].

Financial constraints to cover the costs of transport to the clinics are another risk factor for post surgical patients not to attend and complete follow up clinics. Myong Kim et al in a retrospective analysis among patient undergone midurethral sling surgery in Brazil reported financial problems was among the reasons for not attending the scheduled visits in 16.1% of the 143 patients lost to follow up[36]. Also a research done by Tupasi TE et al reported lack of transport money to the health facility wasone of the factors associated with loss to follow up during treatment of multi-drug resistance TB patients in Philippines. It was reported by 20% of the 89 patients lost to follow up[40].Geng EH et al on Reasons for Undocumented Transfer or Stopping Care Among HIV-Infected Patients on Antiretroviral Therapy in Eastern Africa reported that among patients lost to follow up, structural barriers (eg, transportation) was most (65%) prevalent factor[41].

Being uninsured to cover for hospital costs during trauma treatment and long term clinic attendance has been associated with LTFU in trauma reported by Casp et al among 51.2% of the patients[25]. Similarly, Zelle et al reported that being uninsured is a predictor for patient's attrition in orthopedic and trauma clinics[42]. Myong Kim et al in a retrospective analysis among patient undergone midurethral sling surgery in Brazil reported financial problems was among the reasons for not attending the scheduled visits in 16.1% of the 143 patients lost to follow up[36].

Some of patients in post operative clinic follow up don't attend because of being unaware or forgetting clinic appointments. In a retrospectively chart review of post operative patients it was reported that 9.7% of lost to follow up patients forgot scheduled return visit[25]

Relocation and transfer to other areas from initial residence is reported to result into loss to follow up of patients from orthopedics and trauma clinics. A research on spine surgery patients by Daffner et al in USA, when asked the reason for not seeing their prior surgeon, 15%stated that they had moved to other locations[43]. Similarly 4.2% of patients lost to follow up in a prospective study by Hoffmann MF et al on patients with tibia plateau fractures who underwent internal fixation at a Level 1 Trauma Centre in USA were relocated from their

initial residences[38]. In a descriptive analysis research done in Lilongwe, Malawi for patients lost to follow up in Antiretroviral Therapy by Weigel et al, one of the reasons reported for loss to follow up was transfer to other locations and clinics in 90% of patients found alive[44].

Being unsatisfied with the treatment offered results into patients to seek opinions from other areas and Doctors. In a prospective follow up by Hoffmann MF et al on patients with tibia plateau fractures who underwent internal fixation at a Level 1 Trauma Centre in USA, 3.3% of 120 patients lost to follow up did not completed the scheduled evaluation period because of being unsatisfied with treatment given at the hospital[38]. Similarly, a population survey research done in USA on spine surgery patient lost to follow up in, Daffner et al found that among 69 patients undergone spine surgeries previously, 19% were unhappy with their previous care and 32% were seeking a second opinion[43]. Dalen et al in a research done between in Netherlands reported that patients primarily sought a second opinion out of a need for more information about their diagnosis and/or treatment possibilities, or because they were dissatisfied with the result of previous treatment in 30% of 625 patients[45].

1.4 Problem Statement

Postoperative clinic follow up in orthopedics and surgical field is very crucial for the delivery of comprehensive care to the patients however there is still loss to follow up of patients in clinics. In open tibia fractures, the complexity of postoperative care and susceptibility to complication[15] makes it vital for the patient to complete their evaluation without missing. The actual cause of patient's loss to follow up in MOI clinics was unknown. There are researches reported globally on risk factors for patient's loss to follow up in orthopedic clinics and follow up studies but there is scarcity of documented researches in Tanzania. This research aimed at determining the magnitude and risk factors for LTFU in patients with open tibia fracture treated at MOI between January 2016 and June 2017 as they are most common in young age groups[5] and have high risk of healing complications[6].

1.5 Rationale and study justification

In preparation for this research study, comprehensive review of the published research studies demonstrated scarcity of research studies on reasons for patients lost to follow up in clinics and research after orthopedic surgery in Tanzania and other Countries.

Understanding risk factors and the reasons for non compliance with clinic follow up will help us to develop future best methods aimed at facilitating the patients to continue attending clinics follow up appointments.

1.6 Research Question

1. What was the incidence of loss to follow up in patients with open tibia fractures treated at MOI, Tanzania?
2. What were the reasons for loss to follow up in patient with open tibia fractures treated at MOI, Tanzania?

1.7 Objectives of the study

1.7.1 Broad Objective

To evaluate the incidence and predictors for loss to follow up and clinical outcome among patients who underwent treatment of open tibia fractures at MOI Dar Es Salaam between January 2016 and June 2017.

1.7.2 Specific Objectives

1. To evaluate the magnitude of loss to follow up among patients with open tibia fracture treated at MOI.
2. To evaluate social factors resulted into loss to follow up after treatment of open tibia fracture at MOI Dar Es Salaam.
3. To evaluate economic factors resulted into loss to follow after treatment of open tibia fracture at MOI Dar Es Salaam.
4. To evaluate clinical reasons that influenced loss to follow up after treatment of open tibia fracture at MOI Dar Es Salaam.

CHAPTER TWO

2.0 MATERIAL AND METHODS

2.1 Study Design

The study was a Retrospective Cohort Hospital based Study.

2.2 Study Area

The study was conducted at MOI located in Dar Es Salam, Tanzanian`s biggest and populous city from July 2018 to February 2019. MOI is the only tertiary institute providing specialized Orthopedic, Trauma and Neurosurgical Care in the country receiving patients from all over the country and from neighboring countries. Being a Tertiary National Referral Hospital specialized in trauma with well trained qualification MOI has a bed capacity of 272 in public and private wards. Averages of 410 patients are attended in all outpatients' clinics every day at the hospital premises. The hospital theatre has 9 operating tables with more than 30 planned and emergency operations performed daily. There are 34 Orthopedic Surgeons, 7 Neurosurgeons, 5 Anesthesiologists, 4 Radiologists, 36 Residents to attend emergency and follow up patients on daily basis. There are a total of 261 operating room and ward Nurses. MOI receives around 30 new patients' everyday sustaining different injuries around the city primarily or as referred patient from other hospital around the country to be treated at the hospital. Patients attended at MOI are of all kind of economic status, public workers and private worker, unemployed, insured and uninsured from all parts of the country. In MOI there is a social welfare department dealing with all patients socially deprived from paying hospital bills and taking care of those who come unknown and have no relatives. If the patient cannot afford to pay for hospital bills he/she may be exempted temporarily to pay later or completely exempted from services bills.

2.3 Study Period

This study was from was from July 2018 to February 2019.

2.4 Study Population

All eligible patients who underwent treatment for open tibia shaft factures at MOI from January 2016 with one year follow up in January 2017 to May 2017 with a one year follow up in May 2018.

2.5 Inclusion Criteria

1. All patients 18 years and above and had open tibia shaft fracture.
2. Patient who agreed with the study and given a verbal consent to participate.
3. Patients with GA grade 1-3A who were treated within 24hrs after injury

2.6 Exclusion Criteria

1. Patient who underwent treatment of open tibia shaft fracture but had multiple injuries.
2. Patients with inaccessible contacts from hospital data base.
3. Patients who denied consent

2.7 Sample Size Estimation

Convenient sampling technique was used. All patients who were treated for open tibia shaft fracture were included. The estimated sample size was estimated using previous published research from Tanzania in trauma patients where by 17.2% of patients were lost to follow up from femoral shaft fracture treated in Dar Es Salaam followed for 1 year[27]

Sample size calculation was done using formula;

$$N = \frac{\mathrm{z}^2\ \mathrm{P}(100 - \mathrm{P})}{d^2}$$

Where;

N	sample size	?
Z	level of confidence at 95%	1.96
P	proportion in %	17.2
D	degree of accuracy	5%

$$N = \frac{1.96^2 \text{ x } 17.2(100 - 17.2)}{5^2} = 219$$

$$N = 219$$

Taking into consideration a 10% loss to follow up the total sample size was 241 study participants.

2.8 Sampling Technique

Convenient sampling technique was used. All patients who meet the eligibility criteria were included.

2.9 Recruitment of participants

Patient's information for those with open tibia shaft fractures were retrieved from MOI hospital database including admission books, hospital database and emergency theatre booking list during the specified period of time. The retrieved information included demographic data, phone numbers of the patients and relatives, date of surgery and implant used to fix the fracture.

Clinic appointment of the patient was estimated using MOI routine for post operative patient's clinic attendance from surgery date which is; Two weeks from discharge date, Six weeks, Three months, Six months and One year from operation date.

All patients with open tibia shaft fractures were cross checked from MOI outpatient database if they attended any of the clinics during the specified periods from injury. Patients who completed six months and one year follow up were considered as completed and those who did not complete follow up clinic from six months up to one year were considered as lost from follow up clinic. All participants with persistent healing problems (discharging sinuses, pain and unhealed fracture) were scheduled for evaluation at the outpatient's clinics and were attended accordingly.

2.10 Data Collection Tools

Data were collected by using structured questionnaires through phone call communication interview.

2.11 Data collection process

The included patients were called at least three times a day and three days a week to try to access them. When patient's contact was unavailable relative's contacts was used to check for the whereabouts of the patient and get the access of respective patients.

Verbal consent was sought from the patient and all those agreed to participate in the research questionnaires and administered to them through phone call. The participants were asked about their educational level, physical address during treatment and occupation. The distance from hospital to patient's residence during clinic follow up was estimated using Google Map. Those who were lost to follow up were asked more questions relating reasons for not completing clinic follow up.

2.12 Study variables

The independent variables were age, sex, educational level and reasons for LTFU. Loss to follow up was the dependent variable.

2.13 Data analysis

Descriptive data obtained were entered and analyzed by using the SPSS Version 25 software. Continuous variables have been presented as means with standard deviation. Categorical variables have been summarized using frequency and proportions. The results of the study have been presented in forms of tables and diagrams.

2.14 Ethical Considerations and Clearance

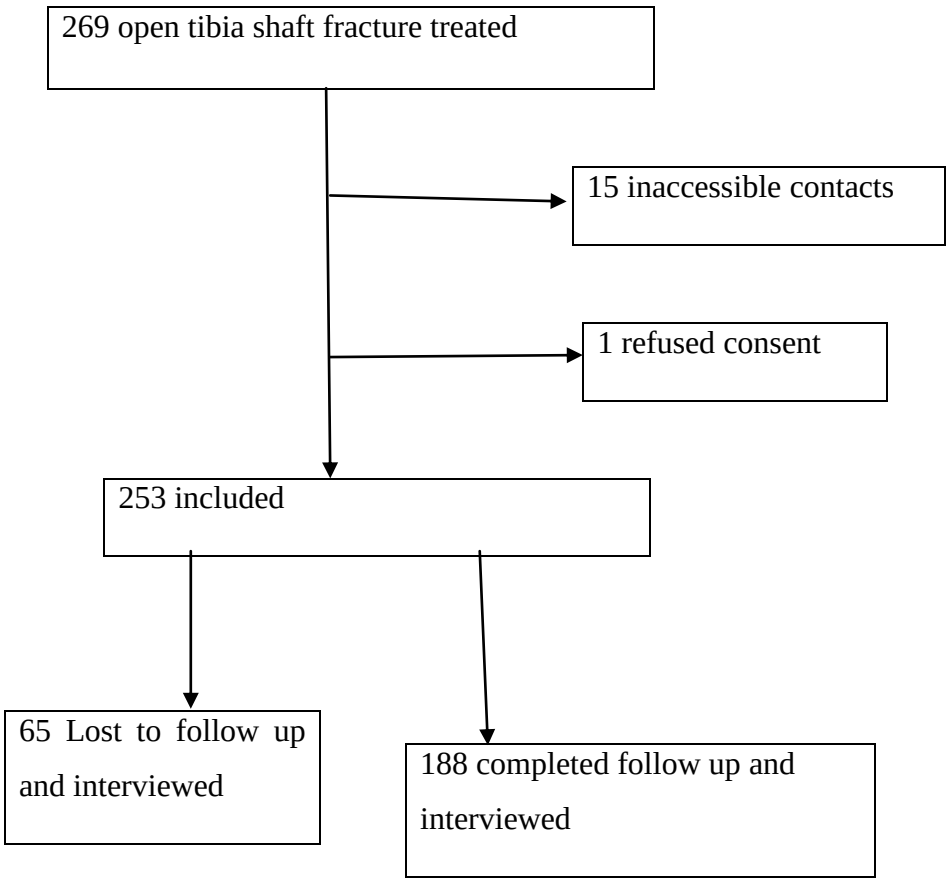
Ethical clearance for this study was sought from the MUHAS Research and Publications Committee the permission to conduct the study granted by MOI administration.

Participants were informed about their autonomy to participate and confidentiality of their information was guaranteed. Verbal consent was obtained from the respondents. Explanation was given to the respondents that the information obtained was for research purpose only. And to ensure that their names were not written in the questionnaire. Freedom to participate or refuse was granted and was told it will not affect their future services at MOI. All participants with persistent healing problems (discharging sinuses, pain, and unhealed fracture) were scheduled for evaluation at the outpatient's clinics and were attended accordingly.

CHAPTER THREE

3.0 RESULTS

During the whole period a total of 269 patients with open tibia shaft fractures were operated at MOI within 24 hours of injury. 16 patients were excluded due to inaccessibility of their contacts and consent denial.



Among253 study participants 219(86.6%) were males and 34(13.4%) were females with mean age of 32.4 years (SD 10.7). 188(74.3%) participants completed clinic follow up and 65(25.7%) participants were lost to follow up.

Table 1: Socio-economic characteristics, fixation and follow up status of study participants

Variable	Frequency (%) N = 253	Percentage (%)
Sex		
Male	219	86.6
Female	34	13.4
Age group (years)		
< 20	11	4.3
20-29	113	44.7
30-39	73	28.9
>40	56	22.1
Occupation		
Employed	220	87.0
Unemployed	33	13.0
Level of education		
Primary education	184	72.7
Secondary and above	69	27.3
Distance of stay from hospital		
Within 100km	168	66.4
>100	85	33.6
Hospital bills payment		
Able to pay	134	53.0
Unable to pay	119	47.0
Follow up status		
Completed follow up	188	74.3
LTFU	65	25.7
Fixation method		
IMN	116	45.8
External Fixation	137	54.2

More males were treated for open tibia shaft fractures (86.6%), age group 20- 29 years was the predominant with 44.7% of all participants. 72.7% of the participants had none to primary level of education and 87.0% had an employment for daily earnings. Among the study participants 53.0% were able to pay hospital bills either using insurance or pocket money and the remaining depended on relatives to pay for them. 66.4% were living within 100km from hospital during clinic follow up.

Table 2: Socio-economic characteristics and fixation status of study participants lost to follow up.

Variable	Frequency (%) N = 65	Percentage (%)
Sex		
Male	58	86.2
Female	7	13.8
Age group (years)		
< 20	1	1.5
20-29	34	53.2
30-39	13	20.0
>40	17	26.2
Occupation		
Employed	58	86.2
Unemployed	7	13.8
Level of education		
Primary education	58	86.2
Secondary and above	7	13.8
Distance of stay from hospital		
Within 100km	34	52.3
>100	31	47.7
Hospital bills payment		
Able to pay	26	40.0
Unable to pay	39	60.0
Fixation method		
IMN	116	45.8
External Fixation	137	54.2

Participants with less than 30 years were lost more than other age groups, unemployment, having completed primary education and patient who were unable to pay for hospital bills were risk factors for LTFU.

Table 3: Binary Logistic regression analysis of study participant's characteristics with follow up status

Variable	Total N = 253	Follow up status Completed(%)	LTFU(%)	COR	95CI	P value
Age						
<20	11	10(90.9)	1(9.9)	1.00	0.5-2.0	0.12
20-29	173	79(45.7)	34(54.7)			
30-39	73	60(82.2)	13(17.8)			
40 and above	56	39(69.6)	17(30.4)			
Sex						
Male	219	161(85.6)	58(14.4)	1.4	0.6-3.4	0.46
Female	34	27(79.4)	7(20.6)			
Education level						
Primary education	184	126(67.0)	58(33)	4.1	1.8-9.5	<0.0001
Secondary and above	69	62(89.9)	7(10.1)			
Occupation						
Employed	220	163(86.7)	57(13.3)	1.1	0.47-2.56	0.84
Unemployed	33	25(75.8)	8(24.2)			
Distance from hospital						
Within 100km	168	134(79.8)	34(20.2)	2.3	1.26-4.04	0.005
>100km	85	54(63.5)	31(36.6)			
Payment of hospital bills						
Able to pay	134	108(80.6)	26(19.4)	2.0	1.14-3.60	0.016
Unable to pay	119	80(67.2)	39(32.8)			
Fixation method						
IMN	116	87(46.3)	29(53.7)	0.9	0.5-1.6	0.817
External fixation	137	101(73.7)	36(26.3)			

The logistic regression analysis above shows that having primary education and lower, living more than 100km from hospital and inability to pay hospital bills significantly affected the clinic follow up among the study participants. ($p < 0.0001, 0.005$ and 0.016 respectively)

Table 4: Multivariate logistic regression analysis of study participant's characteristics with follow up status

Variable	LTFU	COR	95CI n=65	P value	AOR	95CI	P value
Education							
Primary	58	4.1	1.8-9.5	0.001	4.8	2.0-11-4	<0.0001
Secondary	7						
Distance from hospital							
Within 100km	34						
>100km	31	2.3	1.26-4.04	0.005	2.21	1.2-4.1	0.013
Hospital bills payment							
Able to pay	26						
Unable to pay	39	2.0	1.1-3.6	0.016	2.1	1.1-3.9	0.025

The multivariate regression analysis shows that having primary education, living more than 100m from hospital and depending on relatives for hospital bills payment were significantly associated with LTFU.

Table 5: Reasons for loss to follow up from patient's perspective

Reasons	Frequencies (%)(N=65)
Socio-economic	
Distance far from home to the hospital	28 (43.1)
Shifted to another region	28 (43.1)
Lack of money for transport fare	22 (33.8)
Travelled during follow up dates	11 (16.9)
Forgot follow up appointment	7 (10.8)
Lack of money for hospital bills	4 (6.2)
Sick, unable to attend	2 (3.1)
Died during follow up	2 (3.1)
Clinical reasons	
Felt good, healed, no need for follow up	7 (10.8)
Unsatisfied with treatment offered	5 (7.7)
Decided to attend another hospital	2 (3.1)

Among the stated socio-economic reasons for not completing clinic follow up was shifting to other area and longer distance from hospital stated by 43.1% of patients each followed by lack of transport fare to the hospital(34.9%), travelling to other areas during appointments (17.5%), feeling healed and no reason to attend clinic (17.5%), forgetting appointments (11.1%). Feeling healed and no need of follow up, being unsatisfied with treatment offered were the clinical reasons found in patients lost to follow up by 10.8%, 7.7% and 3.1% respectively.

CHAPTER FOUR

4.0 DISCUSSION

Loss to follow up bring challenges to orthopedic and trauma surgeons and patients management as well. The magnitude and reasons for LTFU varies in different countries and regions of the World.At MOI the loss to follow up is not uncommon and accounted for 25.7% among patients with open tibia shaft fracture treated between from 2017 to June 2016. These findings are more than results findings from other countries in trauma patients[24,25]. For tibia fracture treatment the results differs from reports of other researches done.[20,22,23] The differences may be due to follow up schedules and other ways employed for retention of patients during follow up period required[17]. These techniques are like calling patients days before appointment, sending messages through phones or emails which are rarely done in our settings. These findings are less or more similar to a prospective research done in USA which reported loss to follow of 39%[21]. The findings are also more than other researches done in Africa on trauma patients which were reported as low as 7.4%[26–28]. The difference may be explained by the difference in time used for follow up and management used for the patients. If the follow up time is shorter more patients will be accessed than longer time. Also most of the lost patients in the study were treated with external fixation thus after removal of the external fixator and POP they felt free and no need to attend any more clinic than those with internal fixation who felt there a need for removal of the implant although the difference was not significant.(p 0.817).

Patients who had lower than secondary education were found to be lost more than those with secondary and higher levels of education by 89.2% (p <0.0001). These findings were similar to findings in patients with distal radius fracture treated in USA in which low level of education was a risk factor for drop out from clinic[30]. Also correlates with other results of a retrospective review research done in Canada which reported that loss to follow up in trauma patient was more on unskilled workers than skilled workers[33]. Findings of a retrospective cohort on diagnostic and follow-up period among HIV-infected more loss to follow up were

reported among participants with low level of education[31] support results of this study. This may be attributed to the fact that patient with low level don't understand the disease itself, its impacts and the importance of attending clinic follow ups. Patients with 30 years and below were lost from follow up clinic more by 53.8%.Although these findings were not clinically significant (p 0.12), they are supported by an RCT (Flow Trial)[24] which reported that age of less than 30 years was a predictor of missing to the follow up clinic. Similarly being young[34,35]was found to be an independent risk factor for not completing clinic follow up. The results are also similar to other retrospective and prospective studies which reported that being younger than 30 and 40 years respectively was a strong predictor of loss to follow up from study clinics[31,32]. These are the young and mostly involved in different economic activities and most of times they forget or shift to other areas and making the follow up to the clinics difficult.

Patients living more 100km from hospital were found to be at the risk of being lost from clinic than those who were living within 100km during treatment and clinic follow up (p 0.005). 43.1% of study participants reported not completing clinic follow up because of living far from the hospital which requires longer travel hours. This study is similar to a retrospective chart review among orthopedic patients undergone operative management in Urban Level I Trauma Center, where it is reported that living more than 100 kilometers from the clinic site was significantly associated with loss to follow up of patients[37].Also similar to these results in trauma it has been reported in other researches[25,38]. A prospective observational research done in South Africa in patients with ankle fractures treated at Kimberly Hospital reported similar findings in relationship to LTFU and travel distance to the clinic.[46]In a prospective cohort study on HIV infected pediatric patients enrolled in care and treatment in Dar Es Salaam, Tanzania reported that receiving treatment from hospital which is far from home instead of health center was one of the reasons for patient's loss to follow up from clinics[39].From this study 43.1% of patients reported that they failed to attend follow up clinic because of shifting to other regions after the injury. Similar to these findings, a research in German found that transfer to other areas from initial residence result into loss to follow up of patients from orthopedics and trauma clinics[38]. The results are supported also by another

research in medical which found that, transfer and relocation was a reason for patients loss to follow up and discontinuation to attend Antiretroviral Therapy clinics who were traced and found alive in other areas[44]. As these patients get injured they don't work anymore hence they have no support from their employers because most of them are privately employed. They have to shift back to their parent's home for social support. Also it was observed that 27.7% of study participants forgot and travelled during appointment days. These findings are supported by a study done in University of Virginia which reported that 9.7% of LTFU were due to patients being unaware or forgetting appointment dates.[25] This may be due to being unaware of the appointment or other patients being unable to read the appointment dates.

Lack of funds for transportation to the hospital was reported to be among reasons for loss LTFU in this study as reported by 33.8% of patients. These findings are supported by a study done on post surgical lost to follow up patients after mid-urethral sling surgery[36]. Similarly, in medical patients attending TB and HIV clinics and researches, lack of transport money to the clinic was a risk factor for their drop out from the respective follow up clinics and researches [40,41]supports the finding of this study. Most of these patients are motor cycle riders. When they injured around the city they go back to the home places which necessitates travelling a longer distance to the clinic. This adds to the costs of transportation of the patient. 6.2% of study participant did not attend follow up clinic because of missing money to cover for hospital bills. The findings are supported by researches done in other countries which reported being uninsured to cover for hospital costs during trauma treatment and long term clinic attendance has been associated with LTFU in trauma patients[25,42]. Insufficient insurance for hospital treatment was reported also to be the reason for LTFU among patient as reported by a research done in German[38].

A large number of patients who were lost to follow up from trauma, surgical clinics and research reported not seeking further follow-up care because of symptom improvement, feeling well and not having a need to be seen[25,36]. These reports correlate with the study findings in which 10.8% of patients lost to follow up reported being healed and there was no need of more clinic visits. Being unsatisfied with the treatment given during initial treatment

and attended another hospital was reported by 10.8% of patients lost to follow up from this study. This is similar to a research done in patients with tibia plateau fractures, where it was found among the reason for loss to follow up was being unsatisfied with treatment offered[38]

4.1 Study Limitations

Firstly, different geographical locations in our country obscured network availability to the patient during contact. Here patients were traced several times every week until the end of data collection.

Secondly, some of the patient changed their phones and numbers of their relatives were inaccessible which made them being inaccessible.

Thirdly, other patient's mobile phones were not listed during admission and relatives were not aware of whereabouts of the patient.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

1. There is high incidence of lost to follow up at MOI following surgery of open tibia shaft fracture after six months has been observed during the study which may substantially affect patient management and outcome.

2. Having primary education or none, shifting to other regions after injury and staying more than 100km from the hospital were the social factors which affected participant's clinic follow up after surgery.

3. Depending relatives to pay for hospital bills and participants who lacked money to cover transportation to and from the clinic were reasons for missing clinic follow up.

4. Among the clinical reasons for loss to follow up were feeling healed and no need to continue attending the clinic after 6 months, also participants were unsatisfied with treatment and decided to attend other hospitals.

5.2 Recommendations

It is essential to have continuous and comprehensive follow up strategies in patient who are treated at the hospital in order to minimize LTFU and optimize treatment outcome. These strategies may include;

1. Establish a follow-up unit in the hospital. This will involve calling patients/sending messages 2 or 3 days before clinic. Also will help to trace patients who might be lost to follow up and add more attention to patients
2. More education should be given to the patients emphasizing completing the respective follow up schedule regardless of feeling well and healed.
3. Improvement on cost sharing system to help exempt some costs to those patients unable to pay all the hospital bills.

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APPENDICES

Appendix I: Consent Form

CONSENT TO PARTICIPATE IN THE STUDY WITH THE TITLE:

PREDICTORS OF LOSS TO FOLLOW AMONG PATIENTS WITH OPEN TIBIA SHAFT FRACTURE TREATED AT MOI: A RETROSPECTIVE COHORT STUDY.

I am DR. Baraka M Mponda, a resident in Orthopedics and Traumatology at MUHAS doing a research on the above-mentioned title. I will ask you some questions related to the reason why you did not attend clinic follow-up after operative treatment.

This is a voluntary survey, you can refuse to participate or to answer any question you feel uncomfortable and stop the interview at any time. Every effort will be made to protect the confidentiality of the information you will provide and your answers will not affect on your future treatment at this hospital. I hope that your participation and the obtained information from this study will benefit others and other study planning in the future.

For any questions regarding this study, contact me, the investigator, Dr Baraka M Mponda, MUHAS, P.O. Box 65001, Dar es Salaam, Tel No 0767 401238 or my Supervisor Dr Haonga Tel No 0754563761.If you have any questions concerning your rights as a participant, you may contact Chairman of the Senate Research and Publication Committee, Dr Bruno Sunguya, P.O. Box 65001, Dar es Salaam. Telephone: +255222152489.

Do you agree to participate? Yes ……. No……

I, …… have understood the read consent form and my questions have been answered and I agree to participate in this study.

Signature of Investigator……

Date ……

Appendix II: Fomu Ya Idhini

IDHINI YA KUSHIRIKI KWENYE UTAFITI UNAOHUSU:

VIASHIRIA NA SABABU ZA KUTORUDI KLINIKI YA KWA WAGONJWA WALIOVUNJIKA MGUU NA KUTIBIWA MOI.

Mimi ni Dr Baraka M Mponda, ni mwanafunzi wa udaktari wa Uzamili katika upasuaji wa mifupa na tiba za ajali katika Chuo cha Afya na Sayansi Shirikishi Muhimbili, ninafanya utafiti wa kujua sababu za wagonjwa kutohudhuria kliniki za matibabu baada ya kuvunjika mguu na kutibiwa kwa upasuaji MOI. Nitakuuliza maswali yanayohusiana na sababu za wewe kutohudhuria kliniki hiyo. Huu ni utafiti huru na wa kujitolea, unaweza kutoendelea na utafiti huu au kutojibu swali unalohisi hauko huru kulijibu. Taarifa zako zote utakazotoa zitatunzwa kwa usiri mkubwa kadiri ya itakavyowezekana na hazitaathiri matibabu yako ya baadaye katika Taasisi ya Mifupa Muhimbili

Ni matumaini yangu kuwa ushiriki wako na ajibu yako yatasaidia kwenye uendeshaji wa kliniki za kawaida za Hospitali na uandaaji wa tafiti za tiba za baadaye.

Kama una swali lolote kuhusiana na huu utafiti unaweza kuwasiliana na mimi Dr Baraka M Mponda, MUHAS, S.L.P 65001, Dar es Salaam, Simu 0767 401238 au Msimamizi wangu Dr Haonga, MUHAS, Simu 0754563761

Kwa maswali yoyote yahusuyo haki zako mshiriki unaweza kuwasiliana na Mwenyekiti wa Kamati ya Tafiti na Machapisho, Dr. Bruno Sunguya, S.L.P 65001, Dar es Salaam. Simu +255222152489.

Unakubali kushiriki utafiti huu? Ndio …… Hapana ……..

Mimi ……. nimeelewa nilichosomewa katika idhini ya kushiriki na niko tayari kushiriki.

Sahihi ya mtafiti ……

Tarehe ……

Appendix III: Questionnaire

IDENTIFICATION NUMBER _ _ _

1. Age
    a) below 20
    b) 20-29
    c) 30-39
    d) 40 and above

2. Gender
    a) Male
    b) Female

3. Place of domicile after hospital discharge and during clinic follow up
    a) Dar es Salaam+ Pwani (within 100km)
    b) Other Regions. Mention …….(>100km)

4. Educational level
    a) No formal education
    b) Primary education
    c) Secondary education
    d) College and above

5. Occupation
    a) Government employee
    b) Self employed. Specify ……
    c) Unemployed ……..

6. Who was paying for your hospital treatment after injury and during clinic follow up? (circle that apply)
    a) I had an insurance
    b) Myself
    c) My relatives
    d) Others. (Mention) …….
7. Fixation used to stabilize the fracture
    a) Intramedullary Nail
    b) External fixator

FOR THOSE LOST TO FOLLOW UP

8. Did you have transport fare problems that made you not to attend a follow-up at MOI after 6 months?
    a) Yes
    b) No

9. Did you have problems with money to pay for hospital services?
    a) Yes
    b) No

10. Did you felt good and healed that there is no need to be seen again after 6 months?
    a) Yes
    b) No

11. Were you unsatisfied with services provided during initial treatment and clinic attendance?
    a) Yes
    b) No

12. Did you attend another hospital for treatment?
    a) Yes
    b) No

13. Did the distance from your home to the hospital affect your follow up attendance?
    a) Yes
    b) No
14. Did you shifted to another place during clinic follow up affecting your attendance at MOI?
    a) Yes
    b) No
15. Did you fall sick during clinic follow up affecting your attendance at MOI?
    a) Yes
    b) No
16. Did it happen you forgot the appointment date for clinic follow up at MOI?
    a) Yes
    b) No
17. Did you travel during appointment dates affecting clinic follow up at MOI?
    a) Yes
    b) No