

**MAGNITUDE OF USE OF PROSTHESES AMONG PATIENTS WITH  
UNILATERAL LOWER LIMB AMPUTATION DUE TO PERIPHERAL  
VASCULAR DISEASE AT MUHIMBILI COMPLEX**

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**MMed (Orthopaedics and Traumatology) Dissertation  
Muhimbili University of Health and Allied Sciences  
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**Muhimbili University of Health and Allied Sciences**

**Department of Orthopedics and Traumatology**



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**By**

**Daud Damas Zumbula**

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

**Muhimbili University of Health and Allied Sciences  
October, 2018**

## **CERTIFICATION**

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: “**Magnitude of use of prostheses among patients with unilateral lower limb amputation due to peripheral vascular diseases at Muhimbili complex**”, in (partial) fulfillment of the requirements for the Degree of Master of Medicine (Orthopaedic and Traumatology) of Muhimbili University of Health and Allied Sciences.

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Senior Lecture MUHAS

**Supervisor**

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**Date**

**DECLARATION AND COPYRIGHT**

I, **Daud D. Zumbula**, 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.

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Lastly but not least, and perhaps this is where I should have begun, I would love to acknowledge the support, motivation and inspiration of my wife, Catherine and our beloved daughter, Cherish. Without them I would have never made it this far in life. They have been there for me every step of the way, have always loved me unconditionally, and have supported me through all of my tough moments. I say thank you!

**DEDICATION**

To my wife Catherine

And

To my beloved daughter, Cherish You have always stood by me and dealt with all of my absence from many family occasions with a smile.

## **ABSTRACT**

### **Introduction**

Amputation is a surgical operation by which the diseased or the injured limb or part of it is cut off. The disadvantage of amputation over other ablative surgery is that, the effects is immediately visible to a patient and produce a psychological sense of loss even though there is a possibility of restoring functions with prosthesis replacement.

The study aimed at assessing the magnitude of the use of prostheses among individuals with unilateral lower limb amputation secondary to peripheral vascular diseases done at Muhimbili complex.

### **Methodology**

The study was a descriptive prospective hospital based, conducted on 58 patients who underwent unilateral lower limb amputation due to PVD at Muhimbili complex between April 2017 and February 2018. The participants were enrolled by convenience sampling after reaching the inclusion criteria and written consent obtained. The participants were followed up for three months after surgery. A Structured questionnaire were used to collect information, the use of prostheses were assessed using HOUGHTON SCALE. Data were analyzed using statistical package for social sciences, approval for the study was sought from Muhimbili University of Health and Allied Sciences ethical committee. Permission to conduct the study was granted by the Executive Directors of Muhimbili Orthopaedic Institute and Muhimbili national hospital.

### **Result**

A total of 58 participants were recruited in ten months of recruitment, of which they were 31 females (53.45%), 29 participants (50%) resides in Dar es salaam while other half were from other regions within Tanzania. Most study participants fell into age group of 54 years and above, with this age group having the largest proportion (53.45%) among other participants. 52 participants (89.66%) had closed amputation while 6 (10.34%) had open amputation. When inquired about accompanied diseases, 11 participants (18.97%) had no comorbidities, while 47 (81.035 %) had comorbidities such as diabetes, anemia, cardiac and sepsis. The magnitude of

prosthetic fitting was 75% with a 95% CI 61.1%-85.5% in the population. The level of amputation was a significant factor in which above knee amputation use of prosthesis was 75.7% while 91.67% participants with below knee did not use prosthesis. Sex predicts the use of prosthesis, in which 22 users were female (59.4%), no other factor that seems to be a barrier to the use of prosthesis. At the end of the study Majority of prosthesis users were household-limited community (43.2%). The magnitude of re-amputation was 8.2% with a 95% CI 3% - 20.4%, while the mortality rate among study participants was 15.5% with a 95% CI 8.1% to 27.6%.

### **Conclusion**

Majority of amputees were fitted with prosthesis, in which level of amputation was a significant factor to be fitted. Majority of AKA were fitted and used prosthesis, mostly female amputees. Closed amputation was the commonest procedure, predominantly AKA hence the magnitude of re-amputation was low. Mortality among study participants was relatively high, as was realized the age groups of 54 and above were majority of the study participants and most of them had comorbidities, mostly being diabetes. At the end of the study majority of the participants uses prosthesis both in household and limited community areas while very few were household limited user.

### **Recommendation**

Majority of AKA were fitted with prosthesis for free from donors while majority of BKA were not fitted as there was no free below knee prosthesis. For those who were fitted there was successful use of prosthesis, therefore there should be an effort from the both MNH and MOI to create a means which will make a good access of prosthesis to both amputees. Integrated management of amputees secondary to peripheral vascular diseases is needed including physicians, surgeons, physiotherapist, psychologist, occupation therapist and orthotic and prosthetic technologist to achieve optimal recovery, as most of them have comorbidities.



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**ABBREVIATIONS**

LMICs	Low and Moderate Income Countries.
LSS	Limb Salvage Surgery
MOI	Muhimbili Orthopedics Institute
MNH	Muhimbili National Hospital.
MTC	Motor Traffic Crash
MUHAS	Muhimbili University of Health and Allied Sciences
OTA	Orthopedic Trauma Association
PVD	Peripheral Vascular Disease
AKA	Above Knee Amputation (Transfemoral amputation)
BKA	Below Knee Amputation (Transtibial amputation)
MMED	Masters in Medicine
ADL	Activities of Daily Living
TMWT	Two minutes walk test
TTA	Trans Tibia Amputation
TFA	Trans Femoral Amputation

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

Amputation is the surgical operation by which the diseased or the injured limb or part of it is cut off. Others define amputation as the removal of an extremity in whole or part, while disarticulation is the removal through the joint. The disadvantage of amputation over other ablative surgery is that, the effects is immediately visible to a patient and produce a psychological sense of loss even though there is a possibility of restoring functions with prosthesis replacement [16]. Prosthesis is an artificial device that replaces a missing body part, which may be lost through trauma, disease or congenital condition.

Ambroise Pare in 16<sup>th</sup> C (1500 – 1590) introduced ligature of the blood vessels so as to control bleeding and also he was the first creator of femoral artificial limb. Although Ambrose Pare was a pioneer of the first artificial limbs, much interest on amputation surgery and prosthesis developed after World War one. The development of immediate and early post-surgical prosthetic fitting has stimulated much improvement in amputation surgery and patient care [1].

The number of lower limb amputee patients due to peripheral vascular disease is high in Japan, United States, Europe and Brazil, and the elderly population is the most affected [8,9]. Despite advances in Medicine and the emphasis on disease prevention, amputations are still very prevalent in the world, and the projection is that by 2050 the prevalence rate will reach 3.6 million people in the United States alone. Accurate statistics on amputation are scarce and vary significantly worldwide, however most authors agree that amputation increase each year, and this is due to aging population with high incidence of diabetes and other peripheral vascular diseases [16].

The variation is partly contributed by variation in clinical decision making, lack of similar standards of medical care such as vascular surgery, and ethnic variations. It is estimated that, about 200-500 million amputations are performed annually world-wide [19, 20, 21].

The mortality rates 1 month after amputation are high, ranging from 15 to 30% [8, 9]. After 1 year, the mortality rates are above 50% [11] and after 5 years, they may reach up to 74% After the amputation [10]. The rehabilitation program aims to regain autonomy for ambulation, with a prosthesis if possible, and also for daily activities, while taking care of the cognitive, emotional and social aspects [12]. The rehabilitation of these patients is challenge for the multidisciplinary team, because they suffer from other diseases associated with vascular disease, especially *diabetes mellitus*, and cardiovascular disorders, especially coronary heart disease, which can affect the survival of these individuals[10,11,12]. Follow-up studies of this population show that re-amputations are frequent, the abandonment rate of the use of the prosthesis is elevated, and the mortality rate is high[10,11,13,,14,15,16]. The study aim to assess the magnitude of use of prostheses among patients with unilateral lower limb amputation due to peripheral vascular diseases at Muhimbili complex.

## **1.2 Literature Review**

### **Prosthetic fitting**

For an open amputation the wound is left open and secondary wound closure is done when there is no signs of infection. In closed amputation myoplast or tension myodesis is performed. However myodesis and myoplasty are not advised in ischemic extremities [16]. A drain is inserted and removed 48 – 72 hours after operation. The stump should be dressed with soft/rigid dressing and early prosthesis fitting is advised [16]. Postoperative care is geared towards the rehabilitation of amputee to optimal functional level such as independent of self-care, and participation in recreational and vocational activities. Important post-operative management includes pain control which hastens the rehabilitation process. Equally important is the prevention of edema, infection and deep vein thrombosis (DVT). This will lead to early mobilization of the patient. Normally on the 3<sup>rd</sup> to 6<sup>th</sup> day except for the patient with bilateral amputation, they should be able to stand on parallel bar and ambulate on crutches [15, 16]. Immediate post-operative fitting (IPOF) has been advocated but should be avoided until 7 – 10 days post-operative so as to allow tissue to heal [15, 16]. If the stump develops no complications, it should be possible to proceed to definitive prosthesis within 3 – 4 weeks. Incidence of delayed wound healing have been observed with immediate and early prosthesis fitting, and consequently advised delay in weight bearing.

### **Use of prostheses**

A study done by Stewart in the year 1993, in USA 87% of TTA wore prosthesis while 70% of TFA wore prosthesis, Also Davies in the year 2003, Chicago USA found 56% of dysvascular amputees ambulate with prosthesis. Majority of amputees due to PVD were fitted with prostheses (77.4%) while among these, only (35.8%) were still using prosthesis at the end of the study done by Chamlian in Sao Paul, Brazil [29]. also in a study done in Netherlands in the year 2009 and Nigeria 2015 it was revealed that majority of amputees were fitted with prosthesis and successful used prosthesis [31, 32]. in 2001 a study done by Brooks D et al, to determine the construct validity and responsiveness of the two minutes' walk test as a measure of function in individuals with lower extremity amputation, it was concluded that it was



responsive to change with rehabilitation in person with lower extremity amputation. In addition, the two minutes' walk test showed adequate correlation with measures of physical functioning and prosthetic use [49]. In 2003 a study was conducted by Michael D et al, to look for reliability, validity and responsiveness to change of a Houghton scale of prosthetic use in people with lower limb amputations, concluded that, the scale is appropriately responsive to change in prosthetic use after rehabilitation, floor and ceiling effect were not detected and the reliability of the scale was high [50].

The abandonment to the use of prostheses among PVD amputees were high (62.5%) despite high proportional of prosthetic fitting [14, 29]. In the year 1995, a study done by Sapp in California USA, 77% used prosthesis regularly while 16% abandoned prosthesis, in the following year, that was 1996 the same study were conducted in Washington by Valentine found 10% were household ambulators with prosthesis, 22% community ambulators with prosthesis and 10% abandoned the use of prosthesis.

### **Re amputation**

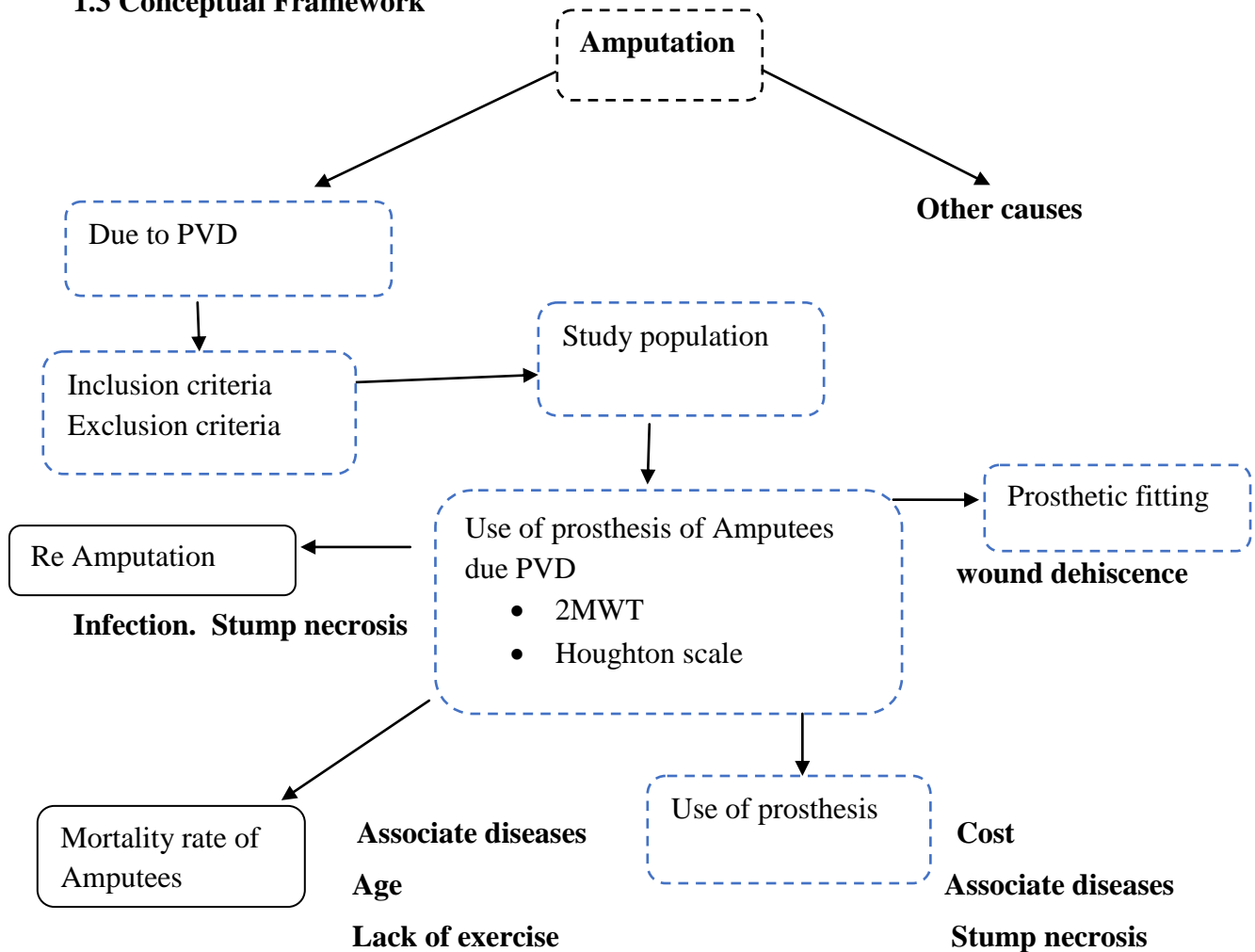
re amputation are frequent among amputees due to PVD, this is said to occur more in distal primary amputation in which foot amputation more likely to convert to trans tibia, also trans tibia more likely to convert to trans femoral [29]. In a study done in North West of Tanzania in the year 2012 it was found re amputation rate to be 29.6% [30]. It is reported that most of the amputation done are transtibial as primary major lower limb amputation [29].

### **Mortality**

The mortality and early death rates of PVD amputees were high, especially among diabetics and those who were not fitted with prosthesis, in a study done in Brazil, among the population whose death occurred, diabetes was present in 67% of the cases [29]. This finding was confirmed in the studies of Stewart et al and McWhinnie et al, in which the presence of diabetes mellitus was shown as a marker of increased morbidity among amputee patients, as well as a risk factor for shorter life expectancy after amputation, with survival rate around 27% at five years in diabetics and 40% among non-diabetics [33, 34].

A study conducted in Denmark showed that the risk of not surviving 30 days after amputation was six times higher in patients with four or five comorbidities, compared to those who had zero or one associated disease [11]. The other study done in Ghana found a mortality rate of 14% and identified among other factors associated with high mortality as being female, age above 59 years, diabetes mellitus and AKA [28]. Other studies found a mortality of 16% within 30 days of surgery [22]. It was revealed, mortality rate of 16.7% during first year post amputation in a study done North West part of Tanzania [30].

### 1.3 Conceptual Framework



**Figure 1: Conceptual Framework**

After amputation, inclusion and exclusion criteria's were followed to obtain a study population. The core value of the study was to look for magnitude of use of prosthesis as a crucial part in rehabilitation of lower limb amputees, then, it was able to asses for prosthesis fitting, use of prosthesis, re-amputation, Mortality and their associated factors. Final Houghton scale and two minute walk test were used as tools for assessing use of prosthesis and mobility.

#### **1.4 Statement of the Problem**

There is scarcity of Published data on rehabilitation and prosthesis use of dysvascular amputees in developing countries including Tanzania. Data from Burkina Faso and Algeria, on patients with diabetic foot ulcer, 45% and 30% respectively were amputated [44, 45]. Similarly in Bugando hospital out of 136 patients with Diabetic foot ulcer 56.7% had undergone amputation [30]. Likewise out of 92 patients seen at MNH with diabetic ulcer 33% underwent amputation [46]. After the amputation, rehabilitation program aims to regain autonomy for ambulation ,with a prosthesis if possible, and also for daily activities while taking care of the cognitive, emotional and social aspects[12].The rehabilitation of these patients is a challenge for multidisciplinary team, because they suffer from other diseases associated with vascular disease, especially diabetes mellitus and cardiovascular disorders, especially coronary artery disease, which can affect the survival of these individuals[10,11].

#### **1.5 Rationale of the Study**

This study will help to address issues concerning rehabilitation of amputees due to PVD as it has been reported that these patients in most of the cases are associated with other diseases related to PVD like coronary artery disease, hypertension and diabetes mellitus [10, 11]. Clinician needs information to help create appropriate rehabilitation goals for their PVD amputees at MNH and MOI.

Successful rehabilitation of amputees requires a dual approach of surgical skill for amputation and prosthetic expertise [15]. Equipping patient with prosthesis not only improve the patients functional status, but also help his/her psyche [17]. The overall aim is to bring the patient to optimal physical, mental emotional and economic efficiency. This study is also important for partial fulfillment of my masters of medicine degree in Orthopedics and Traumatology

## **1.6 Objectives**

### **1.6.1 Broad objective**

To determine the magnitude of the use of prostheses among patients with unilateral lower limb amputation due to Peripheral vascular diseases at Muhimbili complex from May 2017 to April 2018.

### **1.6.2 Specific objectives**

1. To determine the magnitude of prosthetic fitting among amputees due to peripheral vascular diseases at Muhimbili complex from May 2017 to April 2018.
2. To determine the rate of use of prosthesis among amputees due to peripheral vascular diseases at Muhimbili complex from May 2017 to April 2018.
3. To determine the magnitude of re amputation among amputees due to peripheral vascular diseases at Muhimbili complex from May 2017 to April 2018.
4. To determine mortality rate among amputees due to peripheral vascular diseases at Muhimbili complex from May 2017 to April 2018.

## **CHAPTER TWO**

### **2.0 METHODOLOGY**

#### **2.1 Study design**

Descriptive Prospective Study (cross Sectional)

#### **2.2 Study population**

All patients with unilateral lower limb amputation secondary to PVD with and without diabetes mellitus done at MOI and MNH who consent to be involved in the study from April 2017 to February 2018.

#### **2.3 Study Area**

This study was conducted at Muhimbili Orthopedic Institute (MOI) and Muhimbili National Hospital (MNH) that is Muhimbili complex, in Dar es Salaam, Tanzania from May 2017 to April 2018 where patients was enrolled into the study.

Muhimbili Orthopedic Institute (MOI) is the largest orthopedic referral center in Tanzania, which offer both Orthopedic and Neurosurgery services, with a capacity of 150 beds (30 privates and 120 general). It has orthotic and prosthetic workshop which offer services to both patient from MNH and other hospitals from Dar es Salaam and upcountry. The unit has nine workers with the capacity of attending up to 50 cases per month; both below knee and above knee prosthesis are available at affordable price. The institute also has the physiotherapy unit which works hand in hand with other firms to accomplish comprehensive management to patients; it has ten physiotherapists with well-equipped unit attending up to one hundred patients per day.

Muhimbili National Hospital is one of the four main tertiary hospitals in Tanzania. Others are Bugando Medical Centre, Kilimanjaro Christian Medical Centre and Mbeya Referral Hospital. MNH is national referral hospital, Research Center, and university teaching hospital. It is located in Ilala district of Dar es salaam city.

Of the three municipalities of Dar es Salaam, Kinondoni is the largest, covering an area of 531km<sup>2</sup>, with a population of 2,497,940. The district has a total of 185 health facilities. Temeke is the second largest district, while Ilala is the smallest, covering an area of 210km<sup>2</sup>, with a population of 637,572 and has 145 health facilities (URT, 2004, Yengo 2009).

MNH has a 1,500 bed facility, attending 1,000 to 1,200 outpatients per day, admitting 1,000 to 1,200 patients per week. It has 3000 employees of which 300 are doctors and specialists, 900 registered and enrolled nurses and the rest are supporting operations employees.

MNH is organized into eight directories which are Medical services, Clinical Services, Nursing services, and quality, Clinical support services, Human resources, Finance and Planning, Technical services, and Information and Communications Technology. It has 29 departments and 107 units.

Most of amputations due do PVD are done at MNH by general surgeons, hence patients were referred to MOI for physiotherapy and prosthetic services.

#### **2.4 Sample size**

From the pilot study at MNH and MOI from May to December 2016, the number of patients who underwent unilateral lower limb amputation due to various medical reasons was about 87 patients, which is 2.3% of all total surgical procedures done in both institutions. (OR registry). So the prevalence of unilateral lower limb amputation were 2.3%.

The sample size of this study was calculated from the formula

$$N = Z^2P(1 - P)/ E^2$$

Where:

N = Sample size

P = Prevalence

E = Marginal error. Which is 0.05 for 95% CI?

Z = Confidence interval. For 95% CI is 1.96

$N = 1.96^2 \times 0.023 \times (1 - 0.023)/0.05^2$  N = 34.53 was estimated to minimum 35 patients who reached the inclusion criteria and consented to participate were enrolled in the study.

Loss to follow up; 10% of 35 equal to 3.5 = 4 patients

Total number of sample was  $35 + 4 = 39$

Minimum sample size was 39, but since it was convenient sampling, the sample size were as more as they came.

The study recruited a total of 58 participants.

## **2.5 Sampling methods**

Convenience sampling technique was used where by all patients who underwent unilateral lower limb amputation secondary to PVD were enrolled after he/she consent.

## **2.6 Inclusion criteria**

All patients with unilateral lower limb amputation secondary to PVD done at MNH or MOI.

## **2.7 Exclusion criteria**

Patients with preexisting musculoskeletal deformity with the potential of affecting gait.

## **2.8 Data collection**

**Technique:** The structured questionnaire was administered to study participant after an informed written consent obtained. The questionnaire contained socio-demographic information, pattern of amputation, co morbid, complications and prosthetic use tool (Houghton scale and two minutes' walk test). In case of missed information patient files were retrieved.

### **Tools:**

**Two minutes' walk test;** the test was performed 6<sup>th</sup> and 12<sup>th</sup> weeks after amputation, by asking the patient to walk at his/her own speed in two minutes then distance covered was recorded in meters for each individual, Normal speed is 1.2m/sec.



HOUGHTON SCALE comprise of three questions which assess use of prosthesis, these questions are; 1) do you wear your prosthesis 2) do you use your prosthesis to walk 3) when going outside wearing your prosthesis do you? In each question corresponding responses are graded from 0 to 3, the sum total of 9 means excellent prosthetic use while below 5 poor prosthetic use and the rest good to moderate prosthetic use.

Duration of hospital stay were recorded from the day the patient was admitted to the day the patient is discharged, at the end of the study the patient who obtained and use prosthesis were recorded and those who returned to their pre morbid activities were recorded too. Patients who were discharged from general surgical ward was requested to attend clinic visit at MOI during the study period to ease follow up, any complication that occurred were recorded and managed accordingly.

On week 12<sup>th</sup> after amputation patients were discharged from the study after final assessment, and continued to be attended as other patients.

## **2.9 Follow up**

When patients discharged they were given a clear appointment date for their follow up. All patients came for follow-up on Tuesday and Saturday. A calendar system was used to keep track of patients. Patients were reminded of their visit using a phone call or a text.

### **Two weeks post operation follow up**

Two weeks after surgery, muscle contraction exercises and progressive desensitization of residual extremity was initiated. The patients were assessed for surgical site infection and if he/she could require second surgical procedure, such as surgical debridement of the wound. And during this visit, prosthetic fitting was initiated.

### **Six weeks follow up**

Usually prosthetic management is started 6weeks post lower limb amputation, depending on the condition of the extremity and wound. During this week the patient were assessed for distance coverage in two minutes.

**Three months follow up**

During this visit the patients were assessed on physical mobility using walking aid or prosthesis and the use of prostheses were assessed using Houghton scale.

**2.10 Data analysis**

Microsoft excel were used for data entry into the database and exported to SPSS version 23 for analysis. Statistics, including proportions, means, and SD, were computed for all demographic and clinical measures. Proportional were determined for categorical variables while means/median and standard deviation were determined for numerical variables. Student t-test was used for comparisons of numerical variables while for categorical variables, Chi square test or Fisher exact test were used. A P value of less or equal to 0.05 were considered statistically significant.

**2.11 Ethical consideration**

Ethical clearance was obtained from the ethical clearance committee of MUHAS. The aim of the study was explained to the patients. The participants were allowed to ask questions about the study. During and after study period, the patient's confidentiality were maintained. The obtained information was used for research purpose only.

The participants signed a consent form after they had agreed to participate. The participant was free to withdraw from the study at any time during the study. They were allowed to have people help them in case they needed assistance.

## **CHAPTER THREE**

### **3.0 RESULTS**

#### **3.1 Socio-demographics**

A total of 58 patients with unilateral lower limb amputation secondary to peripheral vascular diseases who were admitted to Muhimbili Orthopaedic Institute and Muhimbili national hospital and who met inclusion and exclusion criteria were recruited in to the study, of which they were mostly females 31 (53.45%). The age group of 54 years and above had largest proportion (53.45%) among study participants. When inquired about accompanied diseases, 11 (18.97%) participants had no comorbidities, while 47 (81.035%) had comorbidities such as diabetes, cardiac, anemia and sepsis. 52 participants (89.66%) had closed amputation while 6 (10.34%) had open amputation. Other characteristics are shown in table 1.

**Table 1: Describe socio-demographic characteristics, stratified by sex.**

<b>Characteristic, n (%)</b>	<b>Total, 58 (100)</b>	<b>Male, 27 (46.55)</b>	<b>Female, 31 (53.45)</b>
<b>Age group, n (%)</b>			
<25 years	2 (3.45)	-	2 (6.45)
25-34 years	2 (3.45)	1 (3.70)	1 (3.23)
35-53 years	23 (39.66)	14 (51.85)	9 (29.03)
54 and above years	31 (53.45)	12 (44.44)	19 (61.29)
<b>Marital status, n (%)</b>			
Married	52 (89.66)	23 (85.19)	29 (93.55)
Single	6 (10.34)	4 (14.81)	2 (6.45)
<b>Education level, n (%)</b>			
No formal education	5 (8.62)	3 (11.11)	2 (6.45)
Primary level	34 (58.62)	13 (48.15)	21 (67.74)
Secondary level	13 (22.41)	8 (29.63)	5 (16.13)
University level	6 (10.34)	3 (11.11)	3 (9.68)
<b>Employment status, n (%)</b>			
Student	1 (1.72)	-	1 (3.23)
Unemployed	2 (3.45)	1 (3.70)	1 (3.23)
Formally employed	13 (22.41)	8 (29.63)	5 (16.13)
Self-employed	16 (27.59)	9 (33.33)	7 (22.58)
Farmer	26 (44.83)	9 (33.33)	17 (54.84)
<b>Dependants, n (%)</b>			
None	4 (6.90)	-	4 (12.90)
1 to 2	19 (32.76)	15 (55.56)	4 (12.90)
3 and above	35 (60.34)	12 (44.44)	23 (74.19)
<b>Limp amputated, n (%)</b>			
Right	33 (56.90)	14 (51.85)	19 (61.29)
Left	25 (43.10)	13 (48.15)	12 (38.71)
<b>Level of amputation, n (%)</b>			
Above knee	36 (62.07)	16 (59.26)	20 (64.52)
Through knee	1 (1.72)	-	1 (3.23)
Below knee	21 (36.21)	11 (40.74)	10 (32.26)
<b>Diabetes mellitus, n (%)</b>	38 (65.52)	17 (62.96)	21 (67.74)
<b>Cardiac illness, n (%)</b>	13 (22.41)	8 (29.63)	5 (16.13)
<b>Anemia, n (%)</b>	10 (17.24)	5 (18.52)	5 (16.13)
<b>Houghton score, mean <math>\pm</math> SD</b>	7.6 (2.29)	7.2 (2.27)	7.82 (2.32)

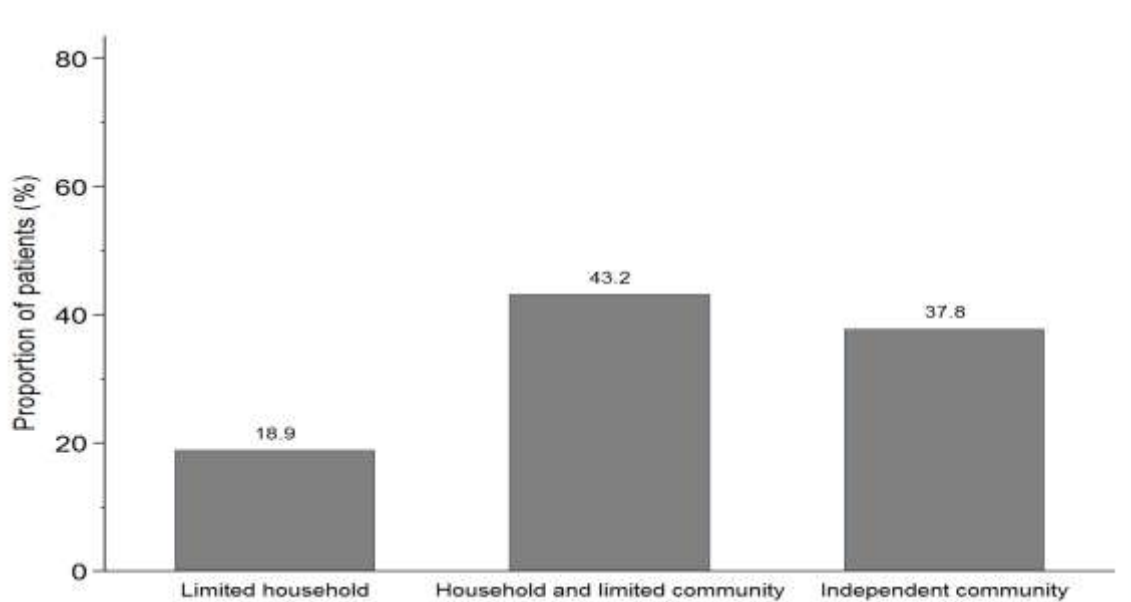
Note; n, number; RTA, road traffic accident; SD, standard deviation

### 3.2 Prosthetic fitting

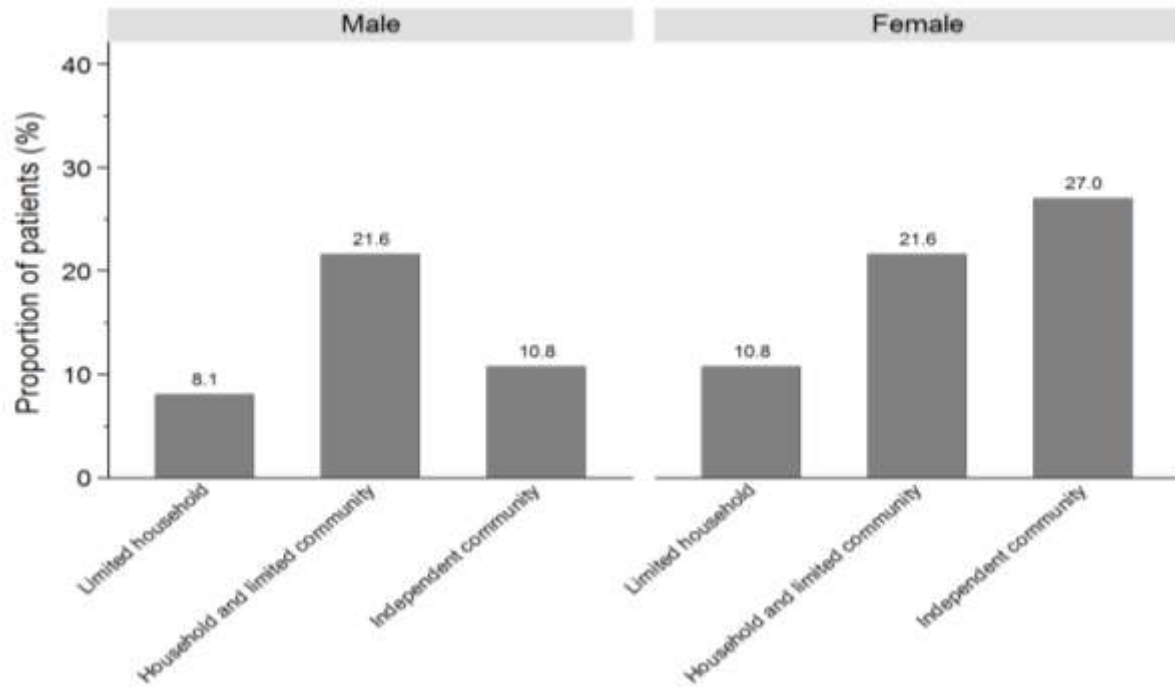
The magnitude of prosthetic fitting was 75% with a 95% CI 61.1% to 85.5% in the population. The observed type of amputation was mostly closed wound amputation in which 52(89.66%) participants had this kind of amputation while the remaining participants 6 (10.34%) had open type of amputation. Majority of the participants 36 (62.7%) had above knee amputation as shown from table 1. Of those who were not fitted with prosthesis the main reason was lack money to acquire the prosthesis.

### 3.3 Uses of prosthesis

The level of amputation was the main factor in which above knee amputation use of prosthesis was 28 (75.7%) while 19 (91.67%) participants of those with below knee did not use prosthesis. Sex predicts the use of prosthesis, in which 22(59.4%) users were female as shown in table 2, no other factor seems to be a barrier to the use of prosthesis. Majority of prosthesis user were household and limited community 16(43.2%) while very few were 7(18.9%) limited household users, mainly due to advanced age and comorbidities. Figure 2 and figure 3 shows overall Houghton score and Houghton score stratified by sex respectively.



**Figure 2: Overall Houghton score categories**



**Figure 3: Houghton score categories by sex**

**Table 2: Table showing significant predictors of prosthesis use after clinical follow up**

Characteristic	Proportion	95% CI	P value
<b>Sex, n (%)</b>			0.05
Male	15 (40.54)	25.6-57.4	
Female	22 (59.46)	42.6-74.4	
<b>Amputation, n (%)</b>			<0.001
AKA	28 (75.68)	58.8-87.2	
TKA	1 (2.70)	0.35-18	
BKA	8 (21.62)	10.9-38.4	

P values estimated from fisher exact test (two sided)

Table 2 shows that the level of amputation influences prosthesis use, with 75.68% of participants who had AKA using prosthesis while 91.67% of participants who had BKA did not use prosthesis.

### 3.4 Re-amputation

Table 3 shows the magnitude of re-amputation was 8.2% in which 4 participants were re-amputated with a 95% CI 3%-20.4%. This was low since most of primary amputation done was above knee, where there is a bulk of muscles to make a good stump envelop and hence good healing potential. Also as you go above the blood supply becomes good.

**Table 3: Participant clinical recovery during follow up**

<b>Characteristic, n (%)</b>	<b>Total (58)</b>	<b>Male (27)</b>	<b>Female (31)</b>
<b>Septicemia, n (%)</b>			
Yes	10 (17.24)	3 (11.11)	7 (22.58)
No	48 (82.76)	24 (88.89)	24 (77.42)
<b>Wound infected, n (%)</b>			
Yes	9 (15.52)	3 (11.11)	6 (19.35)
No	49 (84.48)	24 (88.89)	25 (80.65)
<b>Necrosis, n (%)</b>			
Yes	10 (17.24)	3 (11.11)	7 (22.58)
No	48 (82.76)	24 (88.89)	24 (77.42)
<b>Phantom limb sensation, n (%)</b>			
Yes	57 (98.28)	27 (100)	30 (96.77)
No	1 (1.72)	-	1 (3.23)
<b>Alive on follow up, n (%)</b>			
Yes	49 (84.48)	24 (88.89)	25 (80.65)
Died	9 (15.52)	3 (11.11)	6 (19.35)
<b>Re-operated, n (%)</b>			
Yes	4 (8.16)	1 (4.17)	3 (12.0)
No	45 (91.84)	23 (95.83)	22 (88.0)
<b>Admission, median (IQR)</b>	9 (7-12)	9 (7-11)	9 (7-13)
<b>Aid in movement, n (%)</b>			
Armpit support	17 (34.69)	10 (41.67)	7 (28.0)
Artificial leg	32 (65.31)	14 (58.33)	18 (72.0)
<b>Ambulation, n (%)</b>			
Indoor	3 (6.12)	2 (8.33)	1 (4.0)
Indoor and outdoor	46 (93.88)	22 (91.67)	24 (96.0)
Distance 1, median (IQR)	42 (31-49)	40.5 (31-47.5)	42 (32-51)
Distance 2, median (IQR)	87 (58-108)	86 (63.5-98)	92 (58-117)
<b>Resume, n (%)</b>			
Yes	12 (24.49)	5 (20.83)	7 (28.0)
No	37 (75.51)	19 (79.17)	18 (72.0)
<b>Prosthesis, n (%)</b>			
Yes	37 (75.51)	15 (62.5)	22 (88.0)
No	12 (24.49)	9 (37.5)	3 (12.0)

n, Number of participants; IQR, Interquartile range

### 3.5 Mortality rate among amputee

Mortality rate among amputees were 15.5% with a 95% CI 8.1% to 27.6%. Majority of amputees had comorbidities in which diabetes mellitus were 65.52% while anemia was the least 17.24%. Those who died both of them had comorbidities 9 (100%), diabetes mellitus and cardiac diseases were predominantly 6(66.7%) accompanied diseases. Heart diseases, anemia and septicemia were significantly associated with death, p value <0.005. A total 38(77.55) amputees are diabetic and still alive as shown in table 4.

**Table 4: Mortality against comorbidities**

<b>Characteristics, n (%)</b>	<b>Died, 9 (15.52)</b>	<b>Alive 49 (84.48)</b>	<b>P value</b>
<b>Accompanied illness, n (%)</b>			0.128
Yes	9 (100)	38 (77.55)	
No	-	11 (22.45)	
<b>Diabetes mellitus, n (%)</b>			0.628
Yes	6 (66.67)	32 (65.31)	
No	3 (33.33)	17 (34.69)	
<b>Heart disease, n (%)</b>			0.002
Yes	6 (66.67)	7 (13.29)	
No	3 (33.33)	42 (85.71)	
<b>Anaemia, n (%)</b>			0.005
Yes	5 (55.56)	5 (10.20)	
No	4 (44.44)	44 (89.80)	
<b>Septicaemia, n (%)</b>			<0.001
Yes	6 (66.67)	4 (8.16)	
No	3 (33.33)	45 (91.84)	



## CHAPTER FOUR

### 4.0 DISCUSSION

In this study the prevalence of female participants was high 53.45% which is different from other study which was done in Brazil in which most of amputees were male with prevalence of 66% [29]. In the current study the age group of 54 years and above had largest proportion as compared to other age groups, this finding is quite similar with findings from other previous studies [13, 14]. Most of participants in this study had above knee amputation in which the proportion of above knee amputation was 62% different from the study done by Chamlian TR, et al (2014) where the distribution of amputation level were similar between below knee amputation and above knee amputation. This shows most of peripheral vascular disease patients presents late for the management, as most of peripheral vascular diseases have the tendency of ascending.

In this study the magnitude of prosthetic fitting was high, 75% of amputees were fitted with prosthesis, among them mostly were female. This was a similar finding compared to that observed in a study done by Chamlian TR, et al (2014) in Sao Paulo where the magnitude of prosthetization was 77.4% of amputees. But in a study named prosthetic fitting, use and satisfaction following lower limb amputation done by Webster JB, et al (2012) it was found that half of the study participants (50%) were fitted with prosthesis at four months follow up which was relatively lower than that found in this study, but in that study patients were followed to one year, where prosthetic fitting at one year was found to raise to 92% of the study participants [51]. The difference seen in prosthetic fitting at four months follow up might be due to the fact that in the current study majority of participants fitted were above knee amputees, where healing power is higher due to good muscle coverage and good blood supply.

Prosthesis uses in this study, at the end of rehabilitation program was high, in which 75.51% of amputees maintained the use of prosthesis. Which correlate with findings from other studies where 75% to 95% of study participants maintained the use of prosthesis [21, 23] but higher

than that found in previous studies [1, 29]. The level of amputation seem to be a significant factor in uses of prosthesis, where above knee amputation use of prosthesis was 75.7% while 91.67% participants with below knee amputation did not use prosthesis. Sex also was a significant predictor of prosthesis use with, no other factors seem to be a barrier to the use of prosthesis.in the study done by Bhangu S. et al (2009) sex and level of amputation was not a significant predictor of prosthesis use but age was a significant predictor to the use of prosthesis in which the lower the age the higher the use of prosthesis while those with higher age were poor in the use of prosthesis as most of higher aged participants had comorbidities. In the current study the higher proportion of females who were fitted with prosthesis maintained the use of prosthesis 22(88.0%) while the proportion of men who uses prosthesis were 62.5% opposite to findings obtained other studies where the large proportion of male fitted with prosthesis also maintained the use of prosthesis compared to female [15, 29].

In this study, the magnitude of re-amputation was found to be 8.2%, which was low compared to the study done by Izumi Y, et al (2006) in which re-amputation was found to be 26.7% with in first year after primary amputation. Though this was relatively high compared to that found in previous study, in which the re-amputation rate was found to be 6.2% [29]. In a systematic review and meta-analysis done by Thorud JC, et al (2016) where they were looking for reoperation and reamputation after transmetatarsal amputation the rate of reamputation was estimated at 28.37% [52]. As it is observed in this study, reamputation rate was relatively low due to the fact that most of the study participants had above knee amputation done as the index operation, hence good vascularity at the thigh and enough soft tissue envelop to cover the stump warrants higher power of healing and hence low incidence of reamputation contrally to those who primary amputation are below knee or transmetatarsal.

Mortality rate observed in this study was low, 15.5%. In the study done by Kristensen MT, et al (2012) the mortality rate observed was 30% within first month after amputation while in one year follow up mortality rate was high to 54%.Though the mortality of the current study tally with findings from previous studies where it was found to range from 15% to 30% [10, 11, 29].

Heart diseases, septicemia and anemia was significantly associated with mortality in the current study, in which 100% of those who died had comorbidities, predominantly diabetes mellitus and heart diseases.

#### **4.1 Study limitations**

With time limitation, patients were only followed up for 3 months of which for prosthetic use a minimum of one year follow up period is required to have a good outcomes assessment.

## **CHAPTER FIVE**

### **5.0 CONCLUSION AND RECOMMENDATION**

#### **5.1 Conclusion**

Majority of amputees were fitted with prosthesis, in which level of amputation was a huge factor to be fitted. Majority of AKA were fitted and used prosthesis, mostly female amputees. Closed amputation was the commonest procedure, predominantly AKA hence the magnitude of re-amputation was low. Mortality among study participants were relatively high as was realized the age group of 54 and above was majority of the study participants and most of them had comorbidities, mostly being diabetes. At the end of the study majority of the participants used prosthesis both in household and limited community areas while very few were household limited users.

#### **5.2 Recommendation**

For those who were fitted they successfully use prosthesis, therefore there should be an effort from the MOI and MNH to create awareness on availability of the service which will make a good access of a service and prosthesis.

Another study with long follow up time, at least one year is recommended.

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**APPENDICES**

**Appendix I: Questionnaire**

Unilateral Lower limb amputation secondary to PVD:

Use of prosthesis among amputees due to PVD May 2017 / April 2018

Identification No-----

Date of admission-----

Date of operation-----

Date of discharge-----

**A: Socio demographic Characteristics**

**1. Age of a patient (yrs)**

- i. <25
- ii. 25-34 [    ]
- iii. 35 - 54
- iv. 55+

**2. Sex**

- i. Female [    ]
- ii. Male

**3. Marital Status**

- i. Married [    ]
- ii. Not married

**4. Education level**

- i. Non formal
- ii. Primary [    ]
- iii. Secondary
- iv. Post secondary

**5. Occupation status**

- i. Student
- ii. Unemployed
- iii. Formal employed [    ]
- iv. Self employed
- v. Peasant

**6. Residence**

- i. Dar es Salam [    ]
- ii. Outside Dar es Salaam

**7. Number of dependant**

- i. None
- ii. 1-2 [    ]
- iii. 3<sup>+</sup>

**B: Information patterning to amputation****8. Side of amputation**

- i. Right
- ii. Left [    ]

**9. Type of amputation (Technique)**

- i. Closed [    ]
- ii. Open

**10. Level of amputation**

- i. Through hip
- ii. AKA (Trans femoral)
- iii. Through knee
- iv. BKA (Trans tibial) [    ]
- v. Through ankle (syeme)

**11. Co-existing disease**

- i. None
- ii. Diabetic
- iii. Cardiac [     ]
- iv. Anaemia
- v. Trauma
- vi. Others

**12. Complications**

- i. Yes [     ]
- ii. NO

**13. Systemic**

- i. Cardiac
- ii. Respiration [     ] [     ] [     ]
- iii. Anaemia
- iv. Septicaemia
- v. Others

**14. Local**

- i. Stump infection
- ii. Dehisces
- iii. Flap necrosis [     ] [     ] [     ]
- iv. Phantom / stump pain
- v. Others

**15. Death**

- i. Yes
- ii. No [     ]

**16. Surgical revision**

- i. Yes
- ii. No [     ]
- iii. If Yes, mention type of surgery .....

17. **Duration of hospital stay in days** [ ]

**C: Early function**

**18. Use of walking aid**

- i. Walking frame
- ii. Crutches [ ]
- iii. Prosthesis
- iv. Wheel chair

**19. Degree of ambulation**

- i. Indoor
- ii. Out door [ ]
- iii. Non ambulant

20. **Distance covered in two minutes' walk 1..... 2.....(metres)**

**21. Return to pre morbid activities**

- i. Yes [ ]
- ii. No

**22. Acquiring and use of prosthesis at the end of the study**

- i. Yes
- ii. No [ ]

**23. HOUGHTON SCALE for prosthesis use**

## Appendix II: Houghton scale

Kipimo cha HOUGHTONS kwa matumizi ya mguu bandia

Je unavaa mguu bandia

0 < 25% ya matembezi

1, kati ya 25% - 50% ya matembezi

2, zaidi ya 50% ya matembezi

3, Mda wote wa matembezi

Je Unatumia mguu wa bandia kutembea

0, niendapo hospitali

1, Nyumbani tu bila kutoka nje

2, Nyumbani na hata nje

3, Nje na ndani mda wote

Uendapo nje ukiwa umevaa mguu bandia je ?

0, Unatumia kiti gurudumu

1, unatumia flemu aumagongo

2, unatumia gongo 1

3 hutumii chochote

**Appendix III: Consent Forms (English Version)**

Dear Sir/ Madam

Greetings.

My name is **Dr. Daud Damas Zumbula**, a resident in department of Orthopaedic and Traumatology at MUHAS. I have been authorized by MUHAS research committee and MOI to conduct a research as a necessary requirement for fulfillment of my post graduate studies.

**Title:** To determine the magnitude of the uses of prosthesis among unilateral lower limb amputee secondary to peripheral vascular diseases attended at Muhimbili complex.

The study is aimed to determine age, sex, mechanism of injuries, clinical presentation, management outcome and complications related to thoracic and lumbar spine injuries. Therefore, your participation will require you to provide information to address those issues.

**Confidentiality:** All information collected in questionnaires and hospital register will not be disclosed to any one not related to this study. Initial of your names will be used and results will be presented as overall reflection of the community and not as a report of an individual.

**Risk:** There will be no risk associated with this study.

**Benefits:** Participant will be able to gaining extra information about his/ her condition by being closer to the investigator. Since the report of this study is intended to benefit the whole society, the participant will be part of this effort.

**Participation:** Your participation in this study is purely voluntary that any decision you make will be respected and will not interfere with type of management you will get from the institute. You can choose to participate or not, answering or not answering some of the questions and withdraw from the study at any point. If you agree to participate in this study you will be interviewed.



**Contacts:** For any question about this study you can contact me **Dr. Daud Damas Zumbula**

Phone: 0718278317

P. O. Box 65474, Dar es Salaam.

E-mail: sokozi82@gmail.com

OR

**Dr Billy Haonga.** (Senior Lecturer MUHAS Orthopedics& Traumatology Department).

Phone: 0754-563761

For questions about your rights as a participant, you may contact **Professor M. Moshi,** Director of Research and Publication MUHAS, P.O Box 65001 Dar es Salaam.

**Participant declaration:**

I, ....., have read/ told and understand the content of this form. With my sound mind I do agree/ disagree to participate in this study.

Signature of participant. ....

Signature of investigator.....

Date. ....

#### **Appendix IV: Fomu ya Ridhaa (Swahili Version)**

Salaam,

Mimi naitwa **Dk. Daud Damas Zumbula**, ni mwanafunzi wa udhamili chuo kikuu cha Sayansi za Afya Muhimbili, idara ya magonjwa ya mifupa na majeraha. Ninafanya utafiti huu kama hitaji la lazima ili kukamilisha masomo yangu. Pia matokeo ya utafiti huu yatasaidia kufahamu kwa undani zaidi kuhusu ugonjwa huu na hivyo kuboresha zaidi matibabu yake.

Utafiti huu ni kuhusu matumizi ya miguu ya bandia kwa waliokatwa mguu mmoja kutokana na matatizo ya mishipa ya damu kwa mwaka 2017/2018 MOI na hospitali ya taifa muhimbili.

Taarifa zitakazokusanywa ni kuhusu umri, jinsia, namna ya kuumia, hali baada ya kuumia, aina ya matibabu uliyopata, matokeo ya tiba na madhara ya muda mfupi.

#### **Usiri**

Taarifa za ugonjwa wako zitatumizwa kwa usiri mkubwa kwamba hazitaonekana kwa mtu asiye husika na utafiti huu. Utambulisho wako utatumia herufi za mwanzo za majina yako.

#### **Madhara**

Hakuna madhara yoyote yanayotegemewa kutokana na utafiti huu.

#### **Faida**

Ukishiriki kwenye utafiti huu, utapata fursa ya kufahamu kwa undani kuhusu ugonjwa wako, tiba na matokeo yake. Kwa kuwa matokeo ya utafiti huu yatainufaisha jamii yote, ukishiriki utakuwa ni sehemu ya juhudi hizi za kuisaidia jamii.

#### **Uhuruwakushiriki**

Kushiriki kwenye utafiti huu ni hiyari yako. Una hiyari ya kushiri au kutoshiriki, kujibu au kutokujibu baadhi ya maswali au hata kujitoa wakati utafiti unaendelea. Kwa uamuzi wowote utakaofanya uta endelea kupata matibabu kama kawaida hapa hospitalini.

**Taarifa**

Endapo unahitaji kupata maelezo zaidi kuhusu utafiti huu, wasiliana na **Dk. Daud Damas Zumbula** simu namba 0718278317 au **Dk. Billy Haonga** wa chuo kikuu cha Afya na Tiba Muhimbili na Taasisi ya mifupa Muhimbili.

Kama unaswali lolote kuhusu haki zako kama mshiriki wa silianana **Profesa M. Moshi**, ambaye ni mkurugenzi wa bodi ya utafiti, chuo kikuu cha Afya na Tiba Muhimbili, kwa S.L.P 65001 Dar es Salaam.

**Tamko la mshiriki**

Mimi,.....,nimesoma/  
nimeambiwa na kuelewa kilichomo kwenye fomu hii. Nikiwa na akili timamu na kubali/  
nakataa kushiriki kwenye utafiti huu.

Saini ya mshiriki. ....

Saini ya mtafiti.....

Tarehe.. ..