



**INDICATIONS AND PATTERNS OF MAJOR AMPUTATIONS AT
ADDIS ABABA BURN, EMERGENCY AND TRAUMA HOSPITAL,
SAINT PAUL’S MILLENIUM MEDICAL COLLEGE,ADDIS
ABABA,ETHIOPIA**

BY:

TAMIRU MENKIR

(MD, GENERAL SURGERY RESIDENT)

**RESEARCH PAPER TO BE SUBMITTED TO DEPARTMENT OF SURGERY,
SAINT PAUL’S MILLENIUM MEDICAL COLLEGE**

SEPTEMBER, 2018

ADDIS ABABA, ETHIOPIA

SAINT PAUL'S HOSPITAL MILLINIUM MEDICAL COLLEGE
SCHOOL OF POST GRADUATE STUDIES

TWO YEARS RETROSPECTIVE REVIEW OF INDICATIONS AND
PATTERN OF MAJOR LIMB AMPUTATION AT ADDIS ABABA BURN,
EMERGENCY AND TRAUMA HOSPITAL, SAINT PAUL'S MILLENIUM
MEDICAL COLLEGE

BY:

TAMIRU MENKIR

(MD, SURGERY RESIDENT)

ADVISORS:

1. SOLOMON GOSHU (MD, ORTHOPEDIC AND TRAUMA SURGEON)
2. MILKIYAS TSEHAYE (MD, ORTHOPEDIC AND TRAUMA SURGEON)

SEPTEMBER, 2018

ADDIS ABABA, ETHIOPIA

SUMMARY

Background: Limb amputations have been done since time immemorial. The first surgical description of a leg amputation was by Hippocrates (460- 377 BC). Since then, this ancient procedure has been practiced for various punitive, ritual and therapeutic reasons. In modern medicine, limb amputation is considered as a last resort when limb salvation is impossible. Thus limb amputation is considered when the limb is dead, deadly (endangering the patient's life) or dead loss (functionally useless). Major lower limb amputation results in significant global morbidity and mortality. Apart from physical disability, loss of a limb by an individual causes profound economic, social, and psychological effects on the patients and their families. This effect is more profound in developing countries where prosthetic services are not readily available. Major limb amputations are essentially disfiguring operations that carry a fairly high perioperative mortality and morbidity. Persons who undergone amputation are often viewed as incomplete individuals. However in many cases, amputation of the limb is the only option to save the patient's life.

Objective:-To analyze indications and patterns of major amputations at Addis Ababa Burn, Emergency and Trauma hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.

Methodology:-A retrospective review is conducted among patients who were underwent major limb amputation at AABET hospital, SPHMMC, from August 2015 up to July 2017 G.C. All patients who were underwent major amputation at AABET hospital, SPHMMC, in the given time are studied with no sampling. A structured pretested data collection format is used for data collection. Data is collected by trained orthopedic residents. Data is analyzed with computer programs (SPSS version 22) and the result is presented by numbers, ratios, tables and graphs. Depending on the result appropriate interpretations, discussions, conclusions and recommendations is made. The total cost of the project is 33,286 birr.

Results: - Majority (56.7%) patients were below the age of 40 years and 80.6% of patients were male. Trauma is the most common cause of major amputation (47.76%), followed by DM (16.42%) and PAD (16.42%). Most (59.38%) of cases of trauma were due to RTA. Majority (81%) of patients underwent lower limb amputation which makes ratio of Lower limb to upper limb amputation is 4.3:1. Most (76.1%) of patients acquired post-operative complications. SSI is the most common (74.5%) post-operative complication followed by stump gangrene (21.6%). There was no death during the study period. Wound debridement and closure is the most common (n=29, 56.9%) additional procedure done. There is significant association between indication of amputation and post op complication (P-value=0.008) and also between age of the patient and indication of amputation (P-value=0.000)

Conclusion and Recommendation:-Trauma is the most common cause of major amputation followed by DM and PAD. Majority cases (59.38%) of trauma is due to RTA. Systematic disease management and patient education programs should be designed to improve health seeking behavior. **Keywords: - major amputation, pattern of amputation, AABET**

AKNOWLEDGEMENT

I would like to thank St Paul's Hospital Millennium Medical College for giving me the chance to conduct this research and for providing me with necessary materials and fund

I would like to express my deepest gratitude to my advisor Dr. Solomon Goshu for his guidance during this research paper development. My acknowledgement also goes to all staffs of St Paul's Hospital Millennium Medical College and AaBET Hospital for helping me in accessing all the necessary information and documents. In addition I would like to thank Dr Engida Abebe (MD, Associate professor, General Surgeon, Renal transplant surgeon) for his continuous guidance during the proposal and research development.

TABLE OF CONTENTS

Contents	page
SUMMARY	I
AKNOWLEDGEMENT	II
LISTS OF TABLES	V
LISTS OF FIGURES	VI
ABBREVIATIONS AND ACRONYMS	VII
CHAPTER ONE	1
1. INTRODUCTION	1
1.1. Background information	1
1.2. Statement of the Problem	2
1.3. Significance of the study	3
CHAPTER TWO	4
LITERATURES REVIEW	4
CHAPTER THREE	8
3. OBJECTIVES	8
3.1. General Objective	8
3.2. Specific Objectives	8
CHAPTER FOUR	9
METHODOLOGY	9
4.1. Study area and periods	9
4.2. Study design	9
4.3. Population	9
4.4. Sample size and sampling technique	9
4.5 Study variables	10
4.6. Data collection tools and procedures	10
4.7. Data collectors	10
4.8. Data quality control	10
4.9. Data analysis and interpretation.....	10
4.10. Ethical consideration.....	10
4.11. Limitation	10
4.12. Dissemination of the study findings	10

4.13. Operational definition and definition of terms.....	11
CHAPTER FIVE	12
5. RESULTS.....	12
CHAPTER SIX.....	21
DISCUSSION.....	21
CHAPTER SEVEN	25
CONCLUSION AND RECOMMENDATION	25
7.1 CONCLUSION.....	25
7.2 RECOMMENDATION	26
ANNEX I	27
REFERENCES	27
ANNEX II	29
DATA COLLECTION FORMAT	29

LISTS OF TABLES

Table 1. Distribution of patients by age who underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Ababa, Ethiopia from August 2015 up to July 2017.....	12
Table 2: Occupation of patients who underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Ababa, Ethiopia from August 2015 up to July 2017.....	13
Table 3: Age Vs Indication cross tabulation in patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	19
Table 4: Indication Vs Postop complication cross tabulation in patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	20
Table 5: Site of amputation Vs indications cross tabulation in patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	20

LISTS OF FIGURES

Fig 1: Gender of patient underwent major amputation at AaBET hospital, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	12
Fig 2: Address of patient underwent major amputation at AaBET hospital, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	13
Fig 3: Indications of amputation among patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	14
Fig 4: Types of trauma that causes major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C...	14
Fig 5: Level of major amputations undertaken at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C	15
Fig 6: Level of lower limb amputation done at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	15
Fig 7: Level of upper limb amputation done at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	16
Fig 8: Pattern of admission at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.....	16
Fig 9: Frequency of post-operative complication among patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C	17
Fig 10: Types of post-operative complication occurred among patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C	18
Fig 11: Additional procedure done for patients who developed post op complication after major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C	18

ABBREVIATIONS AND ACRONYMS

AABET-----Addis Ababa Burn, Emergency, Trauma

AKA-----Above Knee Amputation

BKA-----Below Knee Amputation

DM-----Diabetes mellitus

ICU-----Intensive Care Unit

IRB-----Institutional Review Board

MOH-----Ministry of Health

SPHMMC----Saint Paul Hospital Millennium Medical College

PAD-----Peripheral Arterial Disease

SPSS-----Statistical Package for Social Science

WHO-----World Health Organization

CHAPTER ONE

1. INTRODUCTION

1.1. Background information

Limb amputations have been done since time immemorial. The first surgical description of a leg amputation was by Hippocrates (460- 377 BC). He first described the technique of amputation for a vascular gangrene in a published form in *De Articularis*. The wound was severed off from the margin of gangrenous and left open to heal by secondary intension. Since then, this ancient procedure has been practiced for various punitive, ritual and therapeutic reasons. The major problems with the early amputation surgeries included hemorrhage, shock and sepsis. Although prostheses are not mentioned in medical literature from ancient times, they were indeed made and used as learnt from the non-medical books and pictures (1).

In modern medicine, limb amputation is considered as a last resort when limb salvation is impossible. Thus limb amputation is considered when the limb is dead, deadly (endangering the patient's life) or dead loss (functionally useless) (2).

The global annual incidence of amputation ranges from 3 to 44 per 100,000 people, with Spain and Japan at lower extremity and American Indians at the upper extremity (3, 4). Major lower limb amputation results in significant global morbidity and mortality (3-5). Apart from physical disability, loss of a limb by an individual causes profound economic, social, and psychological effects on the patients and their families. This effect is more profound in developing countries where prosthetic services are not readily available (6, 7).

Major limb amputations are essentially disfiguring operations that carry a fairly high perioperative mortality and morbidity and persons who undergone amputation are often viewed as incomplete individuals. However in many cases, amputation of the limb is the only option to save the patient's life (8).

Limb amputations can be done at different levels. Different criteria have been used to categorize this. ICD-10 criteria identify below knee, above knee, hip disarticulation, and hindquarter amputations as major lower limb amputations. The incidence of different pathologies leading to limb amputation have been reported to vary from one place to the other. In developed countries peripheral vascular disease ranks first as a cause for amputation whereas trauma, infections, uncontrolled diabetes mellitus and malignancies are the leading cause for amputation in developing countries (9, 10).

1.2. Statement of the Problem

Lower extremity amputation results in significant global morbidity and mortality (3, 5). The global annual incidence of amputation ranges from 3 per 100,000 populations in Spain and Japan to 44 per 100,000 in American Indian populations (3, 4). However a recent 2011 review suggests global ranges of 6 to 31 per 100,000 in Italian and German populations, respectively (5). Mortality rates for lower amputations are reported to be higher than some cancers' mortality rate (11); in hospital mortality rates ranges between 2-19% (3, 7, 12, and 14).

Amputations are usually the result of complications of diabetes, peripheral arterial disease, trauma, and malignant tumors and are often complicated by infection (3, 4, 16,). Diabetes complications are commonly acknowledged as the leading cause of global amputation burden and contribute to between 25% (in Italian and Japan) and 90% (in American Indians) of all amputations (4). In the United Kingdom and Europe diabetes account for around 40-64% of amputations (5, 12, 13,). Peripheral arterial disease is contributing cause for 16-100% of global amputations (3), and a primary cause (without diabetes or non-diabetes) for 18-58% of amputations in United Kingdom and European countries. Amputations related to trauma result in 0-57% of all global amputations and trauma appears to be the primary cause 2-13% of United Kingdom and European amputations (3, 16). Finally, malignant tumors are contributing up to 14% of amputations and a primary cause between 2-3% in the United Kingdom and Europe (3, 16). Infections contributing up to anywhere between 4-100% of all amputations, however infections are typically preceded by the above conditions (3, 5). Trauma is the most common cause of amputations in non-industrial countries (17).

Limb amputation results in significant changes in body structure and functions. There is the physical loss of a body part as well as closely related effects of the underlying disease, comorbidities and concurrent injuries. Person with amputations may also experience a wide range of activity limitations and participation restrictions. These affect the ability of a person to return to and maintain work, maintain social relationship, participate in leisure activities and be active members of the community (17).

An important basis for optimal acute and long- term physical therapy management of amputee is an in depth understanding of the patient and functional consequences of amputation, systemic and detailed consideration of the patient and their environment, and sound measurement of functional outcomes (17).

1.3. Significance of the study

The loss of a limb by any individual is devastating to the patients and family members because of the sudden change in body form especially after trauma and the difficulties associated with rehabilitation and livelihood thereafter. Amputation is a major but preventable health problem that is associated with profound economic, social, and psychological effects on the patients and their families especially in developing countries where the prosthetic services are poor(6,7).

For such a seemingly large and preventable cause of morbidity and mortality, the reporting of extremity amputation causes and rates in Ethiopia appears to be a largely under-developed area of research (18).

An important basis for optimal acute and long- term physical therapy management of amputee is an in depth understanding of the patient and functional consequences of amputation, systemic and detailed consideration of the patient and their environment, and sound measurement of functional outcomes (17). Despite this there were no exhaustive studies done to know the magnitude of the problem and associated predisposing factors for existences of amputation in the study area.

Therefore, this study will be conducted to look in the magnitude and associated factors with major amputation at AaBET hospital. In addition, the data will be used for further investigation, prevention and rehabilitation programs and guideline development intending to reduce burden of amputation.

CHAPTER TWO

LITRATURES REVIEW

Lower extremity amputation results in significant global morbidity and mortality. A recent 2011 review suggests global ranges of 6 to 31 per 100,000 in Italian and German populations respectively (3, 5). Prevalence of amputations internationally has been reported as 17-30 per 100,000 persons. Non-industrialized countries generally have a higher incidence due to a higher rate of war, trauma, and less developed medical systems. Trauma is the most common causes of amputations in non-industrialized countries (17). The continued high level of conflict worldwide, including continued use of land mines and increased use of motorized transportation will result in an increasing prevalence of persons with an amputation globally, equating to an increase in the number of persons with chronic disabling conditions (17).

Currently, about 1.9 million people are living with limb loss in the United States. Of the 1.9 million, 54% lost their limb(s) due to complications related to vascular disease (including diabetes and peripheral arterial disease), 45% lost their limb(s) due to a traumatic accident, and less than 2% had an amputation due to cancer. The number of people living with limb loss in the country is expected to double by 2050 due to growing rates of diabetes and vascular disease (19). From 2007 to 2012, 780,020 lower limb amputations were performed in the United States. The leading causes of Lower limb amputation are complications resulting from dysvascular diseases such as diabetes and, the number of people who lose a limb due to a diabetes is expected to almost triple by a year 2050(19,20). In the same years, 61,189 upper limb amputations were performed in the United States. The leading causes of upper limb loss are trauma, cancer, and congenital anomalies (19, 20).

A total of 14,120 amputation procedures were performed in the states of Texas in 2012, including 1,121 upper limb amputation (4.9%), 12,996 lower limb amputations (92%). Most upper limb amputations involved fingers (76.5%), followed by amputations of the thumb (9.5%), above elbow (3.7%), below elbow (3.3%) and shoulder (1.2%). A total of 12,996 lower limb amputations were performed in 2012. Almost half involved toe(45.7%), below knee amputations(BKA) accounted for 23.3%, and above knee amputations(AKA) accounted for 16.5% of the lower limb amputations performed in the state in that year. Almost half of the amputations in Texas were performed on individuals aged 45-64 years old (48.5%), followed by the age group of 65-84 years old (32.2%) (21).

Dysvascular amputations increases with age regardless of etiology, sex, and race. Males are at significantly higher risk for trauma related amputations than females. The leading cause of trauma related amputation have been reported to be injuries involving machinery (40.1%), powered tools and appliance(27.8%), firearms (8.5%), and motor vehicle crashes (8%)(20).

In a two years retrospective analysis of prevalence and etiology of amputation by Ghosh Das and Pooja, Lahiri Sangeeta from January 2008 to January 2010, in Kolkata, India showed the age of amputee ranged from 20 to 70 years with the most common age group was 21-30 years(32.0%) and age group 31-40 years accounts for 23.2%.

There were more male amputees than that of female ones, with 86% of amputee being male. In this study, out of 155 amputation cases, 70.3% were victims of trauma, making this the most common cause of amputation. Trauma was the leading cause of amputation among all age groups except for those in their 60s. In fact, in each of the younger groups from the teens to 30s, amputation due to trauma accounted for more than 70% of all amputations. The most common trauma reported were RTAs, railway accidents, and burns due to fire, electrocution, and chemical injuries. The next most common cause of amputation was peripheral vascular disease (27.7%) which tended to increase parallel with age. The rest percent were due to malignancy. Lower limb amputations were much more common (94.8%) than upper limb amputations (5.2%). Among all lower limb amputation cases, below knee amputations were the most common, followed by above knee amputations (22).

A cross sectional study done between the period of February 2015 and August 2016 in the department of general surgery, government medical college, Kozhikode, Kerala, India on 81 patients showed mean age of population was 59.23 years with a SD of 14.79. The age group ranges from 3 to 90 years. Of this 66 were male and 15 were females. The most common amputation performed was lower limb (90%). Among the lower limb amputations, complication of diabetes mellitus was the main indication for amputation in 32 (39.5%) patients followed by chronic vascular insufficiency 27 (33.3%) cases. Acute limb ischemia and trauma contributed 11.1% and 7.4% respectively. Others indications were malignancy, sepsis developed in limb elephantiasis and neglected patients who have no significant comorbidities (23).

A retrospective study of major limb amputations performed in Kano, Nigeria from January 2006 to December 2010 on 132 patients showed males comprising 114 (86.4%), and 18 (13.6%) females with mean age 30.43 ± 16.28 SD years. Ninety-three (70.5%) patients were below the age of 40 and the peak age was 30-39 years. There were 98 (74.2%) lower limb amputations and 34 (25.8%) upper limb amputations. The commonest indication was trauma (42.4%), followed by traditional bone setters (31.8%) and malignant tumors (12.9%). Diabetic foot gangrene account for only (4.5%) of amputations. The most common procedure performed on lower limb amputation were below knee amputation (48 cases) followed by above knee 41 cases, knee disarticulation 5 cases and hip disarticulation 4 cases. From upper limb procedures, above elbow comprising 19 cases followed by below elbow 8 cases, and shoulder and elbow disarticulation were 4 and 3 cases respectively. . Forty one (31.1%) amputations had complications and wound infection is the commonest complication (17 cases) (24).

D.H.B. Ubayawansa and W.Y.M Abeysekera conducted a retrospective study at teaching hospital Karapitiya, Sri Lanka from October 2013 to September 2014 on 85 patients who underwent major limb amputation. Out of 85 cases, there were 43 above knee amputations, 40 below knee amputations and 2 through knee amputations. Age distribution was between 14-93 years and most of the patients were in their seventh (38.8%, n=33) and the eighth (21%, n=18) decade of life. Among all amputees, 63.5% (n=54) were male and 36.5% (n=31) were females. Diabetic foot ulcer contributed for 37.6% (n=32) followed by peripheral vascular disease 31.7% (n=27). Other causes for amputations were trauma (n=6), acute limb ischemia and infection (n=5), chronic osteomyelitis (n=4), tumor (n=3), elephantiasis (n=1).

Eight patients died during the same admission giving in hospital mortality rate 9.4%. Causes for those death were septicemia, acute renal failure, hospital acquired pneumonia, hyponatremia and massive upper GI bleeding. Out of 8 patients, who died, 6 had undergone above knee amputation, one below knee and one through knee amputation (25).

A retrospective study of limb amputations done at the University Teaching Hospital in Butare, Rwanda, from 1st January, 2009 to 31st March, 2012, 107 patients underwent limb amputation accounting for 3.08% of all operation performed in the study period. Males accounted 75 (70.09%) and 32 (29.91%) were females. The male to female sex ratio was 2.3:1. Their age ranged between 1 to 93 years old with median of 44 years. Most (87.9%) of the patients came from rural area and 11.2% came from urban area. The lower limb was amputated in 76.6% and upper limb in only 23.4%. The commonest indication was gangrene accounting for 43.9% followed by malignancy accounted 28.9% of the cases. Below knee amputation (BKA) done in 37.38% patients and followed by above knee amputation (AKA) in 35.5%. The post-operative mortality rate was 4.7% (8)

A descriptive cross-sectional study that was conducted at Bugando Medical Center, Tanzania, between March 2008 and February 2010 a total of 162 patients underwent major limb amputations during the study period. The patients were aged 2-78 years (mean 42.30 ± 13.72 days). The majority of patients 156 (90.1%) were aged above 10 years of age. 108 (66.7%) patients were males and females were 54(33.3%). The modal age group was 41-50 years. The majority of patients 124 (76.5%) had primary or no formal education. 112 (69.1%) patients were unemployed. Complication of diabetes mellitus was the main indication for the major limb amputation in 68 (41.9%) patients followed by trauma 62 (38.4%) patients and vascular disease in 14 (8.6%) patients. Trauma (mainly RTA and falls) and malignancies were most common indications for amputation in young adults (2nd to 3rd) decades whereas complications of diabetes and peripheral vascular diseases were the main indications in the 4th to 5th decades of age. Post-burn contractures, iatrogenic and congenital limb deformity were the most common indications in children aged 10 years and below. The major indications for upper limb amputations were trauma (42.3%) and malignancies (24.6%) while diabetic gangrene (45.5%) and trauma (32.2%) were the most common cause of amputation in lower limb. Lower limb were involved in 140 (86.4%) cases and upper limb in 22 (13.6%) cases. In the lower limb, the ratio of below knee amputation to above knee amputation was 1.2:1 in the upper limb, the ratio of below elbow to above elbow was 1.2:1. A total of 46 patients (28.4%) required additional procedures. The most common additional procedures performed were wound debridement, secondary suture, and skin grafting in 42.3%, 34.5%, and 23.2% respectively. Postoperative complications occurred in 54 (33.3%) patients. Surgical site infection was the most common postoperative complication accounting 21.0% of cases. Hospital stay of the patients ranged 9 to 58 days with the mean duration of 22.4 days. There were a total of 27 deaths giving a mortality rate of 16.7%. The main causes of deaths were complications of diabetes in 42.8% cases, wound sepsis in 40.5%, advanced malignancies with metastasis in 4.7% and not established in 2.8% of cases (26).

A retrospective study done at Tikur Anbessa Hospital, Ethiopia during the 12 months between May 1, 2001, to April 31, 2002 showed there were 110 patients who underwent major limb amputation. There were 83 males and 27 females. Their age ranged from 1 to 90 years. Eighty-three (76%) of the patients had their lower limb removed and 27(24%) had upper limb amputation. Trauma accounted for 44(40%) of cases. Other indications for amputations included gangrene due to various causes in 35(32%), tumors in 19(17%) and chronic infections 12(11%). Of the 44 patients in the trauma group, 20 were victims of road traffic accident, 5 were injured by machine while the other 19 were due to various causes. Among 35 patients who lost their limb as a result of gangrene, 24 had vascular insufficiency of which nearly 11 were associated with diabetes. In two children, amputation was done for gangrene that followed application of traditional splint, and one resulted from a 'medically applied' tight plaster cast. The infection group 12 patients was comprised of 6 with chronic hematogenous osteomyelitis which had defied medical and surgical management. Only two followed chronic infection of a compound fracture, but four amputations were performed for life threatening gas gangrene, which had complicated a compound fracture (27).

CHAPTER THREE

3. OBJECTIVES

3.1. General Objective

- ❖ To assess indications and patterns of major amputations at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.

3.2. Specific Objectives

- 3.2.1.** To enumerate major amputations done at AaBET hospital, Saint Paul's Millennium Medical College
- 3.2.2.** To describe sociodemographic characteristics of patients who were underwent major amputations at AaBET hospital, Saint Paul's Millennium Medical College
- 3.2.3.** To find out indications of major amputation at AaBET hospital, Saint Paul's Millennium Medical College
- 3.2.4.** To describe patterns of major amputation at AaBET hospital, Saint Paul's Millennium Medical College.

CHAPTER FOUR

METHODOLOGY

4.1. Study area and periods

The study is conducted at AaBET hospital, Saint Paul's Millennium Medical College from August 2015 up to July 2017 G.C.

AaBET hospital was established in July 2015 G.C under SPHMMC by Ministry of Health as Trauma, Burn and Emergency center. It started functioning with only resuscitation room and five orthopedic and trauma beds. It has been expanded very fast and currently in average provides health service for about 9000 to 10000 inpatients and about 1600 orthopedic and trauma procedures annually. Now it has five major departments namely; orthopedic and trauma, Neurosurgery, Emergency medicine & critical care, plastic and reconstructive surgery. It also became a teaching center and now training under graduate and postgraduate students in all departments. The hospital has been giving orthopedics and trauma care since its establishment. Treatment providers includes primary care givers, postgraduate students and consultants. All orthopedics and trauma procedures include major amputations done by orthopedic and trauma surgeons and residents.

4.2. Study design

A retrospective review study design is used.

4.3. Population

4.3.1 Source population

All cases of amputation admitted to orthopedic wards of AaBET hospital, Saint Paul's Millennium medical college, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C.

4.3.2. Study population

All patients who were undergone major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia in the given study period.

4.4. Sample size and sampling technique

There were 92 patients underwent major amputation in the study period. All patient charts were studied without sampling. 25 charts couldn't be retrieved.

Exclusion criteria

- Patient with lost chart.
- Any patient with chart that doesn't contain dependent variables.
- Patients who were underwent major amputation at another center and transfer to AaBET hospital for further care.

4.5 Study variables

4.5.1. Independent variables: Age, sex, address, comorbid disease, risk factors for peripheral vascular disease like Smoking, diabetes mellitus

4.5.2. Dependent variables: Level of amputation, short term outcomes

4.6. Data collection tools and procedures

A pretested data collection format is used to collect data from the operation theatre logbook, ward registers, registry from physiotherapy and then charts of all patients who were underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C is retrieved.

4.7. Data collectors

Data is collected by trained orthopedic residents.

4.8. Data quality control

The principal has supervised each day during the data collection to ensure the quality of data by checking filled format for their completeness and consistency.

4.9. Data analysis and interpretation

The data is analyzed using SPSS statistical software package version 22. Statistical test (Fisher's exact test at 0.05 level of significance) is used to assess the significance of association between variables.

4.10. Ethical consideration

The proposal was reviewed by the college's ethical review board and a written permission paper was obtained to conduct the study. Before the data collection an official letter from SPHMMC research office was sent to AaBET hospital administrative office to get the permission for patient's chart access and subsequent data collection. Patients' information used in the research is kept confidential and will not be used except for further studies on the subject matter. Patient's identities are not revealed in the study.

4.11. Limitation

Lack of research materials done on the topic in similar study area.

Twenty five charts couldn't be retrieved with possible being of improper recording and improper record keeping.

4.12. Dissemination of the study findings

The research findings will be published and submitted to SPHMMC, SPHMMC library, SPH research office and other concerned bodies.

4.13. Operational definition and definition of terms

Amputation: removal of part or all of a body part enclosed by skin.

Major amputation: any amputation at or proximal to wrist for upper limb and at or proximal to ankle for lower limb.

Minor amputation: any amputation distal to wrist for upper limb and at or proximal to ankle for lower limb.

Short term outcomes: refers to hospital postoperative results which is specific to the amputation.

PAD: Vascular diseases other than Diabetic mellitus

CHAPTER FIVE

5. RESULTS

5.1 Demography

A total of 92 patients were underwent major amputation in study period at AaBET hospital, SPHMMC, accounting for 2.88% of all orthopedic operation performed in the study period but only 67 patients fulfilled criteria of inclusion and analyzed.

Majority (43.3%) of the patients who underwent major amputation were in the age range 16-40 years followed by age range 41-65(22.4%). The minimum age was 7 days while the maximum age was 94 years. The mean age was 40.68 ± 23.89 SD and the median age was 37.00 ± 23.89 SD.

Table 1. Distribution of patients by age who underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Ababa, Ethiopia from August 2015 up to July 2017

Age in years	Frequency	Percentage
≤ 15	9	13.4
16-40	29	43.3
41-65	15	22.4
> 65	14	20.9
Total	67	100

Majority of patients were male (80.6%) with the male to female sex ratio of 4.2:1.

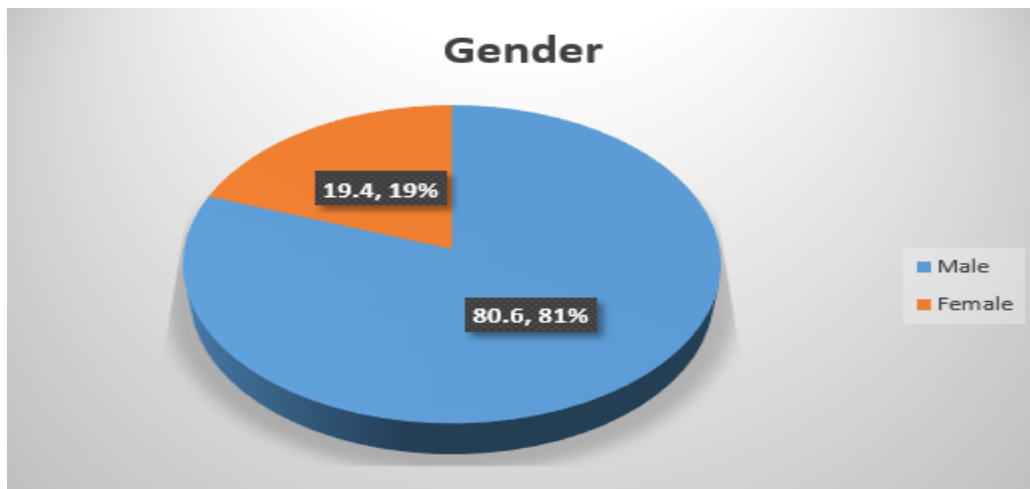


Fig 1: Gender of patient underwent major amputation at AaBET hospital, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Most (62.7%) of patients were came from rural area while the rest (37.3%) were from urban and 61.2% of them were married.

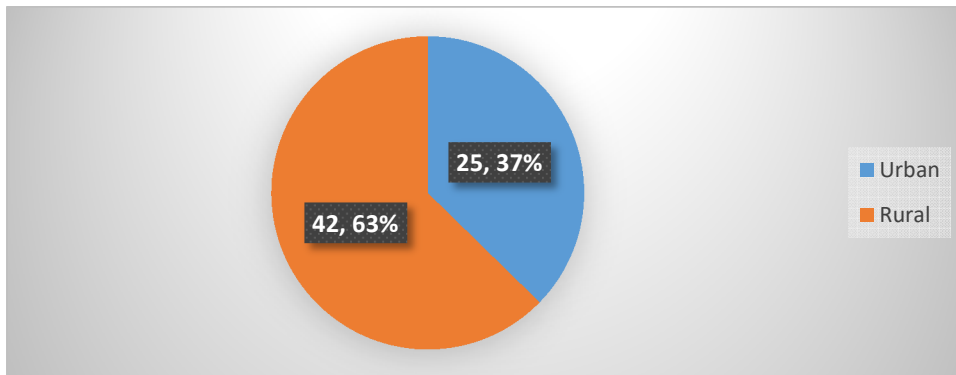


Fig 2: Address of patient underwent major amputation at AaBET hospital, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Majority (n=21, 31.34%) of the patients were farmers followed by students (n=14, 20.9%) and government employ (n=10, 14.9%).

Table 2: Occupation of patients who underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Ababa, Ethiopia from August 2015 up to July 2017.

Occupation	Frequency	percentage
Farmer	21	31.34
merchant	9	13.43
Factory worker	2	3.0
Governmental employ	10	14.9
Daily laborer	3	4.5
Student	14	20.9
others	8	11.93
Total	67	100.00

5.2. Indications of major amputation

Trauma is the most common cause of major amputation (47.76%), followed by DM (16.42%) and PAD (16.42%). Gangrene from tight splint application by traditional healer contributed 7.45% of major amputation. All patients of DM were on treatment and with minimum and maximum duration of disease were 2 and 30 years respectively. Trauma accounts for 87.5%% of male cases and 12.5% of female cases.

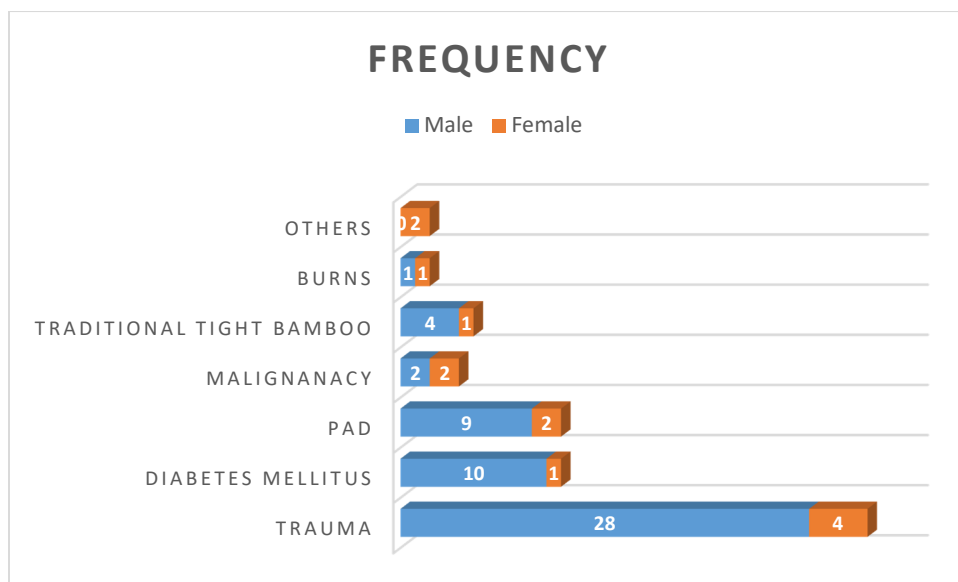


Fig 3: Indications of amputation among patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Majority (59.38%) of cases of trauma were due to RTA followed by different type of assaults (18.75%). Fall and machine injuries contributed each 9.38% of cases of trauma.

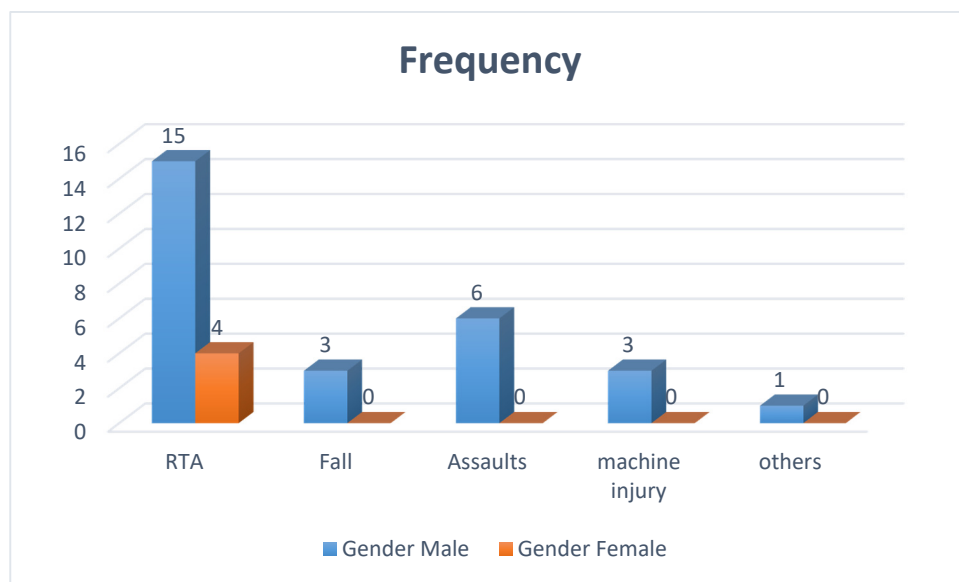


Fig 4: Types of trauma that causes major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

5.3 patterns of Amputation

Most (81%) of patients had undergone lower limb amputation which makes ratio of Lower limb to upper limb amputation is 4.3:1.

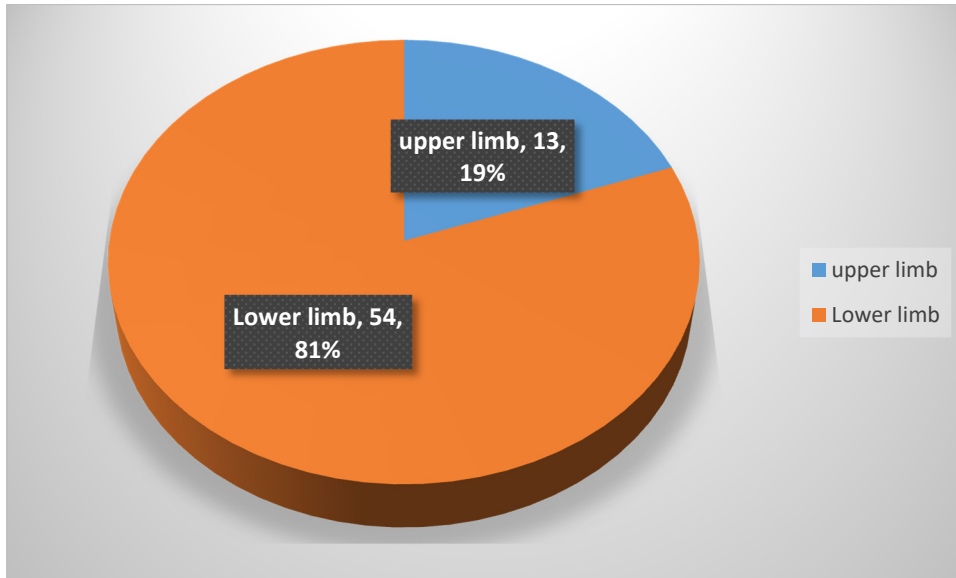


Fig 5: Level of major amputations undertaken at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Majority (59.26%) level of lower limb amputation were BKA, followed by AKA (35.19%) and knee disarticulation (5.55%).

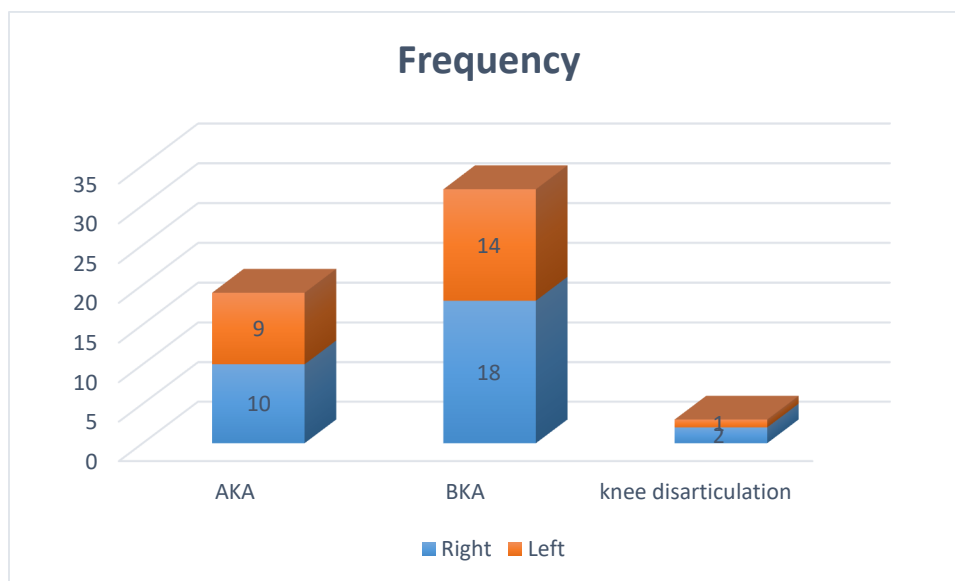


Fig 6: Level of lower limb amputation done at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Above elbow and below elbow are contributed equal percentage (38.46% each) for upper limb amputation followed by shoulder disarticulation (15.38%).

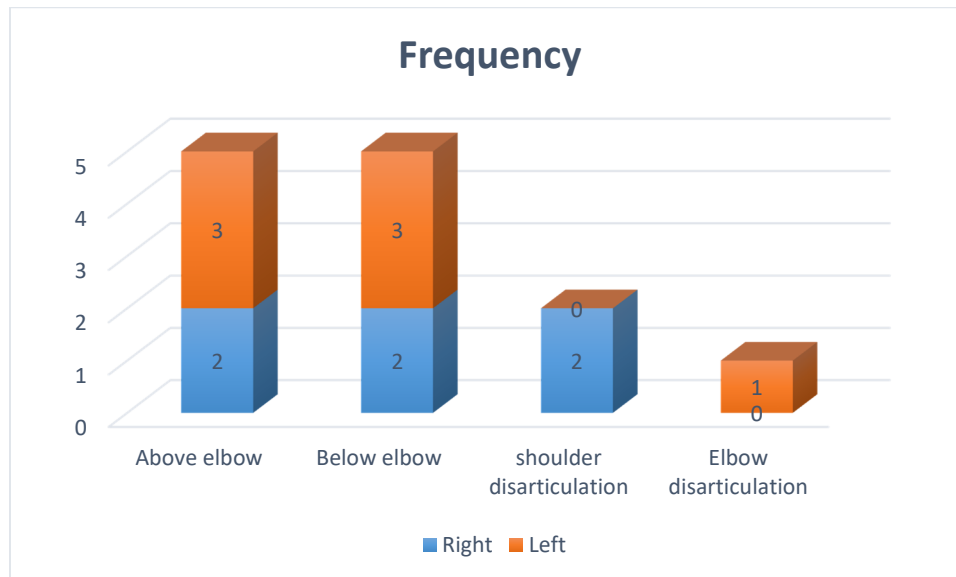


Fig 7: Level of upper limb amputation done at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Majority (59.7%) of patients were admitted on emergency basis while the rest were on elective.

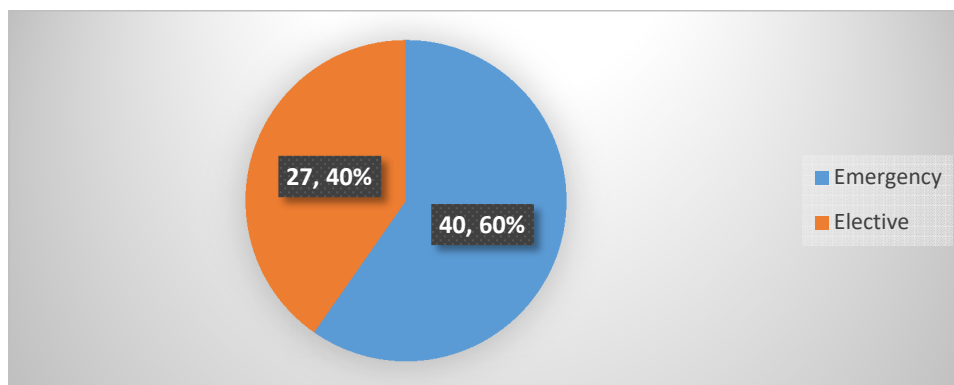


Fig 8: Pattern of admission at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

About 88.1% (59 patients) have no any comorbid illness. Among patients with comorbid illness, three patients were hypertensive while indication for amputation was DM; three patients with cardiac illness and one patient who is chronic smoker were underwent major amputation due to PAD.

5.4 Short term outcomes and additional procedure done.

Majority (76.1%) of patients acquired post-operative complications.

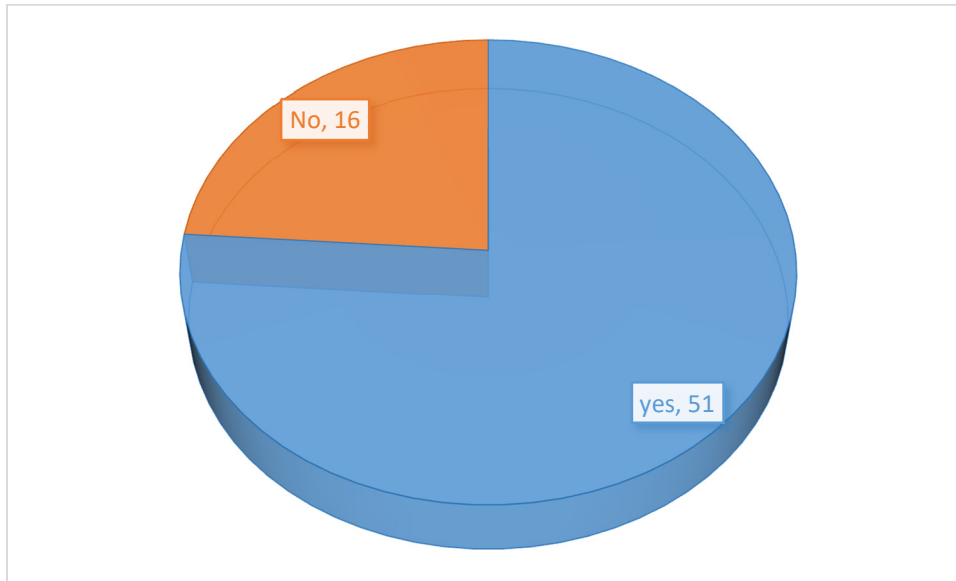


Fig 9: Frequency of post-operative complication among patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

SSI is the most common (74.5%) post-operative complication followed by stump gangrene (21.6%). There was no death during the study period among patients underwent major amputation.

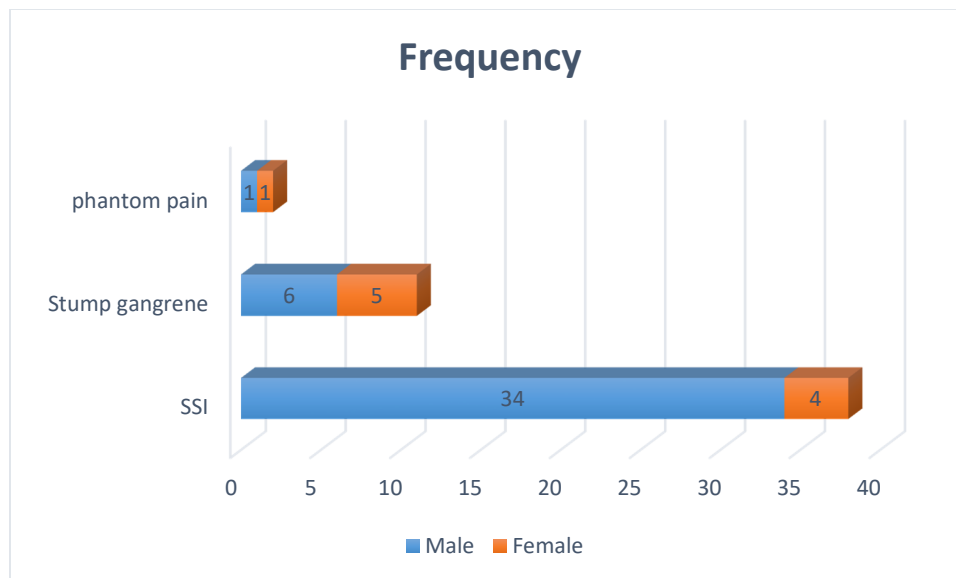


Fig 10: Types of post-operative complication occurred among patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

A total of 45 patients (88.24%) required additional procedure. Wound debridement and closure is the most common (n=29, 56.9%) procedure done for patients who developed postoperative complication after major amputation followed by Re amputation (n=8, 15.7%) and secondary suturing (n=5, 9.8%). Skin graft done for (n= 3, 5.9%). 3.9% of patients healed with wound care only. Re amputation was done for patients who developed stump gangrene.

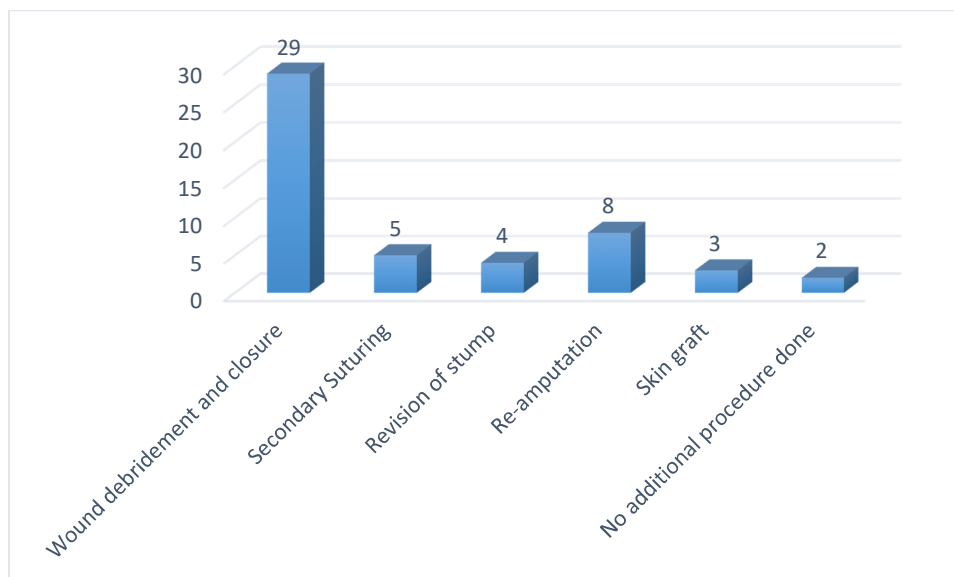


Fig 11: Additional procedure done for patients who developed post op complication after major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

In age group ≤ 40 years the commonest indication for amputation is trauma (63.16%), followed by malignancy and gangrene from tight splint application by traditional healer; each contributed 10.53%. In age group above 40 years, Diabetes mellitus and PAD are the commonest indications of amputation in which each contributed about 34.5% followed by trauma (27.59%).

Table 3: Age Vs Indication cross tabulation in patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Age	Indication for Amputation							Total
	Trauma	Diabetes mellitus	PAD	Malignancy	Traditional tight bamboo	Burns	Others	
<15	4	0	0	1	2	0	2	9
16-40	20	1	1	3	2	2	0	29
41-65	5	6	3	0	1	0	0	15
>65	3	4	7	0	0	0	0	14
Total	32	11	11	4	5	2	2	67

Fisher's Exact test= 39.854, p =0.000

A Fisher's Exact Test was conducted to examine whether there was a relationship between an indication and post op complication. The results revealed that there was a significant relationship between the two variables (Fisher's Exact Test =14.65, P= 0.008). About 91% of DM patients and 87.5% patients of trauma developed post op complications after major amputation. (Table 3).

Table 4: Indication Vs Postop complication cross tabulation in patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Indication for amputation	Post op complication		Total
	Yes	No	
Trauma	28	4	32
Diabetes mellitus	10	1	11
PAD	5	6	11
Malignancy	1	3	4
Traditional tight bamboo	4	1	5
Burns	2	0	2
Others	1	1	2
Total	51	16	67

Fisher's Exact Test =14.65, P= 0.008

A Fisher's Exact Test was conducted to examine whether there was a relationship between an indication and site of amputation. The results revealed that there was a significant relationship between the two variables (Fisher's Exact Test =11.16, P= 0.041). (Table 4). Amputations done due to complication of DM and PAD are sorely in lower limb.

Table 5: Site of amputation Vs indications cross tabulation in patients underwent major amputation at AaBET hospital, Saint Paul's Millennium Medical College, Addis Ababa, Ethiopia from August 2015 up to July 2017 G.C

Indication for amputation	Site of amputations		Total
	Upper limb	Lower limb	
Trauma	7	25	32
Diabetes mellitus	0	11	11
PAD	1	10	11
Malignancy	0	4	4
Traditional tight bamboo	3	2	5
Burns	1	1	2
Others	1	1	2
Total	13	54	67

Fisher's Exact Test=11.16, p=0.041

CHAPTER SIX

DISCUSSION

The study is carried out at Addis Ababa Burn, Emergency and Trauma (AABET) Hospital, Addis Ababa, Ethiopia, which is one of the few trauma centers in the country and the capital. Being the leading trauma center in the capital, different orthopedics cases admitted to and operated in the hospital can be fairly representative of the overall scenario in the capital and the country as a whole.

A total of 92 patients were underwent major amputation in study period at AaBET hospital, SPHMMC, accounting for 2.88% of all operation performed in the study period but only 67 patients fulfilled criteria of inclusion.

Among 67 patients analyzed, there were 54 male patients (80.6%) and 13 female patients (19.4%) with the male-to-female ratio of 4.2:1. Majority (43.3%) of the patients who underwent major amputation were in the age range 16-40 years followed by age range 41-65(22.4%). The minimum age was 7 days while the maximum age was 94 years. The mean age was 40.68 ± 23.89 SD and the median age was 37.00 ± 23.89 SD. Most (62.7%) of patients were came from rural area while the rest (37.3%) were from urban and 61.2% of them were married. It is also comparable with the three years retrospective study of the outcome of limb amputations done at the University Teaching Hospital in Butare, Rwanda, where there were 107 patients underwent limb amputation accounting for 3.08% of all operation performed in the study period. Males accounted 75 (70.09%) and 32 (29.91%) were females. The male to female sex ratio was 2.3:1. Their age ranged between 1 to 93 years old with median of 44 years. Most (87.9%) of the patients came from rural area and 11.2% came from urban area (8). In a retrospective study which was undertaken on 132 patients with major limb amputations performed in Kano, Nigeria showed males comprising 114 (86.4%), and 18 (13.6%) females with mean age 30.43 ± 16.28 SD years. Ninety-three (70.5%) patients were below the age of 40 and the peak age was 30-39 years. (24). A retrospective study done at Tikur Anbessa Hospital, during the 12months showed there were 110 patients who underwent major limb amputation. There were 83 males and 27 females. Their age ranged from 1 to 90 years. (27) And a retrospective study conducted by D.H.B. Ubayawansa and W.Y.M Abeysekera at teaching hospital Karapitiya, Sri Lanka on 85 patients who underwent major limb amputation showed 63.5% (n=54) were male and 36.5% (n=31) were females (25). A cross sectional study done in the department of general surgery, Kozhikode, Kerala, India on 81 patients showed mean age of population was 59.23years with a SD of 14.79. The age group ranges from 3 to 90 years. Of this 66 were male and 15 were females. (23). this shows slight higher mean age (59.23years Vs 40.68 ± 23.89) but comparable results in others parameters.

Trauma is the most common cause of major amputation (47.76%), followed by DM (16.42%) and PAD (16.42%) in general. Gangrene following application of tight splint by traditional healer contributed 7.45% of major amputation. Trauma accounts for 87.5%% of male cases and 12.5% of female cases. In age group ≤ 40 years the commonest indication for amputation is trauma

(63.16%), followed by malignancy and gangrene following application of tight splint by traditional healer each contributed 10.53%. In age group above 40 years, Diabetes mellitus and PAD are the commonest indications of amputation in which each contributed about 34.5% followed by trauma (27.59%). Majority (59.38%) of cases of trauma were due to RTA followed by different type of assaults (18.75%). Fall and machine injuries contributed each 9.38% of cases of trauma. A two years retrospective analysis of prevalence and etiology of amputation by Ghosh Das and Pooja, Lahiri Sangeeta in Kolkata, India showed out of 155 amputation cases, 70.3% were victims of trauma, making this the most common cause of amputation. Trauma was the leading cause of amputation among all age groups except for those in their 60s. In fact, in each of the younger groups from the teens to 30s, amputation due to trauma accounted for more than 70% of all amputations. The most common trauma reported were RTAs, railway accidents, and burns due to fire, electrocution, and chemical injuries. The next most common cause of amputation was peripheral vascular disease (27.7%) which tended to increase parallel with age. The rest percent were due to malignancy (22). It is also comparable with two years descriptive cross-sectional study that was conducted at Bugando Medical Center, Tanzania, on 162 patients. Trauma (mainly RTA and falls) and malignancies were most common indications for amputation in young adults (2nd to 3rd) decades whereas complications of diabetes and peripheral vascular diseases were the main indications in the 4th to 5th decades of age. (26) A four years retrospective study of major limb amputations performed in Kano, Nigeria on 132 patients showed the commonest indication was trauma (42.4%), followed by traditional bone setters (31.8%) and malignant tumors (12.9%). Diabetic foot gangrene account for only (4.5%) of amputations (24) which is almost similar with our study. In one year retrospective study done at Tikur Anbessa Hospital, Ethiopia, showed there were 110 patients who underwent major limb amputation. Trauma accounted for 44(40%) of cases. Other indications for amputations included gangrene due to various cases in 35(32%), tumors in 19(17%) and chronic infections 12(11%). Of the 44 patients in the trauma group, 20 were victims of road traffic accident, 5 were injured by machine while the other 19 were due to various causes. Among 35 patients who lost their limb as a result of gangrene, 24 had vascular insufficiency of which nearly 11 were associated diabetes. In two children, amputation was done for gangrene that followed application of traditional splint (27) which is comparable with the finding of our study.

In our study, most (81%) of patients had undergone lower limb amputation which makes ratio of Lower limb to upper limb amputation is 4.3:1. Majority (59.26%) level of lower limb amputation were BKA, followed by AKA (35.19%) and knee disarticulation (5.55%). Above elbow and below elbow are contributed equal percentage (38.46% each) for upper limb amputation followed by shoulder disarticulation (15.38%). The major indications for upper limb amputations were trauma (53.8%) and gangrene following application of tight splint by traditional healer (23.1%) followed by burn (7.7%). Trauma remain the commonest indication of amputation in lower limb too (46.3%) followed by diabetic gangrene (20%) and PAD (18.5%). In a two years descriptive cross-sectional study that was conducted at Bugando Medical Center, Tanzania, the major indications for upper limb amputations were trauma (42.3%) and malignancies (24.6%) while

diabetic gangrene (45.5%) and trauma (32.2%) were the most common cause of amputation in lower limb. Lower limb were involved in 140 (86.4%) cases and upper limb in 22 (13.6%) cases. In the lower limb, the ratio of below knee amputation to above knee amputation was 1.2:1 in the upper limb, the ratio of below elbow to above elbow was 1.2:1. (26). It is almost similar with our study findings but trauma remains the common indication of amputation in both upper and lower limbs in our findings. In a study conducted in the states of Texas in 2012 on 14,120 patients, upper limb amputation was (4.9%) and lower limb amputations (92%). In upper limb amputations above elbow (3.7%), below elbow (3.3%) and shoulder (1.2%). In lower limb amputations, below knee amputations (BKA) accounted for 23.3%, and above knee amputations (AKA) accounted for 16.5% of the lower limb amputations performed in the state in that year (21). It is also comparable with a three years retrospective study of limb amputations done at the University Teaching Hospital in Butare, Rwanda. The lower limb was amputated in 76.6% and upper limb in only 23.4% Below knee amputation (BKA) done in 37.38% patients and followed by above knee amputation (AKA) in 35.5%.(8). In a four years retrospective study of major limb amputation done in kano, Nigeria showed the most common procedure performed on lower limb amputation were below knee amputation (48cases) followed by above knee 41 cases, knee disarticulation 5 cases and hip disarticulation 4 cases. From upper limb procedures, above elbow comprising 19 cases followed by below elbow 8 cases, and shoulder and elbow disarticulation were 4 and 3 cases respectively which is almost comparable (24). In a two years retrospective analysis of prevalence and etiology of amputation by Ghosh Das and Pooja, Lahiri Sangeeta in Kolkata, India showed Lower limb amputations were much more common (94.8%) than upper limb amputations (5.2%). Among all lower limb amputation cases, below knee amputations were the most common, followed by above knee amputations (22). In one year retrospective study done at Tikur Anbessa Hospital, Ethiopia, showed 110 patients were underwent major limb amputation. Eighty-three (76%) of the patients had their lower limb removed and 27(24%) had upper limb amputation (27).

In our study, majority (n=51, 76.1%) of patients acquired post-operative complications. SSI is the most common (74.5%) post-operative complication followed by stump gangrene (21.6%). There was no death during the study period among patients underwent major amputation. A total of 45 patients (88.24%) required additional procedure. Wound debridement and closure is the most common (n=29, 56.9%) procedure done for patients who developed postoperative complication after major amputation followed by Re amputation (n=8, 15.7%) and secondary suturing (n=5, 9.8%). Skin graft done for (n= 3, 5.9%). 11.77% of patients healed with wound care only. Re amputation was done for patients who developed stump gangrene. In a two years descriptive cross-sectional study that was conducted at Bugando Medical Center, Tanzania, showed Postoperative complications occurred in 54 (33.3%) patients. Surgical site infection was the most common postoperative complication accounting 21.0% of cases. 46 patients (28.4%) required additional procedures. The most common additional procedures performed were wound debridement, secondary suture, and skin grafting in 42.3%, 34.5%, and 23.2% respectively. There were a total of 27 deaths giving a mortality rate of 16.7%. (26). unlike our finding, in this study

post op complication is lower but has higher death rate and no re amputation done. But Common post op complication occurred and additional procedure done were comparable with our finding. A retrospective study of major limb amputations performed in Kano, Nigeria showed Forty one (31.1%) amputations had complications and wound infection is the commonest complication (17 cases) (24) which is comparable but with higher rate of post op complication in our findings.

There was significant association between age of the patient and indication of major amputation. In age group ≤ 40 years the commonest indication for amputation is trauma (63.16%), followed by malignancy and gangrene following application of tight splint by traditional healer; each contributed 10.53%. In age group above 40 years, Diabetes mellitus and PAD are the commonest indications of amputation in which each contributed about 34.5% followed by trauma (27.59%). (P-value=0.000)(Table 2).

There was also significant association between indication and level of amputation (P-value=0.41) (table 4). In a two years descriptive cross-sectional study that was conducted at Bugando Medical Center, Tanzania, showed the major indications for upper limb amputations were trauma (42.3%) and malignancies (24.6%) while diabetic gangrene (45.5%) and trauma (32.2%) were the most common cause of amputation in lower limb (26). Our study also showed association between indication for amputation and post op complication was significant (P-value=0.008) (table3).

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATION

7.1 CONCLUSION

Majority (56.7%) patients were below the age of 40 years and 80.6% of patients were male. Trauma is the most common cause of major amputation (47.76%), followed by DM (16.42%) and PAD (16.42%). Gangrene from tight splint application by traditional healer contributed 7.45% of major amputation. Majority (59.38%) of cases of trauma were due to RTA followed by different type of assaults (18.75%). Fall and machine injuries contributed each 9.38% of cases of trauma. Most (81%) of patients had undergone lower limb amputation which makes ratio of Lower limb to upper limb amputation is 4.3:1. Majority (59.26%) level of lower limb amputation were BKA, followed by AKA (35.19%) and knee disarticulation (5.55%). Above elbow and below elbow are contributed equal percentage (38.46% each) for upper limb amputation followed by shoulder disarticulation (15.38%). About 88.1% (59 patients) have no any comorbid illness. Majority (76.1%) of patients acquired post-operative complications SSI is the most common (74.5%) post-operative complication followed by stump gangrene (21.6%). There was no death during the study period among patients underwent major amputation. Wound debridement and closure is the most common (n=29, 56.9%) procedure done for patients who developed postoperative complication after major amputation followed by Re amputation (n=8, 15.7%) and secondary suturing (n=5, 9.8%). Skin graft done for (n= 3, 5.9%). There is significant association between indication of amputation and post op complication (P-value=0.008) and also between age of the patient and indication of amputation (P-value=0.000).

7.2 RECOMMENDATION

- Systematic disease management and patient education programs should be designed to improve health seeking behavior.
- Emphasis should be given by concerning body to strengthening and improving in infrastructures and some safety practices like installing advance warning and other appropriate signage on roadways and enforcing occupational safety laws.
- Clear system should be designed to collaborate work with traditional healers.
- Comprehensive post-operative rehabilitation centers with trained human power should be established.
- Further exhaustive studies especially prospective studies need to be undertaken in the subject matter.

ANNEX I

REFERENCES

1. Van der Meij W K N. No leg to stand on. Historical relation between amputations surgery and prostheseology 1995; 1:1-256
2. Paudel B, Shrestha BK, Banskota AK. Two faces of major lower limb amputations. Kathmandu Univ Med J 2005;3:212-6
3. Global lower extremity Study Group. Epidemiology of lower extremity amputation in Centers in Europe, North America and East Asia. Br J Surg 2000; 87: 328-37
4. Ephraim PL, Dillingham TR, Sector M, Pezzin LE, Mackenzie EJ. Epidemiology of limb loss and congenital limb deficiency: A review of the literature Arch phys Med Rehabil 2003; 84:747-61
5. Moxey PW, Gogalniceanu p, Hinchliffe RJ, Loftus IM, Jones KJ, Thomson MM, et al. Lower extremity amputation- a review of global variation in incidence. Diabet Med 2011; 1144-53
6. Essoh JB, Bamba I, Dje Bi Dje V, Traore A, Lambin Y. Limb amputations in adults in an Ivorian Teaching hospital. Niger J ortho & Trauma 2007;6:61-3
7. W. Yinusa And M.E. Ugbeye, problems of amputation Surgery In A Developing Country International Orthopaedics (Sicot), 2003; Doi Io
8. Murwanashyaka E, Ssebuufu R, Kyamanywa P. prevalence, Indications, levels and outcome limb amputations at University Teaching Hospital-Butare in Rwanda 2013; 18(2)
9. Olasinde AA, Oginni LM, Bankole JO, et al. Indications for amputations in ile-ife, Nigeria. Niger J Med 2002;11: 118-121
10. Abou-Zamzam Jr AM, Teruya TH. Killeen JD, et al. Major lower extremity amputation in an academic vascular center. Ann Vasc Surg. 2003; 17:86-90
11. Armstrong DJ, Wrobel J, Robbins JM: Guest Editorial: are diabetes related wounds and amputations worse than cancer? Int Wound J 2007,4 (4):286-287
12. Vamos EP, Bottle A, Majeed A, Millett C: Trends in lower extremity amputations in people with and without diabetes in England, 1996-2005. Diabetes Res Clin pract 2010, 87:275-282
13. Lopeze-de-Andres A, Hernandez-Barrera V, Mrtinez huedo MA, Mi-di-Miguel A, Carrasco-Garrido p, Jimenez Garcia R: Trends in lower extremity amputations in people with and without diabetes in Spain, 2001-2008. Diabetes Care 2011,34:1570-1576
14. Lim TS, Finlayson A, Thorpe JM, Sieunarine k, Mwipatayi Bp, Brady A, Abbas M, Angel D: Outcomes of a contemporary amputation series. ANZ J Surg 2006, 76:300-305.
15. Remes L, Isoaho R, Vahlberg T, Hiekkänen H, Korhonen K, Viitanen M, Rautava P: Major lower extremity amputation in elderly patients with peripheral Arterial disease: incidence and survival rates. Agin Clin Exp Res 2008, 20(5):385-393.

16. Heikkinen M, Saarinen J, Suominen VP, Virkkunen J, Salenius J: Lower limb amputations: Differences between the genders and long term survival. *Prosthet orthot Int* 2007; 31(3):277-286.
17. Kohler F, Cieza A, Stucki G, et al. Developing Core Sets for persons following amputation based on the International Classification of Functioning, Disability and Health as a way to specify functioning. *Prosthet ortho Int.* 2009; 33(2):117-129.
18. An Introduction To Orthopedics, Department Of Orthopedic Surgery, AaU Medical Faculty, 1994;pp1-77
19. Ziegler-Graham G, Mackenzie EJ, Ephraim PL, Travison TG, Brookmeyer R. Estimating the prevalence of limb loss in the United States:2005 to 2050. *Archives of Physical Medicine and Rehabilitation* 2008; 89(3):422-9.
20. Dillingham TR, Pezzin LE, Mackenzie EJ. Limb amputation and limb deficiency: Epidemiology and recent trends in the United States. *Southern Medical Journal* 2002; 95(8):875-83.
21. Texas Fact Sheet. Amputee Coalition 2015; 1:1-6.
22. Ghosh Das Pooja, Lahiri Sangeeta. Prevalence and etiology of amputation in Kolkata, India: A retrospective analysis. *Hong Kong physiotherapy Journal* 2013; 31:36-40.
23. Unnikrishnan E.P, Rakesh Rollands, Sasi M. Parambil et al. Epidemiology of major limb amputations: a cross sectional study from a South Indian tertiary Care hospital. *Int Surg J.* 2017; 4(5):1642-1646.
24. A.Ajibade, O.T. Akinniyi, C.S Okoye. Indications and complications of major limb amputations in Kano, Nigeria. *Ghana Medical Journal* 2013;47:4
25. D.H.B. Ubayawansa, W.Y.M. Abeysekera, M.M.A, J, Kumara. Major lower limb amputations: Experience of a Tertiary Care Hospital in Sri Lanka. *Journal of the college of physicians and surgeons Pakistan* 2016; 26(7):620-622.
26. Phillipo L Chalya, Joseph B Mabula, Ramesh M Dass, Isdori H Ngayomela, Alphonse B Chandika, Nkinda Mbelenge, Japhet M Gilyoma. Major limb amputations: a tertiary hospital experience in northwestern Tanzania. Chalya et al. *Journal of Orthopedic Surgery and Research* 2012; 7:18.
27. Manyazewal Dessie.M.D. Preventable amputations in Ethiopia. Department of Orthopedic Surgery, Medical Faculty, Addis Ababa University: a retrospective analysis.

ANNEX II

DATA COLLECTION FORMAT

SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE, SCHOOL OF MEDICINE; DEPARTMENT OF SURGERY.

THIS DATA COLLECTION FORMAT ON INDICATIONS AND PATTERNS OF MAJOR LIMB AMPUTATIONS AT AaBET HOSPITAL, SPHMMC, ADDIS ABABA, ETHIOPIA.

I. Sociodemographic back ground

Card number_____

1. Age_____
2. Sex. Male_____ Female_____
3. Address.
Urban_____ Rural_____
4. Occupation. Farmer_____ Merchant_____ Factory worker_____
Daily laborer_____ Governmental worker_____
Private Worker_____ Others_____
5. Marital status. Single ____ married____ widowed____
6. Pattern of admission
Emergency _____ Elective_____

II. Indication for amputation.

1. Trauma RTA_____ Fall_____ assaults_____ others_____
2. Diabetes Yes____ No____
If yes how long? _____ was on treatment? _____
- 3 malignancy_____
4. Peripheral disease vascular disease_____
5. Others (Specify) _____

III. Comorbid illness

- Hypertension. Yes____ No____
- Diabetes. Yes____ No____
- Cardiac disease. Yes____ No____
- Renal disease. Yes____ No____
- Smoking history. Yes____ No____

IV. Level of amputations

A. Upper limb

- Right _____
- left _____
- Above elbow _____
- Below limb _____
- Shoulder disarticulation _____
- Elbow disarticulation _____
- Others _____

B. Below limb

- ❖ Right _____
- ❖ Left _____
- Above knee _____
- Below knee _____
- Knee disarticulation _____
- Hip disarticulation _____
- Others _____

V. Post op complications

Yes_____ No_____

If yes (specify)

- SSI _____
- Wound hematoma _____
- Wound dehiscence _____
- Stump gangrene _____
- Phantom pain _____
- Others (specify) _____
- No complication. _____

VI. Any additional procedure done

- Wound debridement _____
- Secondary suture _____
- Re amputation _____
- Revision of stump _____
- Skin graft _____
- Others (specify) _____
- No additional procedure done _____