

**PATTERNS, INDICATIONS, AND OUTCOMES OF MAJOR LIMB AMPUTATIONS
AT TIKUR ANBESA HOSPITAL, ETHIOPIA: A RETROSPECTIVE COHORT STUDY
(2019-2024).**



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Abstract

Introduction: Amputation is a critical surgical procedure with a history dating back to ancient times. Despite advancements in surgical techniques and rehabilitation, limb amputations remain necessary for various medical conditions, including irreversible ischemia, severe trauma, uncontrollable infections, and malignancies. Globally, the causes and outcomes of amputations vary significantly, with peripheral vascular disease being the leading cause in developed countries, while trauma and infections predominate in developing nations. Ethiopia, like many low- and middle-income countries (LMICs), faces unique challenges in managing patients requiring amputations, influenced by local health infrastructure, cultural practices, and disease prevalence.

Methods: An institution-based retrospective cohort study was conducted at Tikur Anbesa Hospital, Ethiopia, analyzing medical records of patients who underwent major limb amputations between 2019 and 2024. Data were collected using a pre-tested, coded questionnaire and analyzed using SPSS version 25 computer software.

Results: A total of 190 patients were included in the study. The age range from 8 to 90 years (mean age 43.5 yrs) and male to female ratio is 2.8 to 1. Above knee amputation is the most common pattern with 53.7%. Peripheral arterial disease is the leading cause of major limb amputation with 43.5% followed by trauma (28.9%) and tumor (21.6%). Two third of those with peripheral arterial disease has diabetes mellitus. The post operative complication rate was 40% and surgical site infection was the commonest (36.3%). Statistical significant association was found between post operative complication and those who are operated for an indication of trauma and sever infection. The intra hospital mortality rate was 6.3% and only 34% patients were fitted with prosthesis.

Conclusion- Peripheral arterial disease, trauma and tumor are the commonest indication of major limb amputation in our setting. Majority of amputation are preventable by providing health education, early presentation and proper management of the commonest cause of amputation.

Keywords: - Limb Amputation, Surgical Outcomes, Peripheral Vascular Disease, Trauma, Tikur Anbesa Hospital, Addis Ababa, Ethiopia

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TABLE OF CONTENTS

TABLE OF CONTENTS	4
List of figures.....	6
List of Tables	6
4.5.1. Sample size.....	18
Abbreviation	4
List of figures.....	6
List of Tables	6
Introduction	
1.1 Background	6
1.2 Statement of the problem	6
1.3 Significant of the study	
2. Literature review.....	18
.....	4
2.1 Epidemiology of limb amputation: clinical presentation and global burden.....	
2.2 Clinicalpresentation of limb amputation in adult patients.....	
2.3	
4.5.1. Sample size.....	18
.....	4
List of figures.....	6
List of Tables	6
4.5.1. Sample size.....	18
.....	4
List of figures.....	6
List of Tables	6

4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....	4	
List of figures.....	6	
List of Tables	6	
4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....	4	
List of figures.....	6	
List of Tables	6	
4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....	4	
List of figures.....	6	
List of Tables	6	
4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....	4	
List of figures.....	6	
List of Tables	6	
4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....	4	
List of figures.....	6	
List of Tables	6	
4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....	4	
List of figures.....	6	
List of Tables	6	

4.5.1. Sample size.....	18	TABLE OF CONTENTS
.....		4
List of figures.....		6
List of Tables		6

4.5.1. Sample size 18

List of figures

Figure 1:-Conceptual framework indicating possible relationship between Dependent and independent variables.....**Error! Bookmark not defined.**

List of Tables

Table 1:-work plan.....**Error! Bookmark not defined.**

Table 2:- budget breakdown.....**Error! Bookmark not defined.**

Table 3: Prevalence, indications and patterns of major limb amputation among adult patients among adult patients by gender and age group in at BLH, Ethiopia (from Sep 2019 to Jan 2024) (N= 387)

Table 4: Clinical Characteristics of major limb amputation among adult patients at BLH, Ethiopia (from Sep 2019 to Jan 2024) (N= 387)

Table 5: Outcome of major limb amputation and clinical Characteristics of the study participants, at BLH, Ethiopia (from Sep 2019 to Jan 2024).....

ABBREVIATION:

AEA	-.....Above-Elbow Amputation
AKA	-.....Above-Knee Amputation
BEA	-.....Below-Elbow Amputation
BKA	-.....Below-Knee Amputation
CKD	-.....Chronic Kidney Disease
CS	-.....Corrective Surgery
DBD	-.....Debridement
DM	-.....Diabetes Mellitus
HDA	-.....Hip Disarticulation Amputation
HTN	-.....Hypertension
LOS	-.....Length of Stay
OB	-.....Obesity
PAD	-.....Peripheral Arterial Disease
PS	-.....Prosthetic Surgery
RA	-.....Re-amputation
RS	-.....Revision Surgery
SDA	-.....Shoulder Disarticulation Amputation
SMK	-.....Smoking History

VCVascular Surgery

WCWound Closure

1-Introduction

1.1- Background

Amputation is one of the oldest surgical procedures in human history, tracing its roots back thousands of years. It involves the removal of a limb through the cutting of bone, while disarticulation refers to the separation of a limb at a joint. Historically, early surgical amputations were rudimentary and often performed under extreme circumstances. In the absence of anesthesia, patients endured excruciating pain as their limbs were severed; with methods to control bleeding that included crushing the open stump or immersing it in boiling oil. These crude techniques often resulted in severe complications, including high mortality rates due to hemorrhage and infection. Those who survived the procedure were frequently left with stumps that were ill-suited for fitting prosthetic limbs, severely limiting their functionality and quality of life (1).

The practice of amputation dates back to ancient times, with the oldest known evidence being human remains discovered in Buthiers-Boulancourt near Paris, dating back to around 4900 BC (2). In antiquity, amputations were primarily performed as life-saving measures to halt severe bleeding following traumatic injuries, often sustained in war. Amputations were also conducted for cultural or religious reasons, and even as a form of judicial punishment in certain societies, such as those in Babylonian and Arabic cultures (5). The ancient Greek physician Hippocrates recommended amputation only as a last resort to prevent gangrene, advising that the procedure be performed at the point where the tissue was already necrotic and devoid of sensation. Hippocrates also suggested that disarticulation might be preferable to amputation and advocated

for the use of cautery and vascular ligatures to control bleeding, despite acknowledging the severe complications that often ensued (1).

The techniques described by Hippocrates were largely lost during the Dark Ages but were later reintroduced by AmbroiseParé, a French military surgeon, in 1529. Paré's contributions to the field of surgery were significant, including the invention of the artery forceps, which greatly improved the control of bleeding during surgery (6). Further advancements in the field were facilitated by Morel's introduction of the tourniquet in 1674, which allowed for more precise control of blood flow during surgery, and Lister's introduction of antiseptic techniques in 1867, which dramatically reduced the incidence of postoperative infections (4). The advent of general anesthesia in the 19th century marked a turning point in surgical practices, enabling surgeons to perform more complex reconstructions and create functional stumps that could better accommodate prosthetic limbs. By the 20th century, with a deeper understanding of biology and physiology, as well as improvements in surgical techniques and rehabilitation, outcomes for patients undergoing amputation had significantly improved.

In the United States, the incidence of amputation is estimated at 185,000 cases per year, with a prevalence of approximately 1.6 million individuals living with limb loss as of 2005. This number is projected to double to 3.6 million by 2050, driven by factors such as the aging population and the increasing prevalence of conditions like peripheral vascular disease (7).

The primary indication for amputation is irreversible ischemia of a diseased or traumatized limb. Other indications include uncontrollable severe infections, malignant tumors, and limbs that are no longer functional and can be replaced more effectively by prostheses. The reasons for amputation vary widely depending on geographical location and the available healthcare infrastructure. In developed countries, peripheral vascular disease is the leading cause of amputations, while in developing countries, trauma, severe infections, and malignancies are the predominant indications. These variations underscore the importance of understanding the specific patterns and outcomes of amputations within different healthcare contexts, such as in Ethiopia.

This study aims to investigate the patterns, indications, and outcomes of major limb amputations at Tikur Anbesa Hospital in Ethiopia over a five-year period (2019-2024). By conducting a

retrospective cohort study, the research seeks to provide a comprehensive understanding of the factors leading to limb amputations in this setting, the demographics of affected patients, and the short outcomes post-amputation. The findings from this study will contribute to the improvement of clinical practices and the development of strategies to enhance patient care and rehabilitation in Ethiopia.

1.2- Statement of problem:

Major limb amputations represent a critical medical intervention often necessitated by severe trauma, advanced infections, malignancies, or complications from chronic diseases such as diabetes. In Ethiopia, where healthcare resources are stretched and access to early medical interventions is often limited, the rates of major limb amputations may be higher compared to other regions. Despite the profound impact of these procedures on patients' lives, including physical, psychological, and socioeconomic consequences, there is a significant gap in the understanding of the patterns, indications, and outcomes of major limb amputations in the country.

Tikur Anbesa Hospital, as the largest referral and teaching hospital in Ethiopia, provides a unique opportunity to study these issues. However, there is a lack of comprehensive data on the epidemiology of limb amputations at this institution. Specifically, little is known about the demographic and clinical characteristics of patients undergoing amputations, the primary indications leading to these surgeries, and the short outcomes for these patients.

This gap in knowledge is problematic for several reasons. First, without a clear understanding of the causes and outcomes of limb amputations, it is challenging to develop effective prevention strategies or to optimize surgical and postoperative care. Second, the absence of reliable data hampers the ability to advocate for necessary resources, such as rehabilitation services and prosthetic care, which are essential for improving the quality of life for amputees. Finally, the lack of research in this area limits the ability of healthcare providers and policymakers to make

informed decisions that could reduce the incidence of amputations and improve patient outcomes.

This study aims to address these gaps by retrospectively analyzing data from Tikur Anbesa Hospital over a five-year period (2019-2024). By identifying the patterns, indications, and outcomes of major limb amputations, this research will provide critical insights that are necessary for improving patient care, informing policy decisions, and ultimately reducing the burden of limb amputations in Ethiopia.

1.3- Significance of the study:

This study is crucial for understanding the magnitude and trends of major limb amputations at Tikur Anbesa Hospital, a tertiary care center in Ethiopia. By meticulously analyzing patient data from 2019 to 2024, we aim to quantify the incidence, prevalence, and patterns of these amputations. This information will provide a baseline for future epidemiological studies, enabling the identification of high-risk populations and the development of targeted prevention strategies. Moreover, by investigating the underlying indications for amputation, we can inform the optimization of treatment protocols and the allocation of resources for conditions such as diabetes, trauma, and infections.

The study's findings will contribute to the evidence base on amputation outcomes in a low-resource setting. By examining factors associated with postoperative complications and mortality, we can identify areas for improvement in surgical care, rehabilitation, and patient management. The results will be valuable for healthcare providers, policymakers, and researchers in developing and implementing strategies to reduce the burden of limb loss and enhance the quality of life for amputees. Ultimately, this research will contribute to the improvement of amputee care in Ethiopia and serve as a foundation for further studies in this field.

A comprehensive understanding of the patterns, indications, and outcomes of major limb amputations at Tikur Anbesa Hospital will inform evidence-based decision-making and facilitate the development of targeted interventions. The study's findings will be disseminated through

peer-reviewed publications and conferences to maximize their impact on the prevention, treatment, and rehabilitation of amputees in Ethiopia and similar settings.

2- Literature review:

2.1 Epidemiology of Limb Amputations: Global Burden and Trends:

Limb amputation is a significant global health burden, with approximately 185,000 amputations occurring each year in the United States alone. The prevalence of limb loss in the U.S. is high, with nearly 2 million individuals living with amputations. The majority of these cases are attributable to peripheral vascular disease, particularly among individuals with diabetes, which accounts for 54% of amputations. Trauma is the second leading cause, responsible for 45% of cases, while tumors contribute to less than 2%. The burden of amputation is expected to increase, particularly in aging populations, with projections indicating that the prevalence could double by 2050 due to rising rates of peripheral vascular disease and diabetes among older adults (8).

Similar trends are observed in other countries, such as India, where lower limb amputations constitute 90% of cases, with peripheral arterial disease being the predominant cause. Studies from Thailand, Saudi Arabia, and African countries like Nigeria and Tanzania also reflect a high incidence of lower limb amputations, with trauma and vascular diseases as the leading causes. These variations across regions highlight the global burden of limb amputations and the need for targeted interventions to address the underlying risk factors (9-4).

2.2 Clinical Presentation of Limb Amputations in Adult Patients:

The clinical presentation of limb amputations varies significantly depending on the underlying cause, geographical location, and demographic factors. In the United States, older adults (65+)

and men are disproportionately affected, with a higher prevalence of lower extremity amputations, especially major amputations. In India, the mean age of patients undergoing amputation is 58 years, with a male-to-female ratio of 4:1, and peripheral arterial disease is the most common indication. The clinical profile in Thailand and Saudi Arabia shows a similar male predominance, with lower extremity amputations being more common. In Africa, studies indicate that trauma is the leading cause of amputations, particularly among younger adults, while diabetic foot and tumors also contribute significantly. For instance, in Nigeria, the mean age of amputation is 32.4 years, with trauma and diabetic foot being the leading causes. These patterns underline the importance of early diagnosis and intervention, particularly in high-risk groups, to prevent the progression of conditions that necessitate amputation (8-12).

2.3 Challenges and Strategies of Limb Amputations in Low- and Middle-Income Countries (LMICs):

Limb amputations in LMICs present unique challenges due to limited healthcare resources, delayed presentation, and inadequate access to preventive and rehabilitative services. Studies from Africa and India highlight the high prevalence of lower limb amputations, with peripheral arterial disease, trauma, and diabetic foot as the leading causes. However, the management of these conditions is often complicated by the lack of early detection and appropriate treatment. In Tanzania, for example, a significant proportion of patients require reoperations, with surgical site infections being a common complication. In Rwanda and Kenya, the challenges are exacerbated by the high proportion of patients from rural areas, where access to healthcare is limited.

The findings from Ethiopia further emphasize the role of traditional bone setters, whose practices often lead to severe complications necessitating amputation. Addressing these challenges requires a multifaceted approach, including improving access to primary healthcare, enhancing public awareness about the risks of delayed treatment, and strengthening healthcare infrastructure to provide timely and effective surgical interventions (9-17).

2.4 Etiological Spectrum of Limb Amputations: Geographical and Temporal Variations:

The etiology of limb amputations varies widely across different geographical regions and over time. In high-income countries like the United States, peripheral vascular disease, particularly among individuals with diabetes, is the predominant cause of amputations. In contrast, trauma

remains the leading cause in many LMICs, particularly in younger populations. For instance, in Nigeria and Tanzania, trauma and diabetic foot are the most common indications for amputation, while in Kenya, congenital defects also represent a significant cause. The temporal variation is also notable, with increasing cases of peripheral vascular disease in aging populations, particularly in countries like the United States and India, where the burden of diabetes is rising. Conversely, in some African countries, the role of traditional bone setters and inadequate healthcare access continues to contribute to the high rates of amputations due to trauma and infections. These geographical and temporal variations in the etiological spectrum underscore the need for context-specific strategies to prevent and manage limb amputations (8-15).

2.5 Short-Term Outcomes Following Limb Amputations in Adult Patients:

Short-term outcomes following limb amputations vary based on the underlying cause, level of amputation, and quality of postoperative care. In high-income countries like the United States, the majority of amputations are of the lower extremity, with relatively lower rates of postoperative complications due to advanced healthcare systems. However, even in these settings, the increasing burden of peripheral vascular disease poses challenges for postoperative recovery. In India, the intra-hospital mortality rate following amputation is 10%, with surgical site infections being a common complication.

In LMICs, the outcomes are often worse due to delayed presentation, limited access to rehabilitation services, and high rates of postoperative infections. For example, in Tanzania, postoperative complications occur in 33.3% of cases, with surgical site infections being the most common. The reoperation rates in settings like Rwanda and Ethiopia also highlight the challenges in achieving optimal surgical outcomes. Improving these outcomes requires not only timely surgical intervention but also comprehensive postoperative care, including infection control, rehabilitation, and psychological support for patients (8-17).

Conceptual framework:

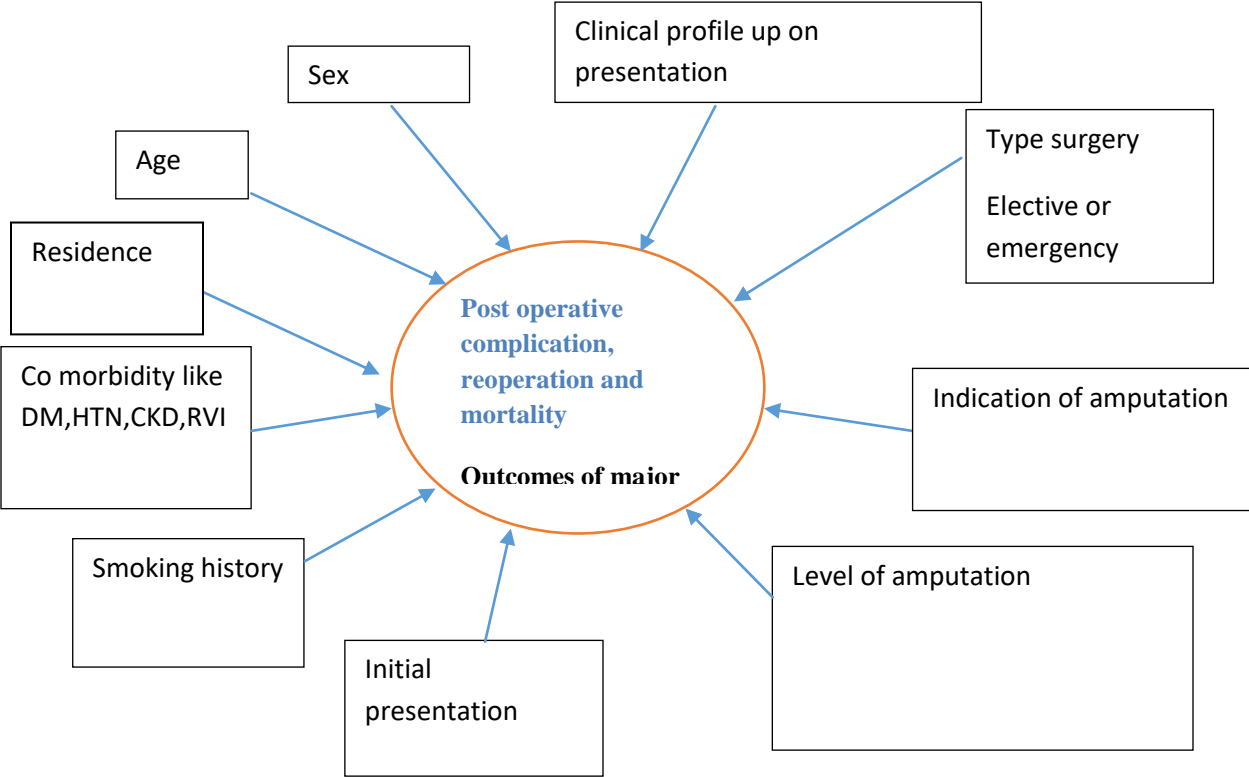


Figure 1: Conceptual framework indicating possible relationship between Dependent and independent variables

3- Objectives

3.1- General objective

- To determine the patterns, indications, and outcomes of major limb amputations among patients at Tikur Anbesa Hospital, Addis Ababa, Ethiopia, between 2019 and 2024.

3.2- Specific objectives

- To determine the incidence, prevalence, and distribution of major limb amputations by age, sex, and type of amputation at Tikur Anbesa Hospital between 2019 and 2024.
- To identify factors associated with the primary indications for major limb amputations among patients at Tikur Anbesa Hospital between 2019 and 2024.
- To determine the rates of postoperative complications and mortality
- To determine describe pattern of prosthesis fitting status of amputee

4. Materials and Methods

4.1. Study Area and Period

This study was conducted at Addis Ababa University orthopedics and trauma surgery department of Tikur Anbesa hospital (from September 2019 to march 2024). Addis Ababa is the capital city

of Ethiopia. It is the only tertiary care center in Ethiopia that has a catchment population of over 100 million.

The hospital's health service covers the outpatient department, inpatient services, critical care, and emergency intervention unit, and different clinics, such as antenatal care clinics, delivery services, tuberculosis, ART, ophthalmology clinics and others. It provides health services for approximately 6.6 million inpatients and 50.6 million outpatients in a year. At present, the majority of orthopedics and trauma cases are diagnosed and treated within orthopedics and trauma centers.

Study design:

A retrospective study was conducted, among adult cases that underwent major limb amputation during study period

Source population:

The source population was all patients who underwent major surgical procedure at orthopedics and trauma surgery department in TikurAnbesa hospital

Study population:

All patients who underwent major limb amputation during study period, eligible for inclusion criteria, evaluated at orthopedics and trauma surgery departments during the study period.

4.4 Inclusion and Exclusion criteria

4.4.1. Inclusion criteria

❖ Inclusion criteria

- -All patients who underwent major limb amputation will be included
- Those with complete documentation
- Treatment Time Frame: Patients presented within the specified 5-year period (from September 2019 to march 2024).

❖ Exclusion criteria

- Incomplete Records: Patients with incomplete or missing medical records and those who underwent minor amputation will automatically be excluded from the study.

4.5. Sample size and Sampling technique.

4.5.1. Sample size

4.5.1. Sample size

The sample size for this study will be determined by using a single population proportion equation.

The sample size for this study will be determined by using a single population proportion equation.

Previous study conducted at [Ayder Hospital in Mekelle](#) indicates that trauma was the leading indication 35.7% (16). So, P will be 0.357, margin of error (d) 0.05 and 95% confidence-interval critical value ($Z_{\alpha/2}=1.96$) and substituting the values gives

$$n = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2} = n_0 = \frac{(1.96)^2 \cdot 0.357(1-0.357)}{(0.05)^2} = 0.88184/0.0025 = 353$$
 but, assuming 10 % non-response rate, the sample size will be: $n=353 + 10 \% = 353 + 35.2 = 387$

4.5.2. Sampling technique

A convenient sampling technique will be employed to recruit study participants until the achievement of the expected sample size within the given study time frame.

4.6. Study Variables

3.6.1. Dependent variables

post-operative outcome

3.6.2. Independent variables

- sociodemographic variables
- comorbidity
- Risk Factors; Smoking history, diabetes, hypertension

- Performance Status
- Clinical factors
- Treatment type
- Level of amputation
- Indication of amputation
- **Outcome factors**; length of hospital stay, presences of any surgical complications, reoperation for the similar reason

4.7. Data collection

4.7.1 Socio demographic and clinical data

Socio-demographic and clinical data was collected using a structured questionnaire (Annex III) and a standard checklist, initially developed in English. Data sources include the operating room registry, patients' medical charts, electronic records, and patient interviews conducted via phone. A pre-tested questionnaire was used to gather information, which includes demographic details, clinical data, and rehabilitation information. The data collection process was facilitated using the Kobo Collect tool.

4.7.2. Data Quality Assurance

All data collection tools (questionnaires and checklist) was standardized. The clinical evaluations was performed by final year orthopedics resident with experienced in care of patients with diseases. The completeness of each data set was checked on daily based and data was double entered to minimize errors.

4.8. Data processing and Analysis

Data was checked for completeness cleaned manually, entered and analyzed using the statistical package for social science (SPSS). Frequencies and cross tabulations was used to summarize descriptive statistics. Statistically significance association was measured by using Chi-square test, univariate and multivariate analysis (logistic regression), odds ratio at 95% confidence interval, P-value < 0.05 will be considered as statistically significant.

4.9. Ethical statement

Ethical clearance and approval for the study was obtained from Institutional Ethics Review Board of Health Institute, Addis Ababa University. Permission was obtained from AAU administration and privacy will be maintained.

4.10. Dissemination plan and use of the result

The findings of this study will be presented to the department of Department of Orthopedics and Traumatology for public defense. Summary report will be submitted to AAU and result will also be communicated to clinicians who treat the patient to identify factors that could be focused on to improve outcome in this setting. Effort will be made to publish the findings in peer reviewed journals.

4.11. Operational definitions:

1-Major limb amputation:

- refers to the surgical removal of a limb at or proximal to the wrist or ankle joint. This includes amputations at the following levels: This can include:

- **Above-Knee Amputation (AKA):** Amputation of the lower limb above the knee joint.
- **Below-Knee Amputation (BKA):** Amputation of the lower limb below the knee joint but above the ankle.
- **Hip Disarticulation:** Amputation through the hip joint.
- **Shoulder Disarticulation:** Amputation through the shoulder joint.
- **Above-Elbow Amputation (AEA):** Amputation of the upper limb above the elbow joint.
- **Below-Elbow Amputation (BEA):** Amputation of the upper limb below the elbow but above the wrist.

2-Reoperation after amputation: refers to any surgical procedure performed on a patient after an initial amputation. This can include:

- **Re-amputation:** Performing another amputation at a higher level due to complications like infection, non-healing, or necrosis.
- **Revision Surgery:** Adjusting or reshaping the residual limb to improve its function or fit for a prosthesis.
- **Prosthetic Surgery:** Surgical interventions related to the fitting, adjustment, or implantation of prosthetic devices, which may be required to optimize the function and comfort of the prosthesis.
- **Corrective Surgery:** Any additional surgery needed to address issues arising from the initial amputation, such as correction of deformities or adjustments needed for better prosthetic fit.
- **Debridement:** Surgical removal of infected or necrotic tissue.
- **Wound Closure:** Secondary surgery to close the amputation wound if primary closure fails.
- **Vascular Surgery:** Procedures to improve blood flow to the residual limb to promote healing.

3- Co morbidity:

- refers to the presence of one or more additional medical conditions that coexist with the primary disease. These co morbid conditions can exacerbate the risk of complications, including the need for limb amputation. This can include:

- **Diabetes Mellitus:** Especially when associated with peripheral neuropathy, poor glycemic control, and diabetic foot ulcers.
- **Peripheral Arterial Disease (PAD):** Reduced blood flow due to atherosclerosis, leading to ischemia and gangrene.
- **Chronic Kidney Disease (CKD):** Often associated with diabetes and hypertension, increasing the risk of vascular complications.
- **Hypertension:** Contributing to vascular damage and poor wound healing.

- **Infection:** Particularly osteomyelitis or severe soft tissue infections that do not respond to treatment.
- **Obesity:** Increases the risk of diabetes, hypertension, and poor wound healing, contributing to the risk of amputation.
- **Smoking:** A significant risk factor for PAD and poor healing outcomes.

4-Smoking history:

-any history of smoking includes the following key components: This can include:

- **Pack-years:** This is a common metric used to quantify smoking history. It is calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked. For example, 1 pack-year is equivalent to smoking one pack (20 cigarettes) per day for one year.
- **Current Smoker:** Someone who currently smokes any tobacco products, either daily or occasionally.
- **Former Smoker:** An individual who has smoked in the past but has quit smoking. The duration of smoking cessation is often specified, such as "quit smoking more than 1 year ago."
- **Never Smoker:** A person who has never smoked, or who has smoked fewer than 100 cigarettes in their lifetime.
- **Cessation Date:** For former smokers, the date when they quit smoking can be documented to assess the duration of cessation.
- **Type of Tobacco Products:** This can include cigarettes, cigars, pipes, and other forms of tobacco use (e.g., smokeless tobacco).

5-Level of amputation:

- are defined based on the anatomical location where the limb is surgically removed. This can include:

1. Upper Limb Amputations:

- **Forequarter Amputation:** Amputation through the shoulder girdle, including the removal of the entire upper limb, clavicle, and scapula.
- **Shoulder Disarticulation:** Amputation at the level of the shoulder joint, removing the entire arm.
- **Above-Elbow (Transhumeral) Amputation:** Amputation through the humerus, above the elbow joint.
- **Elbow Disarticulation:** Amputation at the level of the elbow joint.
- **Below-Elbow (Transradial) Amputation:** Amputation through the radius and ulna, below the elbow joint.

2. Lower Limb Amputations:

- **Hindquarter Amputation (Hemipelvectomy):** Amputation that removes half of the pelvis along with the entire lower limb.
- **Hip Disarticulation:** Amputation at the level of the hip joint, removing the entire lower limb.
- **Above-Knee (Transfemoral) Amputation:** Amputation through the femur, above the knee joint.
- **Knee Disarticulation:** Amputation at the level of the knee joint.
- **Below-Knee (Transtibial) Amputation:** Amputation through the tibia, below the knee joint.

6- Indication of amputation:

- includes a specific set of clinical criteria or conditions that justify the need for a surgical removal of a limb or part of it. This can include:

- **Severe Trauma:** Irreparable damage to the limb, such as from accidents or injuries, where the limb cannot be salvaged.

- **Infection:** Severe, uncontrollable infections, such as gangrene, osteomyelitis, or necrotizing fasciitis, where the infection cannot be controlled by antibiotics or other treatments.
- **Peripheral Arterial Disease (PAD):** Critical limb ischemia due to advanced PAD leading to non-healing ulcers, severe pain, or tissue death (necrosis).
- **Malignancy:** Presence of malignant tumors or cancers in the limb that cannot be treated effectively with other methods and pose a significant risk to the patient's life.
- **Congenital Conditions:** Severe congenital deformities where the limb is non-functional or poses a risk to the patient's overall health.
- **Chronic Pain:** Intractable pain in the limb that is resistant to other forms of treatment, significantly impairing the patient's quality of life.
- **Failed Limb Salvage Procedures:** When previous attempts at limb salvage, such as revascularization or reconstruction, have failed, necessitating amputation.

7-Length of hospital stay: refers to the total number of days a patient remains admitted to a healthcare facility from the day of the amputation surgery until the day of discharge. This metric includes all calendar days the patient spends in the hospital for postoperative care, recovery, and any related complications.

8- Presence of surgical complication: includes any adverse events or conditions that occur as a direct result of the surgical procedure. This can include:

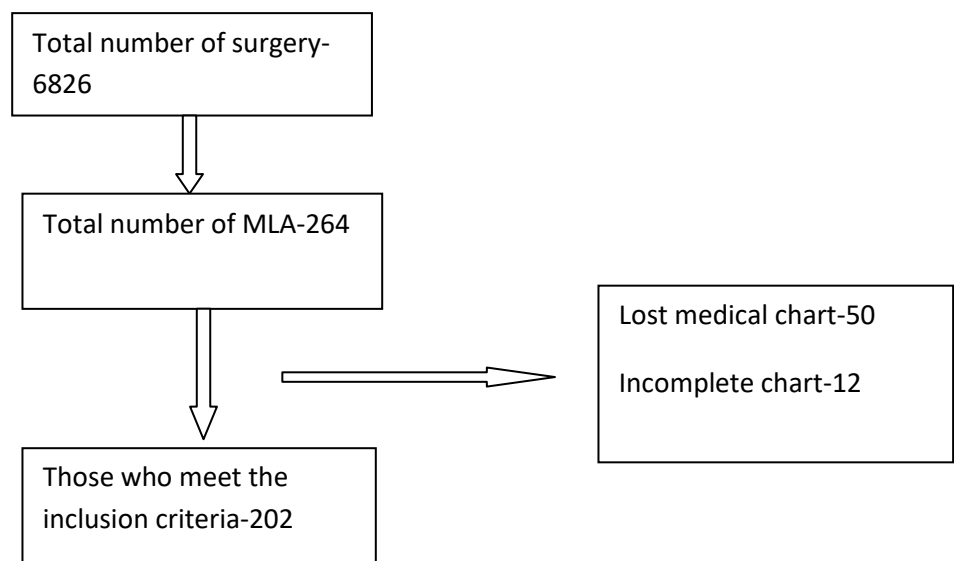
- **Infection:** Includes local wound infections, deep infections involving the bone (osteomyelitis), and systemic infections.
- **Hemorrhage:** Excessive bleeding during or after the surgery, which may require additional intervention.
- **Wound Healing Issues:** Problems such as delayed wound healing, dehiscence (wound opening), or necrosis of the tissue.

- **Phantom Pain:** Pain perceived in the area where the limb was amputated, which can significantly affect the patient's quality of life.
- **Stump Complications:** Issues related to the amputation stump, such as skin irritation, ulceration, or poor fit of the prosthesis.
- **Functional Complications:** Problems affecting the functional outcome of the amputation, including impaired mobility or difficulties with prosthesis use.
- **Vascular Complications:** Issues such as inadequate blood supply to the residual limb, leading to ischemia or necrosis.
- **Nerve Injuries:** Neuropathic pain, phantom limb pain, or neuroma formation due to nerve damage during the procedure.
- **Prosthetic Complications:** Issues related to fitting or using a prosthetic device, though this may be considered separately from immediate surgical complications.
- **Reoperation:** The need for additional surgery due to complications such as infection, wound dehiscence, or poor stump formation.
- **Thromboembolic Events:** Deep vein thrombosis (DVT) or pulmonary embolism (PE) occurring as a result of the surgery.

5-Results

During the study period, a total of 6826 cases were operated in the orthopedics department of Tikur Anbesa hospital. Out of these, 264 were major limb amputation making 3.8%. From these 202 meet the inclusion criteria and included in the study.

Diagram 1- flow chart of exclusion



Socio demographic

The patients were aged 8 to 90 years (mean age 43.54, with a standard deviation of 20.48). Majority of the amputee belongs to age category of 25 to 64 years of age (55.8%). Males

accounted for the majority of the cases, with 147 (74.2%) and females accounting for 55(25.8%). This results in a male-to-female ratio of 2.8 to 1. The majority (57.9%) of the patients were from rural areas.

Table 1 – Distribution of major limb amputation according to age, gender and residence

Variable		Frequency	Percentage (%)
Gender	Male	147	74.2
	Female	55	25.8
	Total	202	100
Age	0-14 yrs	10	3.7
	15- 24 yrs	41	20
	25-64 yrs	109	55.8
	>65 yrs	42	20.5
	Total	202	100
Residence	Rural	116	57.9
	Urban	86	42.1
	Total	202	100

Pattern of major limb amputation

The majority of amputations performed were lower limb amputations, comprising 87.9% of cases. Among these, above-knee amputations were the most common, making up 53.7%, while below-knee amputations accounted for 30%. For major upper limb amputations, above-elbow amputations were the most frequent, constituting 7.9%.

Table 2 – Distribution of various level of amputation

	Frequency	Percent
above knee amputation	104	53.7

below knee amputation	59	30.0
above elbow amputation	17	7.9
hip disarticulation	7	2.6
forequarter amputation	5	2.1
knee disarticulation	3	1.1
shoulder disarticulation	3	1.1
below elbow amputation	3	1.1
hind quarter amputation	1	.5
Total	202	100.0

Co morbid medical condition, smoking and presenting symptoms

The most common symptom leading to amputation was darkening of the extremity (gangrene), observed in 46.3% of cases. Of these, wet gangrene accounted for the majority at 30%, while dry gangrene was present in 16.3%. Other symptoms included fractures (30.5%) and the presence of a mass or lump (21.6%).

The prevalence of smoking among this study patients were 4.7%.

One third of the patients have at least one co morbid medical condition. Type 2 diabetes mellitus (27.4%) and hypertension (19.5%) are the most common associated medical condition.

Diagram 1- Distribution of presenting symptoms

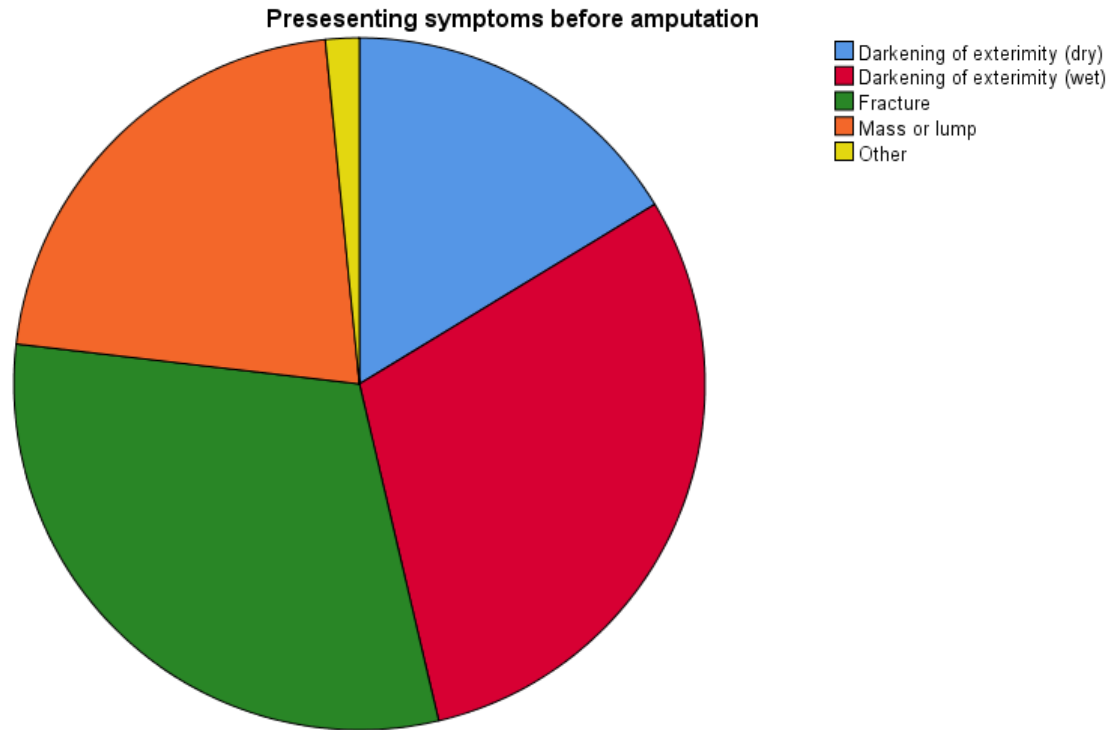


Table 3 – Distribution of co morbid medical condition

Co morbidity	Frequency	Percentage
Type 2 DM	52	27.4
Hypertension	37	19.5
Cardiac condition	15	7.9
CKD	5	2.6
CVD	2	1.1
RVI	2	1.1

Indication of amputation

In this study, the leading cause of major limb amputations was peripheral arterial disease (PAD), accounting for 45.8% of cases, followed by trauma at 28.9% and tumors at 21.6%. Less common reasons included severe infections (2.6%) and complications from traditional bone setter practices (1.1%). The severe infections category encompassed conditions such as necrotizing fasciitis, gas gangrene, and refractory chronic osteomyelitis.

Trauma and tumors are the primary indications for major limb amputation (MLA) in children and young adults, whereas peripheral arterial disease is the leading cause in adults and the elderly. Peripheral arterial disease is the most common indication in both genders; however, trauma is the second most common cause in males, while tumors are more frequent in females. The distribution of amputation indications based on patients' residence shows that the majority of peripheral arterial disease cases (56.3%) occurred among those living in urban areas, while trauma (74.5%) and tumor cases (65.9%) were more prevalent among those from rural areas.

Three-quarters of patients who underwent amputation due to peripheral arterial disease had one or more coexisting medical conditions, while the remaining one-third had no identifiable co morbidities. Diabetes mellitus was linked to 52.9% of peripheral arterial disease cases and 40.2% them had hypertension in our study. From those operated for peripheral arterial disease only 8% had smoking history.

Diagram 2- Distribution of indication of major limb amputation

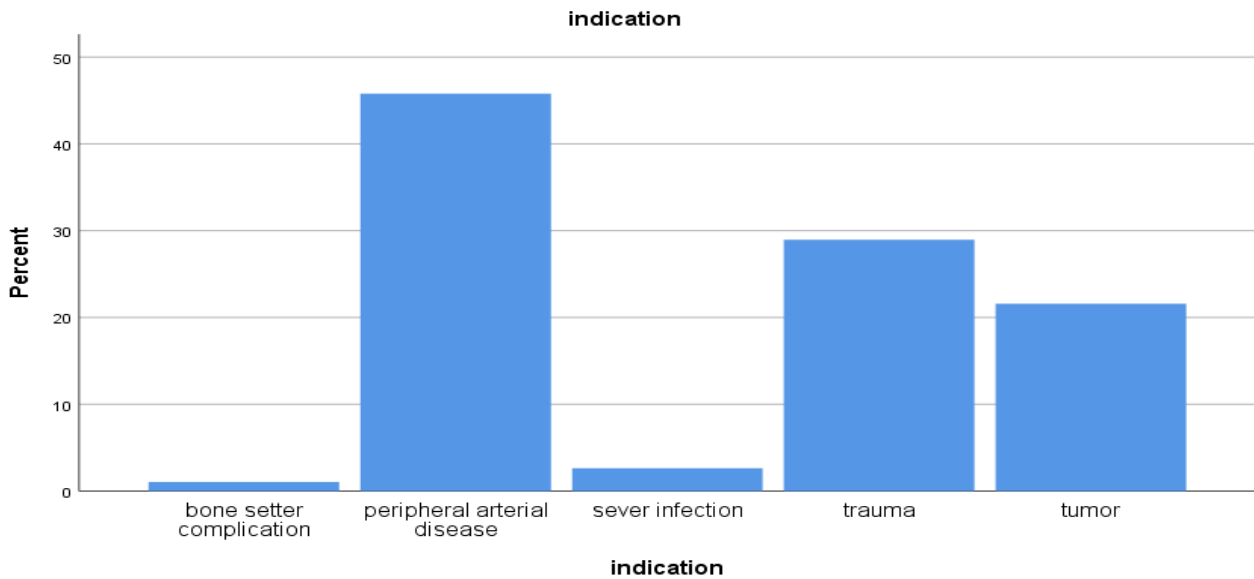


Table 4 – Distribution indication of amputation according to age and gender

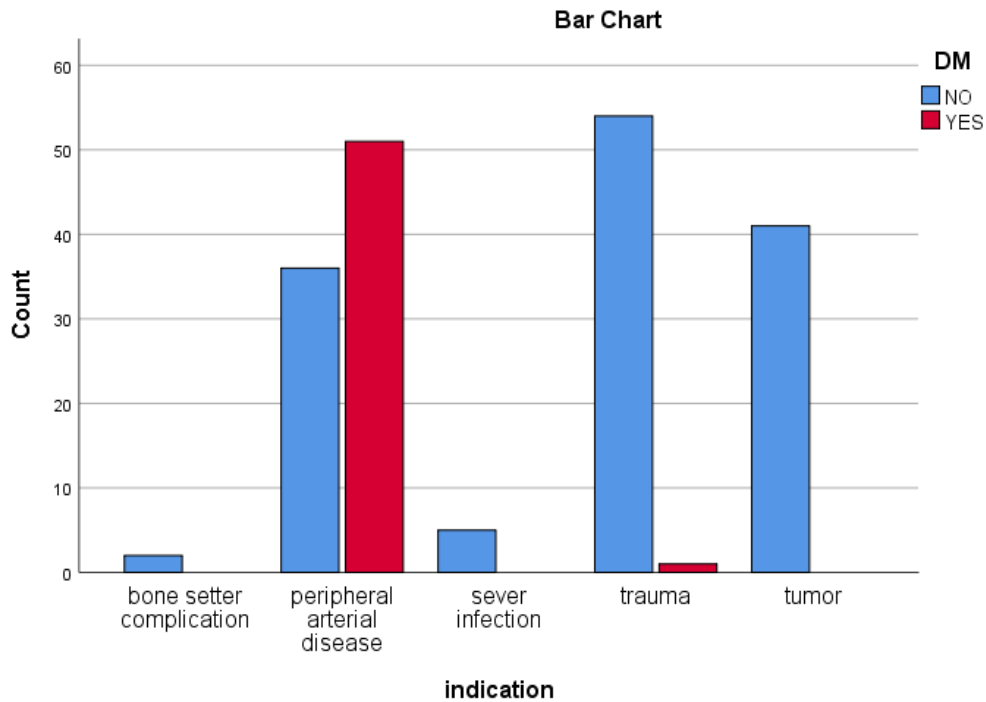
	PAD	Trauma	Tumor	Sever infection	Bone setter	Total

Age category	0-14yrs	-	42.9%	57.1%	-	-	100%
	15-24yrs	-	52.6%	44.7%	-	2.6%	100%
	25-64yrs	47.2%	29.2%	17.9%	4.7%	0.9%	100%
	>65yrs	94.9%	2.6%	2.6%	-	-	100%
Gender	female	53.1%	10.2%	34.7%	-	2.0%	100%
	Male	43.1%	35.5%	17.0%	3.5%	0.7%	100%

Table 5– The distribution of indication according to residence of the patient

Indication	Residence		Total
	rural	Urban	
bone setter	100.0%		100.0%
complication			
peripheral arterial disease	43.7%	56.3%	100.0%
sever infection	40.0%	60.0%	100.0%
Trauma	74.5%	25.5%	100.0%
Tumor	65.9%	34.1%	100.0%
Total	57.9%	42.1%	100.0%

Diagram 3- peripheral arterial disease and DM



Type of surgery and post operative complication

The majority of major limb amputations (77.9%) were performed as emergency procedures, while only 22.1% were done electively.

Table 9– Distribution of amputation according to type of surgery

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Elective	48	22.1	22.1	22.1
	Emergency	154	77.9	77.9	100.0

Total	202	100.0	100.0
-------	-----	-------	-------

Postoperative complications occurred in 40% of patients who underwent major limb amputation. The most frequent complication was surgical site infection, seen in 36.3% of cases. Other less common complications included wound dehiscence (14.2%), stump gangrene (6.8%), and conditions such as deep vein thrombosis (DVT).

Chi square analysis was performed to see the association between post operative complication and whether the amputation was elective or emergency procedure and there was a statistically significant association (χ^2 - 17.34, p - 0.00).

Logistic regression was performed how age , gender, residence area , co morbidity like DM, HTN ,CKD, RVI , smoking status , level of amputation and the indication of amputation affects the presence of post operative complication. The model explains 40.3 % of variation of post operative complication and correctly classifies 76.3% of cases. Association was found with elderly age, rural residence, DM, CKD, RVI, smoking status, and higher level of lower limb amputation but they were not statistically significant. The amputation performed for an indication of trauma had 45.896 odds of likely developing post operative infection than those performed for tumor (p - 0.00). Similarly those amputations performed for an indication of severe infection which includes gas gangrene, necrotizing fasciitis and refractory chronic osteomyelitis 14.654 times more likely to developed post operative infection than those operated for tumor (p - 0.031).

Table 10- Distribution of post operative complication

Post operative complication	Frequency	Percentage
Surgical site infection	69	36.3%
Wound dehiscence	27	14.2%
Stump gangrene	13	6.8%
Others	3	1.6%
No complication	114	60%

Table 11- Distribution of post operative infection according to type of surgery

			is there post operative complication		Total
			no	Yes	
Type of surgery	Elective	Count	37	5	42
		% within Type of surgery	88.1%	11.9%	100.0%
	Emergency	Count	77	71	148
		% within Type of surgery	52.0%	48.0%	100.0%
		% within Type of surgery	60.0%	40.0%	100.0%

Table 11- Binary logistic regression analysis to identify factor associated with the presence of post operative complication (significant variable only).

Variable	Category	Post operative complication		Adjusted odds ratio (95% CI)	P value
		No (%)	Yes (%)		
Indication					
	Tumor	36(87.8)	5(12.2)		

	PAD	58(66.7%)	29(33.3%)	3.136(.478-20.593)	0.234
	Sever infection	2(40)	3(60)	14.654(1.280-167.770)	0.031
	Trauma	16(29.1)	39(70.9)	45.895(8.964-234.971)	0.000

-Variable entered- age ,gender , residence, co morbidity like DM, HTN,CKD,CVD,RVI, smoking , level of amputation and indication for amputation.

Reoperation

The reoperation rate of ours study is 30%. Most of the reoperations involved debridement (I&D) plus stump closure (22.6%), followed by re-amputation (6.3%) and stump closure alone (1.1%). Of those who underwent re-amputation, half involved conversion from below-knee amputation (BKA) to above-knee amputation (AKA), while the remainder consisted of AKA to hip disarticulation (2 cases) and above-elbow amputation (AEA) to shoulder disarticulation (1 case).

Mortality rate and length of hospital stay

Among the patients who underwent major limb amputation (MLA) during the study period, 12 experienced in-hospital mortality, resulting in a mortality rate of 6.3%. The reported causes of death included sepsis, pulmonary thromboembolism (PTE), stroke, cardiac arrest, and one case of poisoning.

The majority of patients (71.1%) had a hospital stay of 1 to 2 weeks, with only 3.7% staying beyond one month.

Rehabilitation

To evaluate prosthesis use, 100 patients were interviewed by phone, and of these, only 34% were using prosthesis.

Diagram 4- Outcome of management

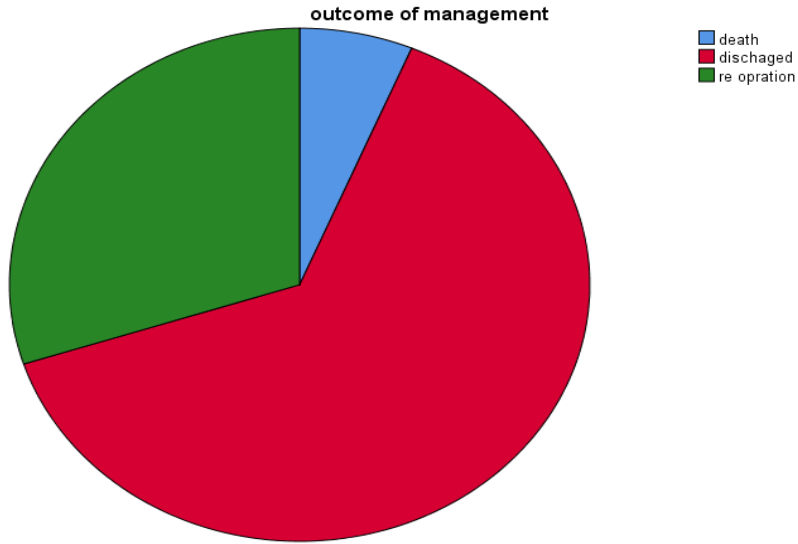


Table 12- Reason for re operations

	Frequency	Percent	Valid Percent	Cumulative Percent
I and D and stump closure	47	22.6	22.6	92.6
Re amputation	16	6.3	6.3	98.9
stump closure	6	1.1	1.1	100.0
Total	202	100.0	100.0	

6-Discussion

Amputation is one of the oldest surgical procedure and it has significant economic, social and physiological effect on the patients as well as the country. The pattern and the indication of major limb amputation vary from country to country and hospital to hospital. This study was done to evaluate the pattern, indication and associated factors of major limb amputation in Tikur Anbesa hospital which is the largest tertiary hospital of the country located in Addis Abeba and to compare it to other similar studies. This will be helpful for the stake holders to take preventable actions.

Socio demography

The mean age of those who underwent major limb amputation was 43.54 years which is similar to the study done in northern part of the country (40.6 years). This also similar to other studies done in east as well as West Africa and Saudi Arabia (45.6years) but the mean age tends to increase in India (59.23 years) and western countries (60 to 70 years). This difference can be explained by the difference in pattern and indication of amputation (7, 8, 9, 11, 12, 13, 16).

The male to female ratio in our study was 2.8 to 1 and this difference distribution in gender is similar in almost all studies.

The majority of patients in our study (57.9%) were from rural areas, which is lower compared to Rwanda's 87% (13).

Pattern (level of amputation)

Major lower limb amputation was the most common procedure in our series, accounting for 87.9%, a finding consistent with other studies. Research shows that preserving the knee joint in amputees enhances rehabilitation potential, and there has been a global decline in above-knee amputations. However, in our study, above-knee amputations (AKA) made up 53.7%, while below-knee amputations (BKA) accounted for only 30%. This contrasts with a study at Ayder Hospital in Mekelle, where AKA represented 35.6%, a significantly lower percentage than ours. Additionally, our results differ from those in Rwanda, Tanzania and Saudi Arabia, where BKA is more common, but are similar to the findings in Nigeria. A possible explanation for our higher rate of AKA is that many patients in our setting presented with advanced gangrene and tumors,

leaving surgeons with no choice but to perform higher-level amputations (7, 9, 11, 12, 13, 16, 19).

Indication

In our study, the leading cause of major limb amputation was peripheral arterial disease (45.8%), followed by trauma (28.9%) and tumors (21.6%). This finding contrasts with previous studies conducted in our country. A study from 20 years ago at the same hospital reported trauma (40%) as the most common cause, followed by tumors (17%) (15). Similarly, a study from northern parts of the country indicated trauma (37.7%) as the primary reason for amputation, with tumors (21%) and peripheral arterial disease (20.7%) following (16). Our results also differ from other African studies in Kenya, Rwanda, Tanzania, and Nigeria, where trauma and diabetic foot complications were the most frequent causes (11, 12, 13, 14). However, our findings align with studies from India and Western countries like the U.S., where peripheral arterial disease is the leading cause, though the percentages vary (India reports 40% due to PAD, while the U.S. sees 54% due to PAD, 45% from trauma, and only 2% from tumors) (8, 9).

Peripheral arterial disease (PAD) is primarily caused by atherosclerosis, which involves the accumulation of fatty deposits in the arterial walls, leading to reduced blood flow to the limbs. Risk factors for PAD include diabetes mellitus, hypertension, dyslipidemia (obesity), smoking, and aging (20, 21). The global prevalence of PAD is estimated to be around 200 million. In developed countries, the prevalence of PAD is between 5% and 12% among individuals over 50 years old and approximately 20% among those over 70 (21). In sub-Saharan Africa it is estimated between 12-15% and one study done in Jimma Ethiopia shows the prevalence of PAD to be 10.8% (20). The epidemiological transition, characterized by a shift from infectious to non-communicable diseases, along with urbanization, has contributed to the increasing prevalence of conditions like PAD in developing nations (20,21). In our study, PAD accounted for nearly 95% of amputations in individuals over 65 years, with most patients coming from urban areas. Notably, about two-thirds of PAD patients also had type 2 diabetes mellitus, which aligns with findings from the U.S. Furthermore, 40% of those with PAD had hypertension, while only 8% had a history of smoking. It is essential for stakeholders to raise public and professional awareness about PAD and its risk factors, promote early diagnosis through screening for at-risk individuals, and enhance vascular surgery services to restore blood flow and prevent limb loss.

Major limb amputation secondary to damage caused by trauma often associated with road traffic accident, industrial injury and bullet injury. Though trauma is the second commonest cause of amputation in our series, it still contributes for almost one third of the cases. So enforcement of traffic laws, improved road design, vehicle safety and improved work place safety will decrease amputation that occurred due to trauma.

Another significant finding is the high proportion of tumor-related amputations, accounting for 20% of cases, which is much higher than the 2% reported in the U.S. Many of these patients could have undergone limb-salvage procedures had they presented earlier or had access to the necessary surgical facilities. This underscores a lack of awareness among the general population and a shortage of equipment for limb-salvage surgeries.

Post operative complication

The post operative complication rate in our study was 40% which was slightly higher than Tanzania (33%) and Nigeria (39%) and lower compared to the Indian study 48%. The most common post operative infection was surgical site infection which was consistent with other studies (9, 11, 12).

A logistic regression analysis was conducted to determine factors linked to postoperative complications. The study identified associations between postoperative infections and factors such as advanced age, rural residency, diabetes, RVI, smoking, higher level of amputation and the indication for amputation. A statistical significant association was specifically observed in amputations performed due to severe infection and trauma.

Chi square analysis was performed to see the association between post operative complication and whether the amputation was elective or emergency procedure and there was a statistically significant association (χ^2 - 17.34, p- 0.00).

Re operation

Reoperation was performed for 30% of patient in our series which was much higher than that of the Rwanda study (7.5%) and comparable to the Indian study (32%) (9, 13). Much of the reoperation was performed for debridement (22.6%) and closure followed by re amputation (6.3%).

The re amputation rate was lower than the report in Tanzania (9.9%), Nigeria (7.4%) and higher than India (4.9%) (9, 11, 12).

Mortality

The early in hospital mortality rate after major limb amputation ranges from 4 to 22% (22). The mortality rate of our study was 6.3% which was consistent with the report from Cameroon (18). This result higher than the report from Rwanda (4.7%) and much lower than the report from Tanzania (16.7%) and India (10%) (9,12, 13). The cause of death in our study was sepsis, cardiac arrest and pulmonary embolism.

Rehabilitation

Looking in to patient rehabilitation, in this study only 34% of patients were fitted with prosthesis. This result is higher than that of the report from Rwanda (6.5%) but still the majority of patients (66%) have no prosthesis they ambulate either crutch or wheel chair.

7-Conclusion

During the study period, major limb amputation accounts for 3.8 % of major surgery done in the orthopedics department of Tikur Anbesa hospital. The majority of major limb amputation was performed on lower limb from this above knee amputation accounts for 53.7% which was much higher than other studies despite the advocacy of preserving the knee. Peripheral arterial disease become the most common cause of major limb amputation in our study compared to similar studies previously done in similar hospital and northern part of the country. However, trauma and tumor are still contributes for significant portion of the indication. Strikingly tumor accounts for 20% of cases which is much higher compared to the report from US (2%).

The post-operative complication rate in this study was 40%, with a statistically significant association found between complications and amputations performed due to severe infection and

trauma. The mortality rate was 6.3%, and only 34% of patients who underwent major limb amputation were fitted with prosthesis.

Limb loss has profound social, economic, and psychological impacts, and most cases are preventable. Enhancing traffic safety, improving road conditions, and ensuring safer work environments could reduce the incidence of traumatic amputations. Raising awareness and providing education about the risk factors for peripheral arterial disease could lower the rate of vascular amputations. Expanding access to limb salvage procedures by training more sarcoma surgeons and providing the necessary equipment for limb salvage surgeries could reduce tumor-related amputations. Increasing the availability of prosthetics is also recommended.

No matter how advanced prosthetic devices and replacement services may be, they can never fully replicate a naturally functional, anatomically intact limb. This underscores the critical importance of emphasizing prevention over treatment.

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19-The Patterns of Acquired Upper and Lower Extremity Amputation at a Tertiary Centre in Saudi Arabia Fayez M. Alshehri , Salwa A. Ahmed , Sami Ullah , Haitham Ghazal , Shah Nawaz , Ahmed S. Alzahran

20- The Prevalence of Peripheral Arterial Disease and Associated Factors among Adults in Jimma Town, South-West Ethiopia: A Community Based Survey Afework Hagos1 , Sintayehu Fekadu2 , Thomas Allison3 , Mekitie Wondafrash4 , Abdulhalik workicho5 and Hailu Abera Mulatu1

21- Epidemiology of Peripheral Artery Disease: Narrative Review

[Lilla Horváth](#)^{1,2,*}, [Noémi Németh](#)², [Gergely Fehér](#)^{1,3}, [Zsuzsanna Kívés](#)⁴, [Dóra Endrei](#)^{4,5} and [Imre Boncz](#)^{4,6}

22- **Early Post-operative Mortality After Major Lower Limb Amputation: A Systematic Review of Population and Regional Based Studies** [J J van Netten](#)¹, [L V Fortington](#)², [R J Hinchliffe](#)³, [J M Hijmans](#)⁴

Annexes

ANNEX ONE: DATA COLLECTION TOOL AND CONCENT FORM

A. Data collection tool and consent form English Version

Addis Ababa University college of Health Science Department of Orthopedics and traumatology

English Version Consent Form containing page

Serial no_____ Card no _____ Name of study participant: _____

I have been requested to participate about this study, which plans to patterns, indications, and outcomes of major limb amputations at Tikur Anbesa Specialized hospital Orthopedics and Traumatology center, Addis Ababa, Ethiopia:

With full understanding of the situations that I agreed to give the informed consent voluntarily to the researcher to use my medical records taken for the research study. Moreover, I have had the opportunity to ask questions about the project and I have received clarification to my satisfaction. I was also told that results would be reported timely to the requesting physicians for the appropriate treatment and management of for causes of major limb amputations.

I agree that I am contributing to the research of my fellows by participating in this project. I have asked some questions and clarification has been given to me. I have given my consent freely to participate in the study, and I approve my agreement with my signature.

Participants' sign: _____ Date _____ Principal Investigator's sign: _____ Date _____

At what time the data collected while the patient is around having his/her medical record _____

B: Questionnaires

These questionnaires are prepared to determine patterns, indications, and outcomes of major limb amputations at Tikur Anbesa Specialized hospital Orthopedics and Traumatology center, Addis Ababa, Ethiopia: A retrospective cohort study conducted from Sep 2019 to Jan, 2024.

Part 1. Socio-Demographic Data		
Sr. no	Questions to be asked	Response
01	Patient ID:	
02	Sex	• Male . Female
03	Age at diagnosis	_____ years old
04	Residence	• Urban . Rural
Part II. Questionnaires Related to Strong Risk Factors for Limb Amputation		
01	Smoking	✓ Yes ✓ No
02	If yes (Q 01) please mention pack year	
03	Presence of comorbidity	A. Yes B. No
04	If yes (Q 03) please select the comorbidity	a. DM b. HTN c. cardiac condition d. CVD e. CKD f. RVI

		<p>g. Malignancy</p> <p>h. None</p> <p>i. Others please specify.....</p>
05	For (Q03) please specify the duration since the diagnosed of the comorbidity present	
06	For (Q04) Please list medications used for comorbidity	
07	For (Q04) Please write follow-up status and adherence to medical management	
08	For (Q04) Please list other systemic complications related to specific comorbidity	
09	If the patient had Malignancy	<p>a. Histology -----</p> <p>b. Duration since diagnosis -----</p> <p>c. Stage -----</p> <p>d. Medical management given if any-----</p>
Part III. Questionnaires Related to Clinical Presentation during initial visit to amputation center		
01	Presenting Symptoms before amputation (check all that apply):	<p>✓ Symptoms of PN</p> <p>✓ Symptoms of PAD</p> <p>✓ Fracture</p> <p>✓ Darkening of extremity</p>

		<ul style="list-style-type: none"> ✓ Mass/lump ✓ Other (please specify):
02	Duration of Symptoms Before amputation:	<ul style="list-style-type: none"> ✓ <1 month ✓ 1-3 months ✓ 4-6 months ✓ >6 months
03	V/s during admission for amputation	<ul style="list-style-type: none"> ✓ G/A = ASL/CSL/ Acute on chronic ✓ Bp ✓ PR ✓ RR ✓ T0 ✓ Pso2
04		
Part IV. Questionnaires Related to Pertinent Investigations done		
01	Pertinent Laboratory data:	<ul style="list-style-type: none"> ✓ Current HA1c (for DMs only) ----- ✓ Current Cr (for all) ----- ✓ Current CD4 (for RVIs only) ✓ Current Hgb (for all) ----- ✓ Others please specify
02	Pertinent Radiologic Investigations:	<ul style="list-style-type: none"> ✓ Echo (if only abnormal) ✓ ECG (if only abnormal) ✓ Doppler of lower extremity

		✓ Others please specify (CT, X-ray, MRI...)
03		
Part V. Questionnaires Related to Amputation		
01	level of amputation	<ul style="list-style-type: none"> a. Upper limb b. Lower limb c. Both upper and lower limb but 3 limbs d. Both upper and lower limb all 4 limbs
03	If answer for(Q01) is Upper limb	<ul style="list-style-type: none"> a) forequarter ampt. b) shoulder disarticulation c) above elbow ampt. d) elbow disarticulation e) below elbow disarticulation f) Bilateral or unilateral
04	If answer for(Q01) is Lower limb	<ul style="list-style-type: none"> a. -hindquarter amputation b. -hip disarticulation c. -above knee ampt. d. -knee disarticulation e. -below knee disarticulation f. Bilateral or unilateral
05	Other detailed comments for c and d of	

	(Q01)	
06	Indication for amputation	<ul style="list-style-type: none"> a. Peripheral arterial disease b. Trauma c. Tumor d. Sever infection e. congenital deformity f. diabetic foot ulcer g. traditional bone setter sequel h. others please specify-----
07	If diabetic foot ulcer	<ul style="list-style-type: none"> a. duration since diagnosis----- b. mode of diagnosis----- c. University of Texas grading----- d. Medical management given----- e. Lower extremity arterial doppler report - -----
08	If Peripheral arterial disease	<ul style="list-style-type: none"> a. duration since diagnosis----- b. mode of diagnosis----- c. Medical management given----- d. Lower extremity arterial doppler report - -----
09	If Sever infection	<ul style="list-style-type: none"> a. Please write specific diagnosis
Part VI. Questionnaires Related to determinant variable for post-operative Patient's Outcome		

01	Type of surgery	A. Emergency B. Elective
02	post-operative outcome	a. Discharged without complications b. Discharged with complications
03	If with post-operative complications for(Q02)	a. Surgical site infection b. Wound dehiscence c. Stump gangrene d. Others please specify-----
04	post-operative length of hospital stay	a. 1 to 2 weeks b. 2 to 3 weeks c. 3 to 4 weeks d. > 4 weeks e. Other please specify----
05	post-operative outcome	c. Discharged improved d. Reoperation e. Death specify the cause of death---
06	If the patient was reoperated please mention reason for reoperation	a. I and d b. Stump closure c. Corrective amputation (revision to higher level) d. BKA to AKA e. Knee dis to AKA

		f. AKA to hip dis g. Others please specify----
07	Prosthesis Status:	a. Prosthesis fitted b. No Prosthesis
10	Current Status by phone call:	Alive Not alive
Part VIII. Additional Information(optional)		
01	Any Additional Information	<input type="checkbox"/> Yes (details:), No
02	Additional Information	Please document blow
##		

Annex Two: Dummy Tables

Table 3: Prevalence, indications and patterns of major limb amputation among adult patients among adult patients by gender and age group in at BLH, Ethiopia (from Sep 2019 to Jan 2024) (N= 387)

Variables	Frequency	Percentage (%)
Sex		
Male		
Female		
Age		
Residence		
Rural		
Urban		

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A. Data collection tool and consent form English Version

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B. Questionnaires

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