



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE
PATTERNS AND INDICATIONS OF AMPUTATION IN AABET
HOSPITAL, ADDISS ABABA, ETHIOPIA: 2 YEAR'S REVIEW

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Abbreviations and Acronyms

ULA – Upper Limb Amputation

LLA – Lower Limb Amputation

AKA- Above Knee Amputation

BKA- Below Knee Amputation

AEA- Above Elbow Amputation

BEA- Below Elbow Amputation

WHO -World Health Organization

AaBET -Addis Ababa Burn, Emergency and Trauma Center

RTA-Road Traffic Accident

FMOH –Federal Ministry of Health

SPSS -Statistical Package for Social Sciences

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ABSTRACT

BACKGROUND: Amputation is a surgical procedure for the removal of a limb which is indicated when limb recovery is impossible. There are different types of amputation, and their causes can vary from one area to the other. Therefore, the objective of this study is to find out the patterns and causes of amputations in patients presented to AaBET Hospital, Addis Ababa, Ethiopia.

METHODS: A hospital based retrospective descriptive study was done. The record of 173 patients who had amputation at different sites after admission to AaBET Hospital, Addis Ababa, from September (9), 12, 2015 – September (9), 10, 2017 were reviewed. Descriptive statistical tools were used to analyze the findings. The results were compared with similar studies worldwide and in Ethiopia.

RESULT: A total of 173 patients had amputation of which 78% were males. The age range was from 4 to 86 years. The commonest type of amputation was major lower limb amputation (46.8%) which includes Below knee amputation (29.1%), Knee Disarticulation (1.7%) and Above Knee amputation (16%) followed by digital amputation (31.4%). There was 14.8% major upper limb amputation. The most common indications were Trauma 75 (43.4%), Gangrene 69 (39.9%) and Tumors 8 (4.6%).

CONCLUSION: Below Knee Amputation was the commonest type of Lower Limb amputation while Digital amputation was the commonest in the Upper Limb. Trauma and Gangrene were the leading indications for amputations in our setup.

KEYWORDS: Amputation. Disarticulation, Amputation Indications, Limb, Trauma, Retrospective

CHAPTER ONE

Introduction

1.1. Background of study

The word Amputation is derived from the Latin word Amputare, which means “Cutting Around”. Amputation can be defined as “removal of diseased, protruding, functioning unit of body”. To restore function, the use of an appliance or prosthesis is required. It can also be defined as the Removal of limb through one or more bones. Disarticulation is the Removal of limb through a joint (1).

Amputation is the most ancient of surgical procedures. Generally, it is aimed at saving life and/or improving function in a diseased extremity. With or without prosthetic replacement, amputation carries high morbidity, the prospect of or actual loss of limb leads to severe emotional and physical problems. It is important that amputations be performed by surgeons who have a complete understanding of amputation surgical principles, postoperative rehabilitation, and prosthetic design. Improved prosthetic design does not compensate for a poorly performed surgical procedure. Amputation should not be viewed as a failure of treatment but rather as the first step toward a patient’s return to a more comfortable and productive life. The operative procedure should be planned and performed with the same care and skill used in any other reconstructive procedure. The National Center for Health Statistics estimated that more than 300,000 patients with amputations live in the United States. The number of amputations performed each year is increasing, mainly because of an aging population. More than 90% of amputations performed in the Western world are secondary to peripheral vascular disease. In younger patients, trauma is the leading cause, followed by malignancy (2).

In developing countries trauma, infections, uncontrolled diabetes mellitus and malignancies are the leading cause for amputation. Most amputee patients in developed countries are older than 60 years of age, and 80-90% of lower limb amputations are performed as a result of vascular problems. Unfortunately, most often patients in developing countries presents late when limb salvage is not a viable option (3). The only absolute indication for amputation is irreversible ischemia in a diseased or traumatized limb. Amputation also may be necessary to preserve life in patients with uncontrollable infections and may be the best option in some patients with tumors, although advances in orthopedic oncology now allow limb salvage in most cases. Injury not

affecting circulation may result in a limb that it is not as functional as a prosthesis. Similarly, certain congenital anomalies of the lower extremity are best treated with amputation and prosthetic fitting (4).

Major limb amputation refers to any amputation performed above the level of the ankle in the lower extremity and the wrist in the upper extremity, whereas minor amputations refer to any amputation performed distal to the ankle and wrist joint. The loss of a limb by any individual, especially in developing countries where the prosthetic services are poor often has profound economic, social and psychological effects on the patient and their family. Major limb amputations are essentially disfiguring operations that carry a fairly high perioperative mortality and morbidity and persons who have undergone amputations are often viewed as incomplete individuals (5).

1.2. Statement of the problem

Amputation is a mutilating surgical procedure, both altering the body image and producing severe functional deficit; yet it is one of the common surgical procedures undertaken in developing countries. While the indications for amputation in Europe and America are dwindling day by day, resulting both from the development of modern technology in the areas of reconstructive vascular and musculoskeletal surgery and the introduction of adjuvant cancer therapy, the situation in Africa is worsening as many treatable diseases and preventable conditions continue to end in amputation. This country also suffers from the lack of rehabilitation available for these unfortunate patients who, as a result, many end up on the streets as glorified beggars. While one research from Black Lion Hospital has reviewed some of the preventable amputations some 17 years back, it's too old to cope with the current increased burden of Road Traffic Accidents in the country and the advances in therapeutic choices of patients with Musculoskeletal tumors and those with diabetic and non -diabetic peripheral vascular diseases globally. The College has no Baseline Data regarding the amputations done in the Hospital. Hence this study is planned essentially to study the changes in patterns of Amputation with the above observable changes in the country and to compare our experience with that of other published information (5).

1.3. Significance of the study

Amputation is a common procedure practiced in Ethiopia. So, the findings of this study will: Supplement other Amputation related literatures, create a baseline data for the hospital and Serve as a clue for those researchers who are interested in conducting further studies in the area. It will also Make concerned bodies (FMOH, Transport minister, Traffic Police officers and the Orthopedic and Oncologic Societies) be aware of the burden of the problem and take appropriate measures, Show the changes in our trend of amputation as a treatment modality with the advent of various treatment alternatives for the indications of amputation and Enable policy makers to design appropriate strategies so that practitioners and other concerned bodies make preventive as well as diagnostic and therapeutic measures.

CHAPTER TWO

LITERATURE REVIEW

2.1. Global

According to a research, what are the key conditions associated with lower limb amputations in a major Australian teaching hospital? Retrospective review of Lower extremity amputation cases performed at the Princess Alexandra Hospital (Brisbane, Australia) between July 2006 and June 2007. One hundred and eighty-six cases were eligible and audited. Overall 69% were male, 56% were first amputations, 54% were major amputations, and mean age was 62 ± 16 years. Key conditions associated included type 2 diabetes (53%), peripheral arterial disease (non-diabetes) (18%), trauma (8%), type 1 diabetes (7%) and malignant tumors (5%). Differences in ages at amputation were associated with trauma 36 ± 10 years, type 1 diabetes 52 ± 12 years and type 2 diabetes 67 ± 10 years ($p < 0.01$) (6).

2.2. Africa

On a study done in Lagos, Nigeria on Lower Limb Amputations at a Nigerian Private Tertiary Hospital, a 10-year retrospective review of lower limb amputations was done. A total of 68 lower limb amputations performed on 64 patients were studied. All were closed amputations. Ages 2 to 76 years were affected with a mean of 36.0 ± 16.2 years and peak age in the 21–30year group. There were 44 (68.8%) males and 20 (31.2%) females, showing a male to female ratio of 2:2.1. Trauma was the most common indication accounting for 42 (61.8%). Motorcycle related accidents were implicated in 26 (61.9%) of the trauma related cases followed by 8 (19.0%) pedestrians involved in road traffic accidents, while 30 (71.4%) of the patients with trauma had visited traditional bone setters before presenting at the hospital. Below knee amputation was done in 51(75.0%) of cases (7).

According to a research, Major Limb Amputations: An Audit of Indications in a Suburban Surgical Practice performed at the Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria, between June 1998 and May 2003. This was a retrospective study. A total of 71 limbs were amputated in 69 patients; 56 limbs (78.1%) were unsalvageable, while 15 limbs (21.1%) were salvageable. Trauma accounted for 76% followed by 22% performed due to gangrene secondary to diabetes mellitus. Out of the 56 unsalvageable limbs, 31 patients presented with severely crushed limbs. Out of the 15 salvageable limbs, there were 11 cases of clean-cut traumatic

amputations, two of soft-tissue sarcoma and one each of ruptured popliteal aneurysm and stenosed popliteal artery. The study concluded that, Trauma and diabetes mellitus were leading indications for amputation (8).

Another research conducted on: Major limb amputations: A tertiary hospital experience in northwestern Tanzania, a descriptive cross-sectional study that was conducted at Bugando Medical Centre between March 2008 and February 2010. A total of 162 patients were entered into the study. Their ages ranged between 2–78 years (mean 28.30 ± 13.72 days). Males outnumbered females by a ratio of 2:1. The majority of patients (76.5%) had primary or no formal education. One hundred and twelve (69.1%) patients were unemployed. The most common indication for major limb amputation was diabetic foot complications in 41.9%, followed by trauma in 38.4% and vascular disease in 8.6% respectively. Lower limbs were involved in 86.4% of cases and upper limbs in 13.6% of cases giving a lower limb to upper limb ratio of 6.4:1 Below knee amputation was the most common procedure performed in 46.3%. There was no bilateral limb amputation (9).

Another study was conducted in Kenya: Major Limb amputations in a provincial General Hospital in Kenya, to determine the pattern of major limb amputations. It was a retrospective study done on patients who underwent major limb amputation between January 1990 and December 1995. The age range was from 1 year and 9 months to 85 years. The highest number of amputees were in the 41-60 year age group. The leading indications were trauma, tumors and complications of diabetes mellitus, each accounting for 26.5% of the amputations done. 94% of the amputations were done on the lower limb while only 8% were on the upper limb (10).

A research done in Sudan, Major limb amputations in El Obeid Hospital, Western: a two-year retrospective review of 50 major limb amputations was done. 72% of the victims were males. The mean age was 51 years $\pm$ SD 34.5. 36% of the amputations were emergency procedures. Sepsis, trauma and vascular causes accounted for 40%, 32% and 16% respectively. The upper limb amputations were due to crushed missile injuries, lacerated wounds of animal bites and gangrenous limbs after post-fracture tight splintage by traditional bone setters. The study showed that 96% of the causes were potentially preventable (11).

In a research, Extremity amputation in Nigeria – a review of indications and mortality, a retrospective review of amputation in Nigeria over a 15-year period were collected and analyzed. The most frequent indications for amputation were trauma (34%); complication of traditional bone

setting (TBS) (23%); malignant tumors (14.5%); diabetic gangrene (12.3%); infections (5.1%); peripheral artery disease (2.1%); and burns (2.1%). The average age of the Nigerian amputee is 33 years (12).

Another research conducted in Nigeria, indications for amputations for amputation in Ile-Ife, Nigeria. It was a retrospective study of amputations during a 13 years' period (1987-1999). 82 patients were studied with a mean age of 35 +/- 22 years. 63 of the patients were adults, while 19 patients were children aged 15 years and below. Trauma was indicated as a reason for 60 patients (73.4%). Road traffic accident with peripheral vascular compromise was the single most common reason for amputation (41.7%). 47 of the 82 patients had lower limb amputations, while the others were upper limbs (13).

2.3. Ethiopia

In a research conducted on preventable amputations in Ethiopia, a retrospective study was made of 110 amputations (Male 83, Female 27) performed at the Tikur Anbessa Hospital during a 12 months between May 1 - April 3 1,200 1- 02. Upper limb amputations (ULA) were performed for 27 (25 %) of the patients and lower limb amputations (LLA) for 83(75%). Amputation was performed for Trauma (40%), Gangrene of various causes (32 %), Tumors (17 %), and Infections (1 1%). The majority 64 (58 %) of the amputations were for conditions, which are preventable; these included all of the 27 upper limbs (100%), and 37 of the lower limbs (45 %) (14).

In a recent study, Patterns and Causes of Amputation in Ayder Referral Hospital, Mekelle, Ethiopia: A Three-Year Experience done using retrospective chart review, the record of 87 patients who had amputation at different sites after admission to Ayder referral hospital, Mekelle, Ethiopia in three years' period were analyzed. A total of 87 patients had amputation of which 78.2% were males. The age range was from 3 to 95 years, and the mean age was 40.6 in years. The most common indications were trauma (37.7%), tumor (24.1%), and peripheral arterial disease (PAD) (20.7%). The commonest type of amputation was major lower limb amputation (58.6%) which includes Above Knee Amputation (35.6%) and Below Knee Amputation (23%) followed by digital amputation (17.2%). There was 11.4% major upper limb amputation of which there was one patient who had re-amputation (15).

CHAPTER THREE

Objective

3.1. General objective

The main objective of this study is assessment of patterns and indications of amputations done from September (9), 12, 2015 – September (9), 10,2017 at AaBET Hospital.

3.2. Specific objectives

The specific objectives of this study is:

- To assess the patterns of amputation at AaBET Hospital.
- To see the common indications for the amputations

CHAPTER FOUR

Methods and Materials

4.1 Study Area

The study was conducted at AaBET Hospital which is an affiliate of SPHMMC and established in 2015 G.C. It is a center mainly setup for the provision of services to patients with burn, medical emergencies and trauma related cases and has several units within it. It has orthopedic, neurosurgical and emergency medicine units together for facilitation and convenient service rendering to visiting patients. But most cases in this hospital are traumatic which might have created variability in the frequency of the Indications for the Amputations.

4.2 Source population

The source population for this study is all patients who were admitted to Orthopedic Unit of AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017 G.C.

4.3 Study population

The study population for this study are all patients who underwent Amputation in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

4.4. Study design, sampling frame and study time

An institution based retrospective descriptive study was used to conduct this research. The study was conducted at AaBET Hospital from March 12- to- July, 16, 2018 G.C.

4.5. Sampling size determination

All patients who underwent amputation from September (9), 12,2015 to September (9), 10, 2017 G.C. were included in this study. The total number of amputations done over the two years is 190 and but 17 of them were excluded making the study among the 173 patients.

4.6. Inclusion and Exclusion Criteria

Inclusion criteria

Exclusion criteria

Patients who were previously operated in other institutions, but required stump revision were excluded from the study. And patients with incomplete or lost charts were excluded.

4.7. Variables

4.7.1. Dependent variables

The Level of Amputation and Indications for the Amputations are the dependent variables.

4.7.2. Independent variables

The independent variables are the Age, Sex, Occupation, Comorbidity and Residence (Region) of patients.

4.8. Method of data collection

A Two-part structured questionnaire organized with instructions was used to collect the data. The questionnaire was adapted from previous studies and after review of literatures relevant to the problem under study to include all the possible variables that address the objective of the study. The 1st part aims to capture their demographic data and information (age, gender, comorbidity and employment,). The 2nd part is aimed at detecting preoperative patient data (category of amputation, the extremities amputated, the levels of amputation and the indications). The list of the charts of patients who have undergone Amputation in AaBET during The 2 years' period was obtained from the log book of the operation room. The data that is needed for this research was collected by reviewing the charts using a checklist developed for this study.

4.9. Data processing and Analysis

Processing of the data was started by checking the gathered data for accuracy and completeness. Each completed questionnaire was assigned unique code and entered in to SPSS version 21 for further analysis. Summary of the data is presented using frequency distributions, cross-tabulations and graphs.

4.10. Operational Definition

Amputation: the removal of a limb through one or more bones.

Major limb amputation: amputation performed above the ankle and above the wrist.

Minor (Distal) Amputation: amputations performed distal to the ankle/wrist joint.

Disarticulation: the removal of a limb through a joint.

BEA: amputation of the forearm through the radius.

Elbow disarticulation: amputation of the forearm through the elbow joint.

AEA: amputation of the arm through the humerus.

Shoulder disarticulation: upper limb amputation through the shoulder joint.

Forequarter amputation: the removal of the whole upper limb with the shoulder Girdle.

BKA: lower limb amputation through the tibia

Knee disarticulation: lower limb amputation through the knee joint.

AKA: lower limb amputation through the femur.

HIP disarticulation: lower limb amputation through the Hip Joint.

Hemipelvectomy: removal of the entire lower extremity with varying amount of the pelvic bone.

4.11. Ethical Consideration

This study was commenced after approval by the Ethical and Research committee of SPHMMC. Confidentiality was observed and no names were quoted. All patients' files were considered to be private and confidential as per hospital ethical and research committee regulations.

4.12. Dissemination of Findings

The result of this study has been submitted to the public health department of SPHMMC as a partial fulfillment of Degree of Medical Doctor (MD). Hard copy and soft copy of this study will be available in SPHMMC library for all undergraduate medical students and other concerned bodies. Publication of the result of this study may be considered according its acceptance and the importance of the findings.

CHAPTER FIVE

RESULT AND DISCUSSION

5.1. Results

A total of 190 Amputations were done in the study period out of which 9 were done for an Indication of stump revision and Revised Amputation and hence excluded from the study. The Medical Records of 5 patients could not be accessed from the Chart store and the card number of 3 patients was not appropriately recorded on the Operation Room Registry Book. So collection of those charts was difficult.

5.1.1. Socio-demographic characters of participants

The data was gathered from a total of 173 patients who underwent Amputation at AaBET Hospital from September (9), 12 ,2015 to September (9), 10, 2017 G.C. Of the 173 patients 135 (78%) were Male and 38 (22%) were Female. Majority of patients 65 (37.6%) are aged between 16 and 30 while 33 (19.1%) are between 32 and 45. The median age is 45, and the minimum and maximum ages are 4 and 86 respectively. Most of the amputated patients were from Oromia (52.6%) and Addis Ababa (41.6%).

Table 1: Demographic Figure of patients who were amputated in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

AGE	Frequency	Percent
0-15	17	9.8
16-30	65	37.6
31-45	33	19.1
46-60	23	13.3
61-75	18	10.4
>75	17	9.8
SEX		
Male	135	78
Female	38	22
Address		
Addis Ababa	72	41.6
Oromia	91	52.6
Amhara region	7	4
Southern Regions	3	1.7

5.1.2. Levels of Amputation and Indications

From the 173 patients, 74 (42.8%) had upper limb and 99 (57.2%) had lower limb Amputations. Out of these 108 (62.4%) underwent major Limb Amputation ((BEA 7 (4%), Elbow disarticulation (2), AEA 11 (6.3%), Shoulder Disarticulation (2), wrist Disarticulation (4), BKA 51 (29.1%), Knee Disarticulation (3) and AKA 28 (16%)). 65 patients (37.6%) had Minor Limb Amputations ((Digital Amputation 55 (31.4%), Hand Amputation 7 (4%), 2 Syme's Amputation and 1 Mid Foot Amputation).

Two patients had bilateral Amputation. The first patient underwent bilateral below elbow amputation following crush machine injury. The other patient underwent bilateral above elbow amputation following unspecified trauma according to the operating room log book but it was difficult to find his Medical chart.

One patient had revised amputation for an indication of stump infection. 4 (2.3%) patients visited a traditional bone setter. 3 of them presented with Gangrene and Below Knee amputation was done. The other patient came with inappropriately tight cast resulting in compartment syndrome and Above Knee Amputation was done.

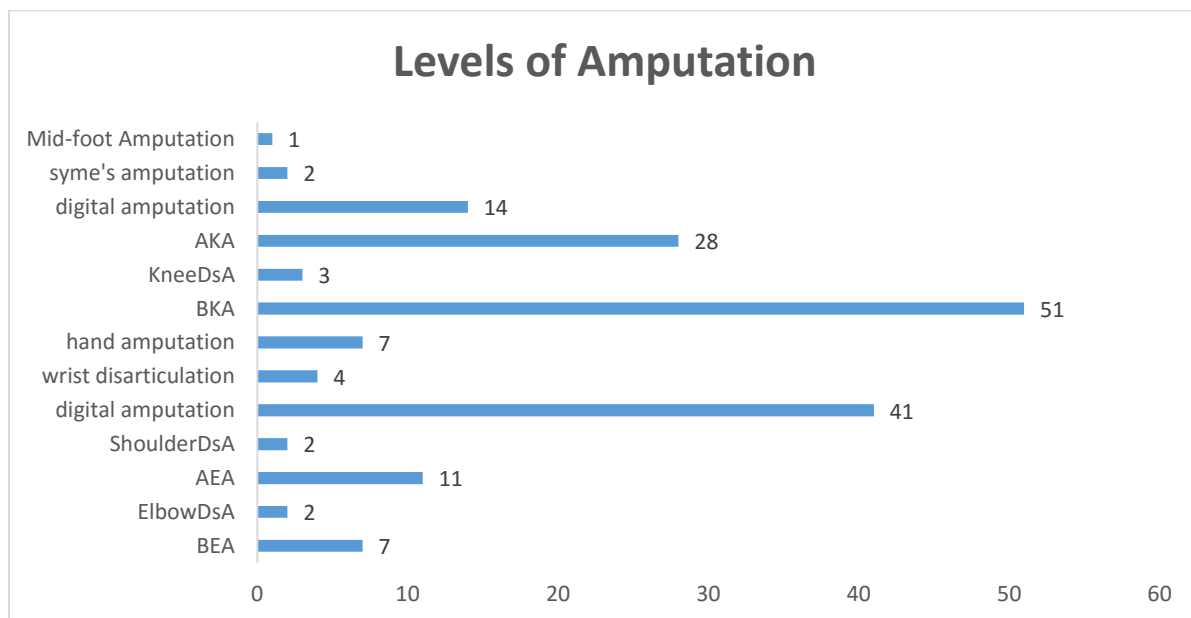


Figure 1: Types of Amputation done in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

The indications for most amputations were Trauma 75 (43.4%) and Gangrene 69 (39.9%) totally accounting to 83.3 % of the amputations. The other indications were Tumors 8 (4.6%), Peripheral Arterial disease 2 (1.2%), Infections 7 (4%), Diabetic Foot ulcer 7 (4%), Compartment syndrome 3 (1.7%) and the others group were 2 (1.2%). Two of the cases in the Others Group Were Animal (hyena) Bite and Olleirs disease.

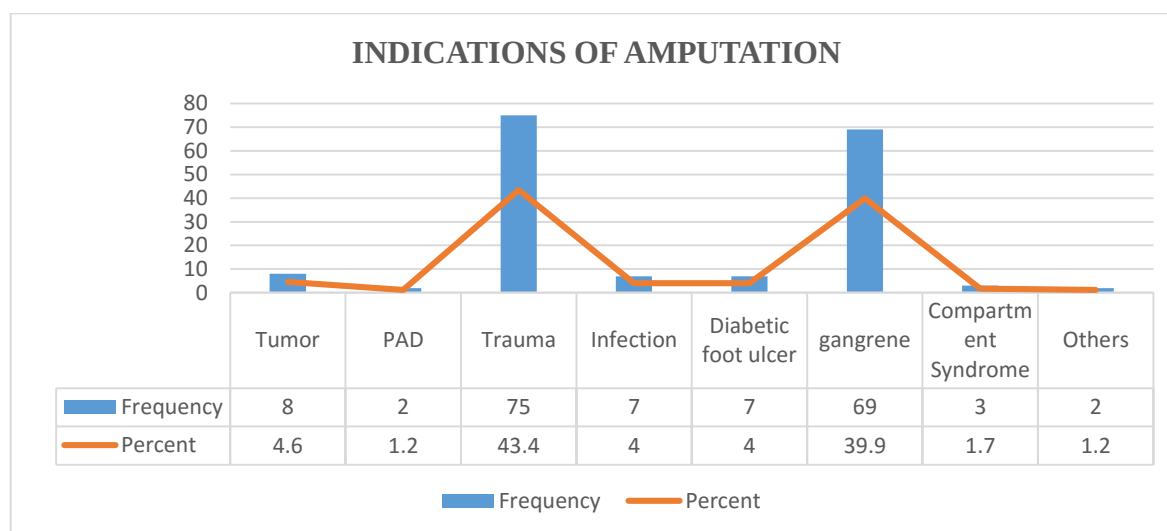


Figure 2: Indications of Amputation done in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

Among the amputations done for trauma, Machine injury is the highest which accounts to 45 (60%) of the traumatic amputations. The others include Road Traffic Accident 16 (21.3%), Violence 6 (8%), Falling down accident 5 (6.7%) and the others group (bullet, burns) accounts only to 3 (4%) of the trauma.

Table 2: Frequency distribution of causes of traumatic amputations in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

Trauma Causes	Frequency	Percent
Road Traffic Accidents (RTA)	16	21.3
Machine Injury	45	60
Violence	6	8
Falling Down Accident	5	6.7
Others (Bullet, Burns)	3	4
Total	73	100

Most of the machine injury related amputations (41 out of 45) were upper limb amputations among which 27 were Digital amputations. And among 16 amputations following Road Traffic Accidents, 14 were Lower Limb Amputations 11 of them being Below Knee Amputations (BKA).

Table 3: Cross-tabulation of causes of trauma and level of amputation in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

		Trauma					Total
		Road traffic accidents (RTA)	Machine Injury	Violence	Falling down accident	others (bullet, burns)	
Amputation Level	Upper Limb	2	41	5	3	3	54
	Lower Limb	14	4	1	2	0	21
Total		16	45	6	5	3	75

Table 4: Cross-tabulation of causes of Trauma and upper limb amputation types in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

		Trauma					Total
		Road traffic accidents (RTA)	Machine Injury	violence	Falling down accident	others (bullet, burns)	
ULA Level	BEA	0	1	2	1	0	4
	Elbow Disarticulation	0	1	0	0	0	1
	AEA	1	4	0	0	1	6
	Shoulder Disarticulation	1	0	0	0	0	1
	Digital Amputation	0	27	2	2	1	32
	Wrist Disarticulation	0	3	0	0	0	3
	Hand Amputation	0	5	1	0	1	7
Total		2	41	5	3	3	54

Table 5: Cross-tabulation of causes of Trauma and Lower limb amputation types in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

		Trauma				Total
		Road traffic accidents (RTA)	Machine Injury	violence	Falling down accident	
LLA Level	BKA	11	2	1	1	15
	Knee Disarticulation	1	0	0	1	2
	AKA	1	0	0	0	1
	Digital Amputation	1	2	0	0	3
Total		14	4	1	2	21

From the amputations done for Gangrene, Majority were caused by Trauma 37 (53.6%). The other causes were Infections 10 (14.5%), Peripheral Arterial Disease 11 (15.9%), Diabetic Mellitus 7 (10.1%), Burn 3 (4.3%) and one case of Unspecified cause of gangrene.

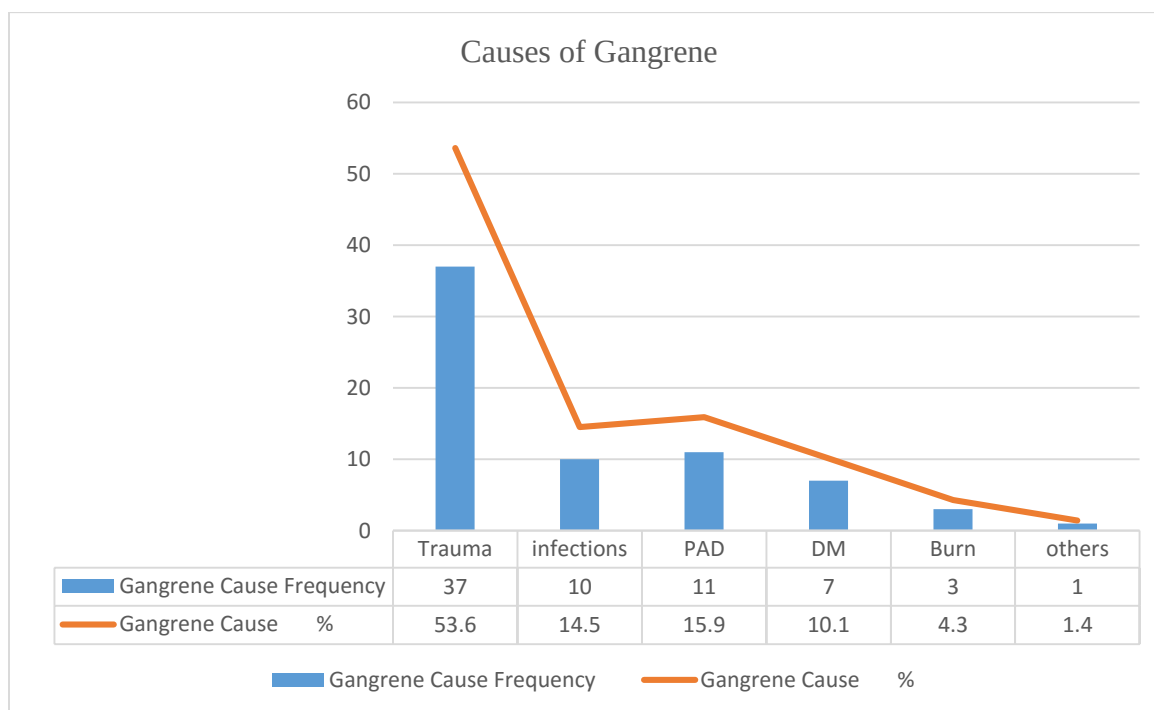


Figure 3: Causes of Amputations due to Gangrene in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

From the 69 gangrene cases, 35 (50.7%) were dry, 31(44.9%) Wet and 3(4.3%) Gas Gangrenes.

Table 6: Types of Gangrene of patients amputated in AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017G.C.

Type of Gangrene	Frequency	Percent
Dry Gangrene	35	50.7
Wet Gangrene	31	44.9
Gas Gangrene	3	4.3
Total	69	100

From the Amputations done for tumor, 4 (50%) were for osteosarcoma ,2 (25%) for soft tissue sarcoma and 2(25%) were unspecified tumors. And in the Infection Group 2 (28.6%) were Chronic Osteomyelitis, 2(28.6%) necrotizing Infections and 2 (42.9%) were unspecified infections. There were 3 cases of Peripheral arterial disease 1 was in a Diabetic patient and the other 2 were not diabetic. There were 3 cases of Compartment syndrome 2 of them were following fracture and one was due to tight splinting by a traditional bone setter.

5.2. Discussion

Looking at the patterns of amputation, Major Lower Limb Amputations were more common than Upper Limb Amputations. Among those lower limb amputations, the most frequent site of amputation in our setup was Below Knee Amputation (29.1%). Similar findings with a study from Tanzania showing 46.3% Below Knee Amputation (9). The finding in Nigeria is a little higher Below knee amputation accounting to 51(75.0%) of the cases (7). On the contrary, the study from Ayder Hospital shows Above Knee Amputation was the commonest type done for 35.6% of the cases (15).

Even though there is variation in the causes of amputation in different age groups, Trauma (includes RTA, burn, FDA, others) (43.4%) and Gangrene (39.9%) were the two common causes in our setup. There were similar results from studies in Black Lion Hospital showing Trauma and Gangrene as an indication to 40% and 32% of the cases respectively (14). In Another study in Sagamu, Nigeria, trauma and gangrene accounted to 76% and 22% of the amputations respectively (8). In the other studies done in Nigeria and Kenya, Trauma was the

commonest indication accounting to 34% and 26.5% of the cases respectively (7,10). This indicates that our safety rules for trauma are very poor, and regarding Gangrene, late presentation of patients and lack of proper follow up of patients in our setup are the main explanations.

Out of the 75 (43.4%) amputations done for trauma, 45 (60%) were due to machine injury followed by Road Traffic Accidents in 16 patients. The studies from Nigeria, Tanzania, Kenya, and Black Lion Hospital Reported Road Traffic Accident as the leading cause of trauma accounting to 41.7%, 38.6%, 26.5%, and 45% of the cases respectively (8, 9, 10, 14). The study from Ayder Hospital reported Falling Down Accident as the commonest cause of trauma (15). This shows that we don't have proper safety rules for workers in factories. The fact that many factories are located in and around Addis Ababa may justify for this gap in causes of trauma.

Among the 69 (39.9%) patients who lost their limbs due to Gangrene 37 (53.6%) were following trauma. On the contrary, in the study from Black Lion Hospital 68.6% of the Gangrenes were following Vascular Insufficiency (14). This might be due to the fact that AaBET Hospital is a National Trauma Center and most referrals are traumatic.

Tumor is the 3rd cause of amputation in our setup with only 8 cases from the 173 patients but it is the second common indication in studies done in Kenya, Sudan and Ayder Hospital, accounting to 26.5%, 14.5% and 24.1% of the amputation cases respectively (10, 11, 15). Peripheral arterial disease the commonest indication of amputation in developed countries like Australia and in some African countries as in Ayder Hospital but in this study there were only 2 cases (6, 15). AaBET Hospital is a trauma center serving at the national level, that is the obvious explanation for the low number of Tumor and PAD cases.

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CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusion

Major lower limb amputations were more common than upper limb amputations. Commonest type of Upper Limb Amputation was digital amputation which was mostly due to machine injuries. Among those lower limb amputations, the most frequent site of amputation in our setup was Below knee amputation (BKA). Trauma and Gangrene were the most common indications for amputations in our setup.

6.2. Strength and Limitations of the study

Limitations

- Two years is very narrow to generalize the findings of this research and to get the accurate picture
- The retrospective method utilized in this study is subject to many limitations. The investigator wished to do prospective study in the area but due to time and budget constraints it was settled for retrospective.
- The information recorded in the medical charts is incomplete.

6.3. Recommendation

- To FMOH
 - As shown in this study huge burden of amputation lies within the younger population group. The government should put effort in Making the required diagnostic and therapeutic modalities available for the early diagnosis and better treatment of acute infections, open fractures and malignant tumors which will decrease the number of patients requiring amputation.
 - The outcomes should also be assessed in a multicenter prospective controlled trials to improve the quality of care nationwide.
 - Advanced limb salvaging procedures should be expanded nationally to decrease the amputations due to trauma and tumor.

- To Transport Minister and Traffic police officers
 - They should play a role in Reducing the number of road traffic accident casualties by improving roads (design, construction, complete separation of pedestrians from vehicles, etc.) and traffic education of drivers and the public in general.
- To Ministry of Labor and Social Affairs
 - The minister should establish and enforce health and safety measures at work, e.g. machine guards, protective hats, clothing and shoes. This will decrease machine injury associated amputations.
- To AaBET Hospital, department of Orthopedics
 - The chart documentation should be improved with complete documentation of their sociodemographic status and their outcomes during their follow up.
 - Progress of the patients in their ward stay should be documented in formal progress notes.
- To Other researchers
 - Further prospective controlled studies are required assessing patterns and indications of amputation with postoperative outcomes.

CHAPTER SEVEN

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ANNEXES

Annex 1: Questionnaire

This is a Questionnaire designed to collect data on patterns and indications of amputations done at AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017 (2008 & 2009 E.C).		
No.	Questions	Coding Categories
101.	Sex	1.Male 2. Female
102.	Age in years	1.<15 2. 16-30 3. 31-45 4. 46-60 5. 61-75 6.>75
103.	Region	1. Addis Ababa 2.Oromia 3.Amhara 4. SNNR 5. others

Part II-Stratification and preoperative data

This is a Questionnaire designed to collect data on patterns and indications of amputations done at AaBET Hospital from September (9), 12,2015 to September (9), 10, 2017 (2008 & 2009 E.C).		
No.	Questions	Coding Categories
201.	Extremity amputated?	1. UL 2. LL
202.	ULA Level	1. Digital amputation 2. Hand amputation 3. Wrist disarticulation 4. BEA 5. Elbow disarticulation 6. AEA

		7. Shoulder disarticulation 8. Forequarter amputation
203.	LLA Level?	1. Digital amputation 2. Syme's amputation (Wrist Disarticulation) 3. BKA 4. Knee disarticulation 5. AKA 6. Hip Disarticulation 7. Hemipelvectomy (Hindquarter amputation) 8. Mid foot (Transmetatarsal) Amputation
204.	Indication?	1. tumors 2. PAD 3. trauma 4. infections 5. Diabetic Foot ulcer 6. congenital limb deformities 7. Gangrene 8. Compartment syndrome 9. others
205.	Gangrene Type?	1. Dry 2. Wet 3. Gas Gangrene

206.	Gangrene cause?	1. Trauma 2. Infections 3. PAD 4. DM 5. Burn 6. others
207.	Cause of Trauma?	1. RTA 2. Machine injury 3. Violence 4. Electrical burn 5. Falling down accident 6. Others (bullets, other burns)
208.	Type of Tumor?	1. Osteosarcoma 2. Soft tissue sarcoma 3. Ewing's sarcoma 4. Giant cell tumors 5. Others
209.	Type of Infection?	1. Acute osteomyelitis 2. Chronic osteomyelitis 3. Necrotizing fasciitis

		4. Others
210.	Diabetic foot ulcer Wagner's Grade?	1. Grade 0 2. Grade 1 3. Grade 2 4. Grade 3 5. Grade 4 6. Grade 5
211.	Cause of Compartment Syndrome?	1. Fractures 2. Soft tissue injury 3. Burns 4. Others
212.	Bilateral amputation?	1. YES 2. NO
213.	Revision Amputation?	1. YES 2. NO
214.	Indication for Revision?	1. Stump infection 2. Stump necrosis 3. Non-healing stump 4. Others
215.	Visit to a Traditional healer?	1. Yes 2. NO

Annex 2: Assurance of the principal investigator

I the undersigned agree to accept all responsibilities for the scientific and ethical conduct of the research project. I will provide timely progress report to my advisors and seek the necessary advice and approval from them in the course of the research.

Name of the investigator: GETACHEW TESFAYE ABATE

Signature: _____

Date: _____

Approval of the clinical advisor

Name of the clinical advisor: Dr. Ebrahim Ahmed

Signature: _____

Date: _____

Approval of the public health advisor

Name of the public health advisor: Mr. Tewodos Fantahun

Signature: _____

Date: _____