

**St. Paul's Hospital Millennium Medical College,
Department of Surgery**



**Patterns of Ankle Fracture and Its Complications after Open Reduction and Internal Fixation
in Addis Ababa Burn, Emergency and Trauma Hospital: 2 Years Retrospective Study**

September, 2018

Addis Ababa, Ethiopia

Patterns of Ankle Fracture and Its Complications after Open Reduction and Internal Fixation in
Addis Ababa Burn, Emergency and Trauma (AaBET) Hospital: between September 2015 to
August 2017

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List of abbreviations and Acronyms

A	Advisor
AA	Addis Ababa
AaBET	Addis Ababa Burn and Trauma Hospital
AAU	Addis Ababa University
AO	Association for Osteosynthesis
BMI	Body mass index
CRPS	Complex regional pain syndrome
DC	Data Collectors
E.C	Ethiopian calendar
G.C	Gregorian calendar
ICU	Intensive care unit
MD	Medical Doctor
N	Number
ORIF	Open reduction and internal fixation
PAD	Peripheral arterial diseases
PI	Principal Investigator
RTA	Road traffic accident
SNNPR	South Nations, Nationalities and People Region
SPH	St Paul's Hospital
SPHMMC	St Paul's Hospital Millennium Medical College
SPSS	Statistical package for social science
SSI	Surgical site infection
TBW	Tension band wiring

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Abstract

Background: Ankle fracture (true ankle fracture) includes fracture of distal tibia, fibula and the talus. Motion of the ankle is complex but true ankle joint allows dorsiflexion and plantar flexion. Ankle fracture is one of the most common lower limb fractures for they account for 10% of all fractures representing a significant portion of the trauma workload. Ankle fractures usually affect young men and older women, however, below the age of 50; ankle fractures are the commonest in men. The vast majority of ankle fractures are malleolar fractures: 60 to 70% as unimalleolar, 15 to 20% as bimalleolar and 7 to 12% as trimalleolar. Ankle fractures may be managed either operatively or non-operatively. There is no data on patterns and complications of ankle fracture management in Ethiopia.

Objective: To identify Patterns of Ankle Fracture and Its complications after ORIF in AaBET Hospital between September, 2015 to August, 2017 G.C

Methodology: The study employed a retrospective cross sectional Study design on all patients treated for ankle fracture at AaBET Hospital orthopedics Department between September 2015 to August 2017 G.C. Study subjects were identified from the hospital admission/discharge records, patient cards, morning logbook and operation log books which was collected by pretested data collection format by trained final year medical students. Data were analyzed using SPSS version 23 software. The analyzed data is presented using charts, tables, and graphs and described using texts. Depending on the result appropriate interpretations, discussions, conclusions and recommendations are made. The total cost of the project was 28,930 birr.

RESULT

Most of ankle fracture patients under this study were from Oromia region (56%). Majority (65%) patients were at or below the age of 40 years and 73% of patients were male. The cause of injury in the majority of patients (51%) was road traffic accident. Most of the ankle fractures were bimalleolar (58%). Open and closed ankle fractures were comparable. Most patients have left ankle fracture (54%). Weber type C is the commonest type of fracture (68%). Tibial fracture was the most common associated fracture (12%). Among patients admitted and treated for ankle fracture, majority (91%) were treated by open reduction and internal fixation. The most common used implant was plate and screw (64.8%). Surgical site infection was the most common postoperative complication (31%) following ankle fracture managements.

CHAPTER ONE

INTRODUCTION

Background

Ankle fracture (true ankle fracture) includes fracture of distal tibia (medial malleoli), fibula (lateral malleoli) and the talus. Motion of the ankle is complex but true ankle joint allows dorsiflexion and plantar flexion (1).

Ankle fracture is one of the most common lower limb fractures for it account for 10% of all fractures representing a significant portion of the trauma workload (1). Ankle fractures usually affect young men and older women; however, below the age of 50, ankle fractures are the commonest in men. Two commonly used classification systems for ankle fractures include the danis weber AO classification and the Lauge-Hansen classification (2, 3). There are several different methods of ankle fracture fixation; however, the goal of treatment remains a stable anatomic reduction of talus in the ankle mortise and correction of the fibula length as a 1 mm lateral shift of the talus in the ankle mortise reduces the contact area by 42% (1, 4).

The vast majority of ankle fractures are malleolar fractures: 60 to 70% as unimalleolar, 15 to 20% as bimalleolar and 7 to 12% as trimalleolar (2). There are similar fracture rates overall between women and men, but men have a higher rates as young adults, while women have a higher rates as old age. The most common causes of ankle fractures are twisting injuries and falls, followed by sports injuries (1). Most fractures are associated with ligament injuries, and the magnitude and direction of the deforming force applied to the ankle joints directly correlate to the fracture pattern (1).

Alcohol and slippery surfaces are each involved in nearly a third of the cases (1). Diabetes mellitus and obesity are associated with fractures in middle aged and older adults and leads to high complication rate after treatment (2, 6). The etiology of this high complication rate is multifactorial. Diabetic patients have an increased susceptibility to wound infections. They also have impaired wound healing from micro- and macroangiopathies. Impairment of nociception and proprioception can lead to delays in recognizing pressure sores and ulceration from the plaster cast as well as inappropriate weight-bearing before union resulting in malunion (7).

Surgical treatment of ankle fractures may be accompanied by several complications. The overall complication rate following ORIF of ankle fractures varies considerably according to different research findings ranging from 1% to 40%. A large population-based study noted that open injuries, diabetes, and peripheral vascular disease were strong risk factors predicting a complicated short-term postoperative course (8).

Surgical site infection (SSI) is one of the most common complications following ankle fracture surgery. The incidence of SSI following operative treatment of ankle fractures varies considerably in the literature, ranging from 1.4% to 5.5%. These infections are associated with significant morbidity, and often lead to increased resource utilization. The management of an infected ankle fracture with exposed hardware is one of the great challenges faced by the orthopedic surgeon, and identification of risk factors for SSI is crucial for developing strategies to prevent potentially disastrous complications (8).

1.2 Statement of the problem

Ankle fracture is one of the common problems worldwide, affecting 10% of the population, representing a significant portion of the trauma workload. Globally, the annual incidence of ankle fracture is between 107 and 184 per 100,000 persons (1). Over five million ankle injuries occur each year in the United States alone, among these 2% of ankle fractures are open fractures (1). The most common causes of ankle fracture in developed countries were fall. In Africa ankle fractures usually affect in patients below the age of 50 years. In the elderly most of the fractures are caused by a fall whereas RTA are the main cause of the fractures in the younger age which is the economically active age group. How well these patients are able to regain their pre-injury level of function and independence is a measure of the success or failure of the treatment regime.

Data on ankle fractures in Africa are scarce. Most studies discuss ankle fractures in general. It is important to establish local data on the demographics, causation and complications on these fractures. Due to lack of data, there are no clear guidelines on the treatment protocols of these fractures. The demographic patterns of ankle fractures and the treatment outcomes have not been well established in our local low-resource setting. This study had not been done at AaBET Hospital or in Ethiopia at all. Therefore there was a need to look at the patterns of these fractures,

to inform the development of protocols and the complications associated with these fractures to be documented.

1.3. Significance of the study

Ankle fracture is one of the frequent causes of morbidity in adult age groups making considerable health demands. So, it causes great economic costs for individuals, families and society as whole. Due to lack of published data in Ethiopia, the magnitude of the problem is not known. Hence, the finding of this study could be the initial input for the SPHMMC and for the country as whole.

The purpose of this study is to analyze the patterns of ankle fracture and their complications after ORIF in a setting where most ankle injury patients in low and middle-income countries receive treatment. The study can also provide surgeons, hospital managers and health planners working in similar set-ups with baseline information on ankle fracture for further investigation, prevention programs and guideline development intending to reduce the burden of ankle injury and improve the outcome of patients.

In addition, the study is intended to have key information with regard to improvements in trauma hospital service deliveries and patient care and, it will also be a good source of information for future establishment of trauma centers in the country.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

Ankle injuries are common and account for more than five million emergency department consultations annually (9). Interestingly, 85% of these ankle injuries are ankle sprains and the remaining 15% are ankle fractures (9). Overall ankle fractures constitute 10% of fractures and are the most common injuries involving articular surface of a weight bearing joint (9). Often, ankle fractures are isolated injuries and up to one in four will require surgical intervention. One in twenty ankle fractures are associated with other fractures. Patients with polytrauma, who survived their initial injuries, are more likely to suffer from functional impairment if foot and ankle injuries were also present (9). The average age of a patients presenting to emergency department is 46 (9), although there is a bimodal age distribution with peaks in older females and young males. There has been a three-fold rise in incidence in the older females over the past three decades because of an aging population (9). There has also been a surge in the number of open ankle fractures amongst the elderly following low energy trauma such as a falls from standing height. Ankle fractures are an increasing problem due to the increasing aging population (9). Ankle fractures incidence has varied between various studies but most have shown a trend of increase incidence over time (2). Most of these studies, either had limited number of patients, limited areas or use of a single hospital. They too demonstrate a pronounced rise in elderly women (2). Several studies have shown a switch in sex by age with a greater incidence in younger men and older women (2).

Currently in US, ankle fractures reported in as many as 8.3 per 1000, similarly in the Finish population showed a rise in ankle fractures in elderly patients (3).

In a Swedish study, the males with ankle fractures were younger than females, averaging 45years and 58 years respectively. The commonest fracture types in females were bimalleolar and trimalleolar (57%) and in men they were lateral malleolar (49%) (3). Closed fractures accounted for 97% with an incidence of 71 per 100,000. In the United States of America, bimalleolar fractures accounted for 27% of ankle fractures while in Canada they constituted 16% of all ankle fractures (3). The proportion of ankle fractures according to Beuchamp was 7% for Weber A,

60% Weber B and 33% Weber C fractures. Kitaoka et al¹⁴ found 3% Weber A, 29% Weber B, 65% Weber C. Tunturi's study found Weber A 24%, Weber B 59% and Weber C 17%. Most ankle fractures were closed. Oslen et al⁴³ found an incidence of 5% of open fractures in the United States of America (3).

In Africa most ankle fracture were seen due to road traffic accidents with the highest percentage of open fracture (4). In a Nigerian study 46.3% of all fracture due to road traffic accident had ankle fractures, while 88% of ankle fractures were due to road carnage in a Ghanaian experience⁽⁴⁾. In Kenya this incidence of ankle fractures is lacking, however 69% of cases seen at Kenyatta National Hospital who were involved in road traffic accidents had fractures (4).

There is a variation in the demography of ankle fractures between African and Caucasian populations (3, 4).

In a Rwandese study, 77.4% of patients were 18-44 years with male to female ratio of 3.3:1⁽⁴⁾. The commonest cause was road traffic accidents at 75% followed by fall 9.3% (3). In a Ghanaian study 62.9% were 31-50 years, male to female ratio of 6:1; 88.6% were due to RTA⁽⁴⁾. In a South African study, the mean age was 39.32 years (range 13-85 years) with a male to female ratio 1.3:1. The mechanisms of injury were; motor vehicle accidents (MVA) (15.95%), falls (53.19%). In the United Kingdom registry, the incidence of ankle/tibia fibula was 14.8/100,000, the male to female ratio 1:1, falls contributed to 75% of the cases. In Denmark the incidence was 107 per 100,000 (3). Below the age of 50, ankle fractures were commonest in men. After this age, females' prevalence was higher and the age-specific incidence rates decreased in both sexes. The main causes of the fractures were falls at 87%. Sports, play or other leisure activities resulted in 55% of the fractures (3).

A high proportion of patients with ankle fractures are at risk of developing post traumatic ankle osteoarthritis in addition to other complications (7). This can significantly impact the quality of life and lead to increased mortality in the most severe cases. Therefore the primary intervention is to restore the normal anatomy. The ankle joint is vital for maintaining posture and ambulation. The congruency and stability of the joint are maintained by a combination of the bony components, surrounding ligaments, tendons, musculature and joint capsule (7). The lateral ligament is composed of three structures: the anterior and posterior talofibular ligament with the

calcaneofibular ligament running between them. Medially, the deltoid ligament which is made up of a superficial part attached to the medial malleolus, talar neck and calcaneum and the deep part which is attached to the medial malleolus and talus. The deltoid is the stronger ligament and its disruption influences the management of ankle fracture. The distal tibia and fibula form a fibrous joint called the distal tibiofibular syndesmosis, which is made up of four ligaments and two bones. The distal tibiofibular syndesmosis contributes to ankle stability and maintains the anatomical position of the ankle to form the ankle mortise (3, 7). The ankle has the smallest surface area out of the major weight bearing joints with the talar dome bearing more weight per unit area than any other joint surface. During ambulation, the stress placed across the joint ranges from 1.25 to 5.5 times normal body weight depending on activity (7). Despite being one of the most congruous joints with a low risk of osteoarthritis, minor disruptions to congruency can lead to arthritic changes in the long term. It has been shown that 1mm of talar shift can lead to a 42% reduction in the tibiotalar contact area causing a 49% increase in the joint contact pressure (5, 7).

Common complications post ankle fractures management includes arthritis, stiffness, DVT and thrombophlebitis, infection, malunion, non-union and synostosis formation. The risk of these complications varies and is dependent upon the initial fracture pattern, velocity of injury, quality of stabilization and patient factors. In patient with ankle arthritis, it has been reported that up to 70% have had a history of an ankle injury. Post traumatic osteoarthritis is the most common complication after an ankle fracture and is the most common indication for ankle arthrodesis (9). The ankle joint has a small surface area and bears a lot of weight per unit area and combined with the complex motion of the ankle, incongruency can result in wear of the cartilage and arthritic changes. The more severe the fracture, the more pronounced the arthritic changes. Eighty percent of patients with stable injuries will be asymptomatic after eighteen years. In comparison, 20% of patients with unstable injuries that undergo operative fixation had radiographical signs of arthritis after six years and while 80% of patients managed conservatively had radiographical changes after six years (9).

Ankle fractures in diabetic and older patients treated by operation have a high incidence of serious wound complications, while those treated without operation are likely to develop a

malunion. Diabetic patients who present with a traumatic ankle fracture are at a high risk of developing complications (4, 7).

In the fractures treated without operation in series there were no problems related to the cast, but Zinar and Brown⁴ reported a 50% incidence of skin breakdown in diabetics with ankle fractures treated in a cast. He recommended open reduction and internal fixation if a peripheral neuropathy was present. His surgical complication rate was 40% which makes this conclusion difficult to justify. The risk of malunion and plaster sores should be minimized by regular radiological assessment and changes of the casts which should be suitably padded and provide widely distributed support.

Despite the fact that most diabetic patients treated without operation developed malunion, they had minor symptoms and all had a functional lower limb. It should be noted that our main focus in this report was on the rates of surgical complications and we did not perform formal outcome assessments of function (7).

CHAPTER THREE

OBJECTIVE

General objective

-To identify the patterns of ankle fracture and its complications after ORIF in AaBET hospital, from September, 2015 to August, 2017 G.C, AA, Ethiopia

Specific objective

- To determine sociodemographic distribution of ankle fractures at AaBET Hospital
- To identify patterns of ankle fracture at AaBET Hospital
- To identify complications of ankle fracture management at AaBET Hospital

CHAPTER FOUR

4. METHODS AND MATERIALS

4.1. Study area and period

The study was conducted at AaBET Hospital which is located in the northern part of Addis Ababa, Ethiopia. AaBET Hospital is the only trauma center in the country, which serves as a referral center for patients from Addis Ababa and all over the country. It is also a teaching hospital for SPHMMC & AAU for both under graduate and post graduate students. The hospital has Orthopedics, General Surgery, Neurosurgery and Emergency medicine, Plastic and Reconstructive surgery Departments with a total of 107 beds (58 for orthopedics, 22 for neurosurgery, 19 for plastic and reconstructive surgery, 8 for general surgery). It has also 11 beds with necessary equipment at its intensive care unit (ICU), 4 operation rooms and 5 recovery beds. AaBET hospital has well organized Emergency and outpatient department (EOPD) which can accommodate 50 patients at once. The study was carried out during period from October, 2017 to August, 2018 G.C.

4.2. Study design

The study employed a retrospective recorded chart review.

4.3. Population and Sampling

Source population - All patients who were admitted and treated at AaBET Orthopedics Department from September 1, 2015 up to August 30, 2017 G.C were considered as the source population. According to the data retrieved from the hospital the total source population was 2014.

Study sample - All patients who were admitted and treated for ankle fracture at AaBET Hospital in the given study period were considered as study population using purposive sampling. Accordingly, the total study sample size was 117.

Inclusion criteria – All patients who were admitted and treated for ankle fracture in AaBET Hospital in the study period and have complete recorded chart were included in the study.

Exclusion criteria – All patients who were admitted and treated for ankle fracture in AaBET Hospital in the study period and have incomplete recorded chart.

4.4. Variables

Dependent variables – post operative complications, Length of hospital stay

Independent variables

Sociodemographic variables: Age, sex, address,

Clinical variables: pattern of fracture, mechanism of injury, time of management, comorbid diseases

4.5. Data collection methods

A pretested data collection instrument was used to collect data from the operation theater log book, ward registers, morning logbook and patient charts of all patients who were admitted and treated for ankle fracture at Addis Ababa Burn, Emergency and Trauma (AaBET) Hospital, Addis Ababa, Ethiopia, from September 2015 up to August 30, 2017 G.C. There were 117 patients treated for ankle fracture in the study period. All patient charts were studied without sampling. 17 charts were excluded from the study. (7 charts couldn't be retrieved while 10 other charts had either incomplete data or incompatible diagnosis).

4.6 .Data collectors

Data were collected by the principal investigator and trained final year medical students.

4.7. Data quality control

The principal investigator have carried out an ongoing supervision each day during the data collection to ensure the quality of data by checking filled-in formats for their completeness and consistency.

4.8. Data analysis and interpretations

Data was analyzed with SPSS version 23. The data were coded and entered into a computer and analyzed using SPSS statistical software package. Results of descriptive statistics were generated as outputs of the analysis.

4.9. Ethical consideration

The proposal was reviewed by the college's ethical review board and a written permission paper was obtained to conduct the study. Before the data collection was conducted, an official letter from SPHMMC research office was sent to AaBET hospital administrative office and orthopedics department to get the permission for accessing the patients' recorded charts and

subsequent data collection activities. Patients' information used in the research will be kept confidential throughout the study.

4.10. Limitations of this study

- ✓ Being retrospective study
- ✓ Absence of standard follow up protocol for ankle fracture

4.11. Operational Definition

Ankle Fracture – fracture of either of the malleolar (medial, lateral, posterior or combination)

Patterns – distribution among unimalleolar, bimalleolar and trimalleolar.

Management – those who are treated for ankle fracture either operatively or conservatively.

Implant failure – broken/loosen implant

Waber A – fracture of fibula below the level of tibial plafond

Waber B- fracture of fibula at/near the level of syndesmosis

Waber C- fracture of fibula above the level of syndesmosis

5. RESULTS

5.1. Socio demography of ankle fractures

The 65 (65%) of patients admitted and treated for ankle injury are in the age range of 15-40 years followed 29% of the patients with age range of 40-65 years. The youngest of the patients under study was 11 year old while the oldest was 80 years (Table 1). The mean age was 36.54. The majority of patients were male (73%) with male to female sex ratio of 2.7:1. Majority of female patients were in the age range 40-65(48.14%) (Table: 1). There was only 1 female patient above the age of 65 years.

Table: 1 Socio demographic pattern of patients treated for Ankle fracture at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

		Sex		Total
		male	female	
Age range	<15	1	2	3
	16-40	54	11	65
	41-65	16	13	29
	>65	2	1	3
Total		73	27	100

Source: Own survey

The geographical distribution of the patients admitted and treated for ankle injuries shows that the majority were from Oromia 56(56%) followed by Addis Ababa which was 34(34%)(Fig.1).

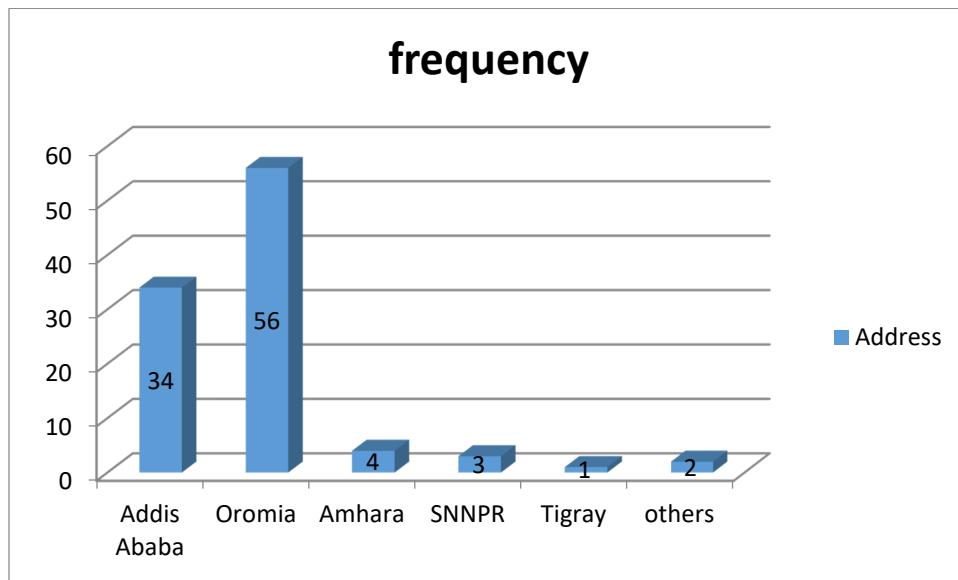


Figure: 1 Geographic Distribution of patients treated for Ankle fracture at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

5.2 Diagnostic categories

Road traffic accident was the most common causes for ankle injury accounting for 51(51%) followed by sudden fall 34(34%), and assault accounts for 8% of the injury (Fig.2).

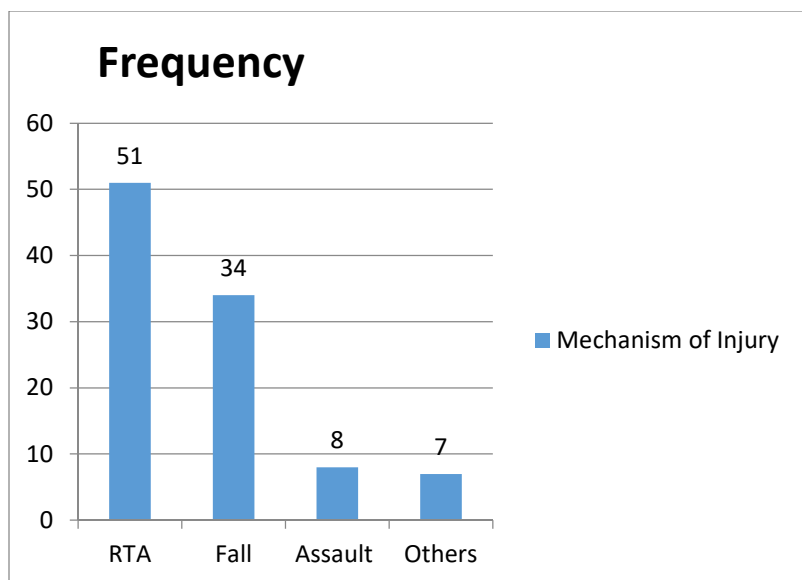


Figure: 2 Mechanisms of Ankle fracture among patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Bimalleolar fracture was the commonest pattern of ankle fracture accounting for 58(58%) of the patients under study, followed by trimalleolar which accounts for 26 (26%) while 16(16%) was unimalleolar (Fig.3).

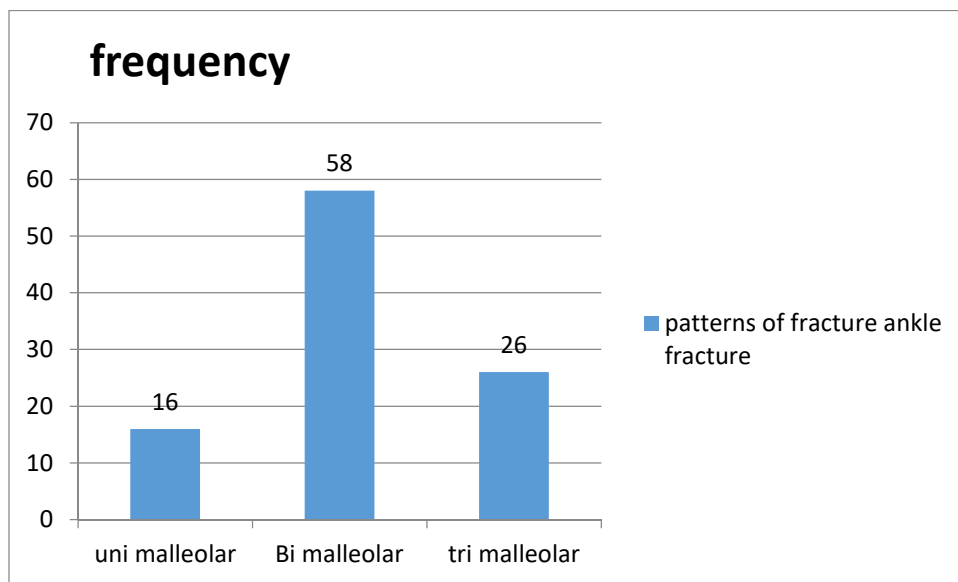


Figure: 3 Patterns of Ankle fracture among patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Open and closed ankle fractures were comparable in the study accounting for 49(49% and 51 (51%) respectively (Fig.4).

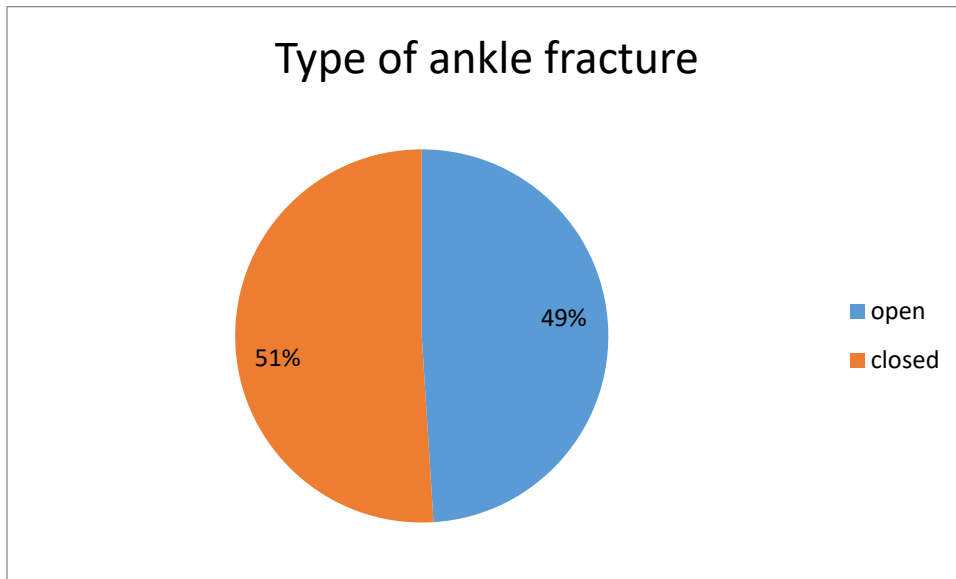


Figure: 4 Type of Ankle fracture among patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Left ankle (54%) was more involved than right ankle (41%) while both were involved in 5% of the cases (Fig.5).

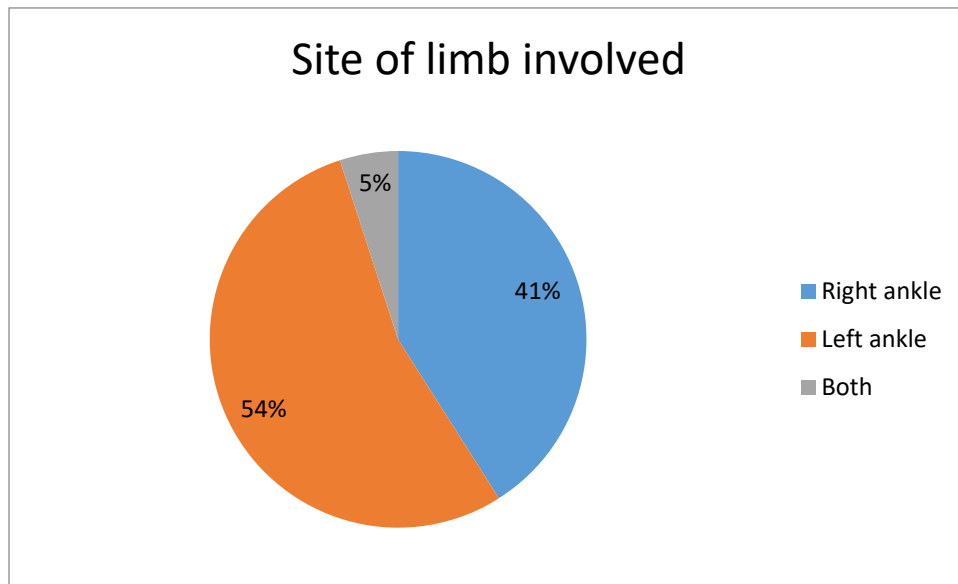


Figure: 5 Site of limb involved among patients treated for ankle fracture at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

5.3 Associated fractures

Nine (9%) of patients admitted and treated for ankle fracture have associated head injury.

Among patients admitted and treated for ankle fracture 12(12%) have associate tibial fracture and 8(8%) have foot injuries (Table: 2).

Table: 2 Associated fractures in patients treated for ankle fractures at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Associated fractures	M	F	Total
	Number (%)	Number (%)	Number (%)
Tibial #	8(8%)	4(4%)	12(12%)
Femoral #	1(1%)	0(0%)	1(1%)
Foot injuries	8(8%)	0(0%)	8(8%)
Pelvic #	0	0(0%)	0(0%)
Upper limb #	1(1%)	0(0%)	1(1%)
None	55(55%)	23(23%)	78(78%)
Total	73(73%)	27(27%)	100%

Most of patients admitted and treated in the hospital were having Weber type C ankle fracture 68(68%) followed by Weber B ankle fracture 17(17%) and weber A accounts for 15(15%) (Fig.6).

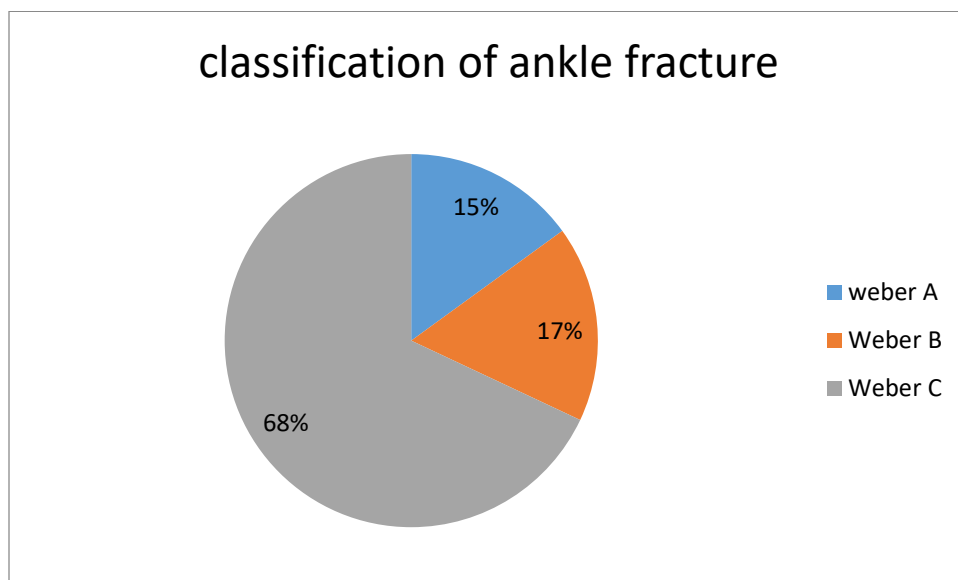


Figure: 6 Classification of ankle fracture among patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Among patients admitted and treated for ankle injury, majority 91(91%) were treated by ORIF while 9(9%) were treated conservatively (Fig.7).

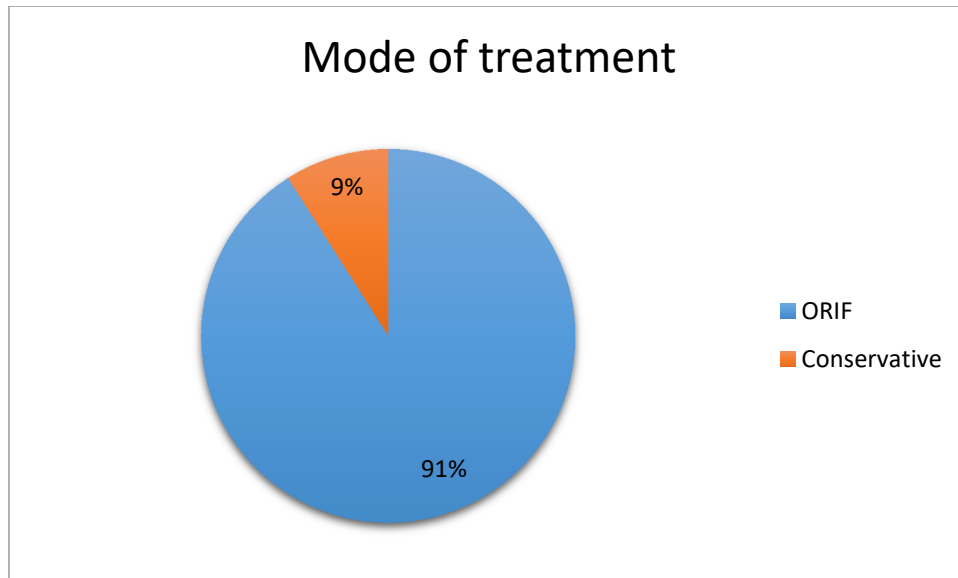


Figure: 7 Mode of treatment in patients admitted for ankle fractures at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Among patients treated operatively, the most common implant used was plate and screw accounting for 64.8%, followed by k-wire and rash road which was 11% (Fig.8).

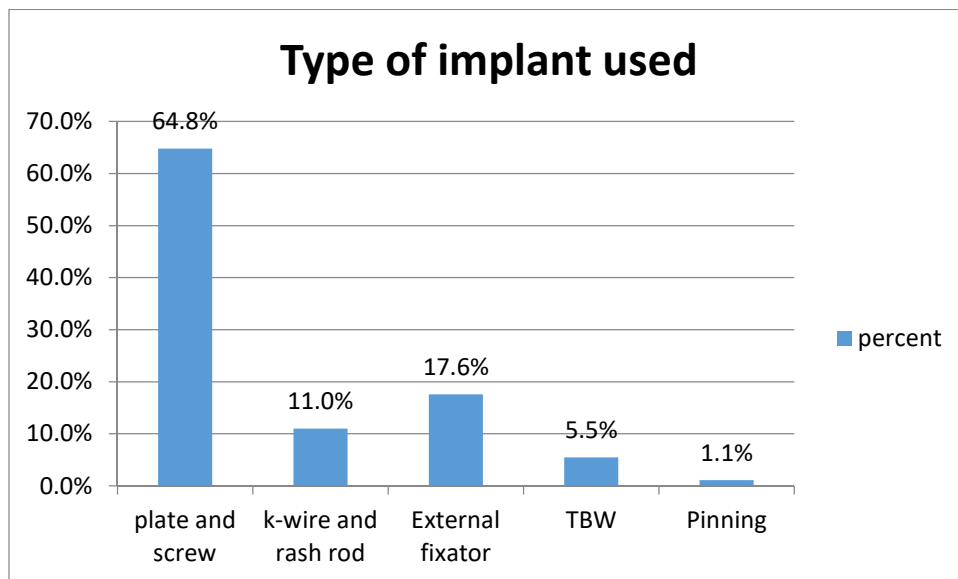


Figure: 8 Type of implant used in patients admitted and treated for ankle fractures at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

5.4 Associated complications

The most common complications after ankle fracture management were surgical site infection accounting for 31(31%), followed by complex regional pain syndrome which accounts for 13(13%) and osteoarthritis with 11 (11%) (Table: 3).

Table: 3 Complications of Ankle fracture among patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

Patient outcome	M	F	Total
	Number (%)	Number (%)	Number (%)
Surgical site infection	26	5	31(31%)
Osteoarthritis	6	5	11(11%)
Implant failure	1	0	1(1%)
Implant prominence	3	3	6(6%)
Nonunion	0	0	0(0%)
Mal-union	0	0	0(0%)
CRPS	10	3	13(13%)
More than one complication	3	2	5(5%)
None	24	9	33(33%)

Of patients admitted and treated for ankle injuries, the average preoperative stay was 5.21 days and the average postop stay was 12.55 days. The maximum preoperative stay was 30 days and the maximum post op stay was 119 days (Fig.9 & 10).

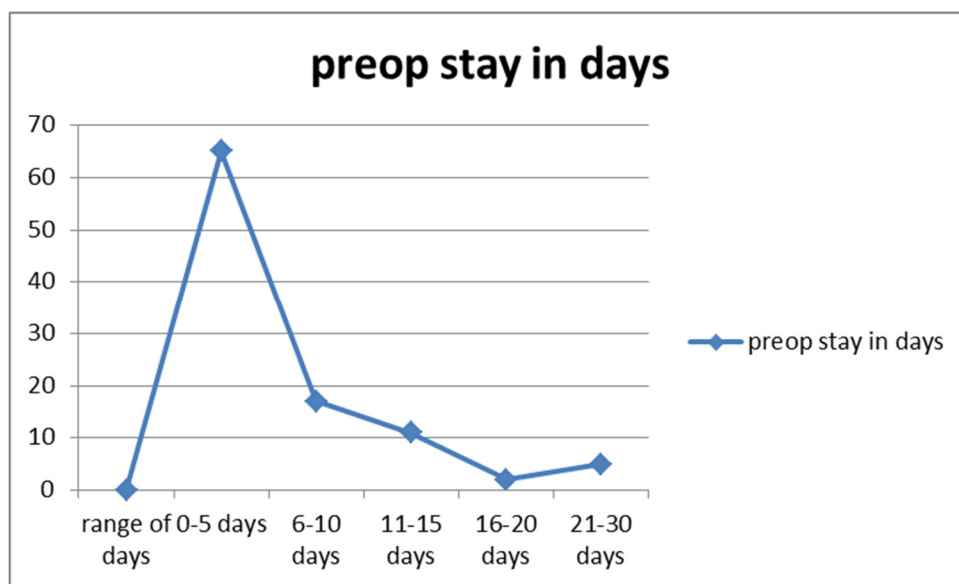


Figure 9 Preoperative stay of Ankle fracture patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

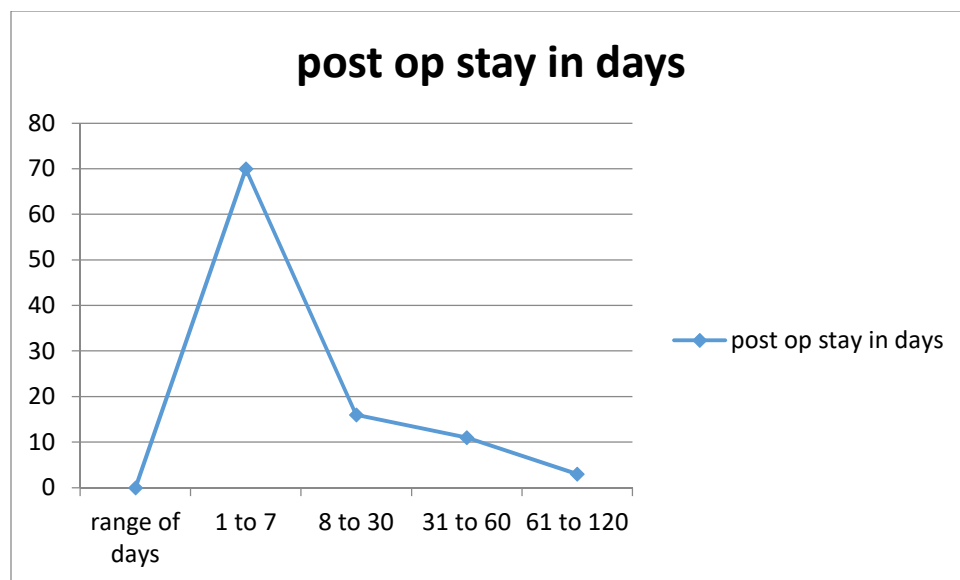


Figure 10 Postoperative stay of Ankle fracture patients treated at AaBET Hospital, from September 2015 to August 2017, Addis Ababa, Ethiopia

6. DISCUSSION

Ankle fracture (true ankle fracture) includes fracture of distal tibia, fibula and the talus.

Ankle fracture is one of the most common lower limb fractures for they account for 10% of all fractures representing a significant portion of the trauma workload.

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

Among patients admitted and treated for ankle injuries, majority were from Oromia 56(56%) followed by Addis Ababa which was 34(34%). This could be due to geographical location and there is no trauma center in the regional health center.

There were 117 patients admitted and treated for ankle fracture in the study period. There were 73 male patients (73%) and 27 female patients (27%) with the male-to-female ratio of 2.7:1. The

male dominance can be attributed to the nature of the condition being related to trauma and assault. It is comparable with kenyattan hospital in which case male patient was 70% and female was 30% with male to female ratio of 2.33: 1(4). In a Rwandese study, it is also comparable with male to female ratio of 3.3:1(4).

In our study majority 65 (65%) of patients admitted and treated for ankle injury are in the age range 15-40 years followed by age range 40-65 years (29%). The minimum age was 11 year while the maximum age was 80 years. The mean age was 36.54. Majority of female patients were in the age range 40-65(48.14%). There was only 1 patient above the age of 65 years. It is similar with kenyattan study in which the mean age was 40years with age range of 20-80 years. It also is comparable with a Rwandese study, 77.4% of patients were in the age range between 18-44 years (4). In a South African study, the mean age was 39.32 years (range 13-85 years). It is similar with Swedish study in terms of age the males with ankle fractures were younger than females, averaging 45years and 58 years respectively.(3)

Road traffic accident was the most common causes for ankle injury and admission 51(51%) followed by fall 34(34%); and assault accounts for 8% of male ankle injury. It is also comparable with a Nigerian study 46.3% of all ankle fracture is due to road traffic accident (4). In a Ghanaian study 62.9% were 31-50 years, male to female ratio of 6:1; 88.6% were due to RTA(4). In general, in Africa most ankle fractures were seen due to road traffic accidents with the highest percentage of open fracture (4).

Bimalleolar fracture was the commonest pattern of ankle fracture accounting for 58(58%), followed by trimalleolar which account for 26 (26%) and 16(16%) was unimalleolar. In Swedish study, the commonest fracture types in females were bimalleolar and trimalleolar (57%) but in men they were lateral malleolar (49%) (3).

Open and closed ankle fractures were comparable in our study accounting for 49(49%) and 51(51%) respectively. It is comparable with Kenyattan study in which closed fractures accounted for 63.9% of the cases (3). But it is higher than the Caucasian studies where open fractures were lower than 5%. This may be related to the etiology of the fractures where in the Caucasian population most ankle fractures were caused by falls which are low energy as opposed to this study where the fractures were due to high energy trauma.

Left ankle 54(54%) was more involved than right ankle 41(41%) and both were involved in 5(5%) of the cases. But in kenyattan study the right limb was involved in 44(62%) of the patients while left limb involved in 27(38%) of the cases (3).

Most of patients admitted and treated in our hospital was Weber type C ankle fracture 68(68%) followed by weber B ankle fracture 17 (17%) and weber A accounts for 15(15%). This could be due to high energy injury. But in kenyattan study weber B type being the most common type 33 (45.8%) of injury followed by Weber type C 31(43.1%) (3).

Among patients admitted and treated for ankle injury, majority 91 (91%) was treated by ORIF and 9(9%) were treated conservatively. But in kenyattan study, non-operative modality of treatment was the most commonly used with a proportion of 68(68%) while operative cases had a proportion of 28 (28%). This could be due to type of fracture; in this study open fracture accounts for 49% of the cases.

Among patients treated operatively, the most common implant used was plate and screw accounting for 59(59%), followed by k-wire and rash road which was (11)11%.

The most common complications after ankle fracture management were surgical site infection accounting for 31(31%), followed by complex regional pain syndrome which accounts for 13(13%), this could be due to large number of our patients were open ankle fracture.

Of patients admitted and treated for ankle injuries in our study, the maximum preoperative stay was 30 days and the average preoperative stay was 5.21 days. The maximum post op stay was 119 days and the average postop stay was 12.55 days. The maximum total stay was 120 days and minimum stay was 1 day and average total stay was 17.74 days. This could be due to the nature of fracture and financial or infrastructure constraints, open fractures, blistering, swelling and theatre space unavailability and limited human power resources.

7. CONCLUSION

- ✓ Most of the patients admitted and treated in our hospital were from Oromia (56%).
- ✓ Majority (65%) of patients presenting to our hospital were at or below the age of 40 years and 73% patients were male.
- ✓ The cause of ankle injury in the majority of patients (51%) was RTA.
- ✓ Open ankle fracture was higher in this study relative to other studies.
- ✓ Most of patients admitted and treated in this study were Weber type C ankle fracture (68%).
- ✓ Bimalleolar fracture was the commonest pattern of ankle fracture accounting for (58%).
- ✓ Most common fractures associated with ankle injury were tibia (12%).
- ✓ The most common complications after ankle fracture management were surgical site infection (31%).
- ✓ Longer preoperative stay and postoperative stay were recorded.

8. RECOMMENDATIONS

- Ankle injury affects the young, productive age group and focus should be given towards trauma management in general.
- There is a need for good road safety measures concerning especially RTA to reduce the trauma burden
- There is need for a protocol to be developed to ensure appropriate management of ankle fractures to reduce risk of infection.
- Trained human power and availability of set up should be a priority to reduce a burden to one center.
- There should be a standard protocol for ankle fracture patient postoperative follow up.
- There is no study done in our country regarding ankle injury hence further detailed studies especially prospective studies need to be undertaken in the subject matter.

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