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St. Paul's Hospital Millennium Medical College**

St. Paul's Hospital Millennium Medical College Postgraduate Study Program

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Admission Pattern and Factors Associated with Treatment Outcome of Orthopedics Patient in
Intensive Care Unit of Addis Ababa Burn Emergency and Trauma Hospital (AaBET) Hospital

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Abstract

Background: Trauma is a leading cause of death and disability worldwide. It is the most frequent cause of death in the first four decades of life, and it remains a major public health problem in every country. Access to critical care is crucial component of health care system hence critically ill patients are admitted to the ICU to reduce mortality and morbidity. The aim of this study is to assess the admission pattern and factors associated with treatment outcome of orthopedics patients in Intensive care unit of Addis Ababa Burn Emergency and Trauma Hospital (AaBET) Hospital.

Method: The study was conducted in Intensive Care Unit of Addis Ababa Burn Emergency and Trauma Hospital (AaBET) from January 1, 2022 to February 28, 2022. The Study utilized a retrospective cross-sectional design by reviewing data on available medical records, over a period of four and half years. A total of 117 patients medical record with orthopedic condition and treated in Intensive Care Unit was included in the study. The data was collected using structured questionnaire, then entered and analyzed using SPSS version 25. Logistic regression (binary and multiple) analyses were used to determine the effect of factor(s) on the outcome variable.

Result: A total of 117 ICU admitted orthopedics patient were studied with the male to female ratio of 6.3:1. More than half (57.3%) of the patients were between age of 20 to 39. Traumatic cause of admission accounted for 93.2% of the admission. Road traffic accident 88(75.2%) and fall down accident from a height 20 (17.1%) were the two most common mechanism of injury. Fracture was present in 109 (93.2%) patients, the common anatomic area being lower limb followed by upper limb. Apart from orthopedics condition associated medical, surgical and neurosurgical condition was present in 84(72.4%), 75(64.7%) and 74(63.8%) cases respectively. Respiratory failure 57 (48.7%) was the major reason of admission. The mean length of stay in ICU was 14.9 (SD=10.069). The overall in ICU mortality was 24 (20.5%). Factors associated with outcome of patients in ICU were GCS ≤ 8 (P=.045) (AOR=4.344, 95% CI; 1.106-17.064), septic shock (AOR=10.495, 95% CI; 1.257, 87.630) and ICU length ≤ 5 days (P=.015) (AOR=4.118, 95% CI; 1.306, 12.986).

Conclusion: Traumatic admission as a result of RTA accounted for the largest proportion of orthopedics patient to end up in AaBET ICU. More than half of the patients were young and in their productive age year. Efforts should be made at reducing the occurrence of road traffic accidents to reduce morbidity. Emphasis made on orthopedics patients who have GCS ≤ 8 , Septic shock and those in their initial 5 days of admission; will help improve the outcome of patients.

Keyword: Orthopedics, Intensive Care Unit, Critical Care, Admission pattern, Outcome

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Acronyms and Abbreviations

AaBET.....	Addis Ababa Burn Emergency and Trauma Hospital
BSF.....	Basal Skull Fracture
CNS.....	Central Nervous System
DAI.....	Diffuse Axonal Injury
GCS.....	Glasgow Coma Scale
HIV.....	Human Immunodeficiency virus
HAP.....	Hospital Associated Pneumonia
ICU.....	Intensive Care Unit
I&D.....	Irrigation and Debridement
ISS.....	Injury Severity Score
MRN.....	Medical Record Number
MVA.....	Motor Vehicle Accident
PACU.....	Post-Anesthesia Care Unit
RTA.....	Road Traffic Accident
RTS.....	Revised Trauma Score
TBI.....	Traumatic Brain Injury
UTI.....	Urinary Tract Infection
VAP.....	Ventilator Associated Pneumonia
WHO.....	World Health Organization

1.Introduction

1.1. Background

Intensive care unit (ICU) is a multidisciplinary staffed and specially equipped area of a hospital dedicated to provide care for patient with life-threatening illness. The unit provides a continuum of care where patients' requiring a frequent assessment of vital signs, invasive hemodynamic monitoring, intravenous medications and fluid management, ventilator and nutritional support to assure safe and effective outcome. There are various source of admissions such as trauma unit, emergency department, inpatient wards, and post anesthesia care unit(1).

Intensive Care Unit requires a vast use of up to date equipment and highly skilled staff. The outcome of patients admitted into the ICU will also depend on the level of training and experience acquired by staff. In developing countries where financial resources are limited training and re-training of staff may not be adequate. Intensive care also demands a tremendous amount of time and effort on behalf of the medical and nursing staff to treat and improve survival of the critically ill patients. (2)

Trauma is a leading cause of death and disability worldwide. The WHO estimates that injury is responsible for more than 5 million deaths annually, more than the mortality caused by HIV, malaria, and tuberculosis combined. It is the most frequent cause of death in the first four decades of life, and it remains a major public health problem in every country, regardless of the level of socioeconomic development. More than 90% of injury occurs in low and middle- income countries, where formal trauma systems and methods for data tracking have not yet been widely implemented(3,4).

Poly-trauma, or the co-existence of multiple traumatic injuries in the same victim, is present in as many as 40% of trauma admissions. In patients with multiple trauma, musculoskeletal injuries are the most common lesions requiring surgical intervention with survivors frequently presenting challenging scenarios in terms of functional outcome and quality of life(5). Costly management including emergency care, imaging and other diagnostic studies, surgical operations, extended postoperative hospital stay with sometimes intensive care unit (ICU) stay, and prolonged rehabilitation programs are commonly encountered issues with multiple injury patients.

Orthopedic surgery is a specialty of surgery dedicated to the prevention, diagnosis, and treatment of diseases and injuries of the musculoskeletal system in all age groups(6). Major or severe trauma

poses diagnostic and therapeutic challenges to trauma, orthopedic and general surgeons practicing in developing countries(7). Injuries in developing countries are increasing due to increase in urbanization, motorization, civil violence, wars and criminal activities. In these countries, major trauma remains a major cause of hospitalization and intensive care utilization and consumes a significant amount of the health care budget(2). Orthopedic injuries are important determinants of short-term and long-term patient outcomes, as are treatment decisions made by the orthopedic surgeon. Modern orthopedic and trauma care entails each patient receiving the best treatment at the right time(5)

There are triphasic occurrences of death in trauma patients in which one-third of them occur at the scene of the injury and are therefore inevitable death. Early phase of trauma- related occur when patient reach the hospital and cannot be salvaged without emergent intervention. But patients who get advanced trauma management were thought to be salvaged at this phase. The late trauma-related death is associated with infections and malnutrition(8). Access to critical care is crucial component of health care system hence critically ill patients are admitted to the ICU to reduce mortality and morbidity. Mortality in the ICU is a huge burden in the economy of the country in terms of losing the productive work force and huge financial cost.

In Ethiopia, there is paucity in basic information on the pattern of admission and outcome of orthopedics patients in multidisciplinary ICU is lacking. So the purpose of the study is to solicit, information on the pattern of admission, outcome and associated injuries of orthopedic patients admitted to AaBET hospital to show direction on future planning to improve quality of service given at the center.

1.2. Statement of the Problem

Major trauma has been reported to be a major cause of hospitalization and intensive care utilization worldwide and consumes a significant amount of the health care budget. In most developing nations where there are several financial constraints resulting from poor funding of the health care generally and the ICU specifically, there is often a limit to the availability and specialization of this form of care (9). Besides allocation of resources, intensive care also demands a tremendous amount of time and effort on behalf of the medical and nursing staff to treat and improve survival of the critically ill patients (9,10). The allocation of ICU facilities when financial resources are limited is determined by cost/ benefit and patient outcome(9,11) . Admission of patients with poor prognosis and/or prolonged use of the ICU facility results in other patients with a better prognosis being denied care; many of these die as a result (11).

AaBET hospital is the first of its kind in serving any emergency patient with special emphasis on burn and trauma patients. AaBET ICU consist of 11 beds and 3 semi ICU beds. However, since its establishment there is no published data that I came across showing pattern of patient admission, associated injuries and their outcome with emphasis on orthopedic patients. Hence the aim of this study is to provide baseline information on orthopedics case ICU mortality, identify possible factors that can affect outcome and determine pattern of admission for future research.

1.3. Rationale of the Study

The rationale for selecting this problem area is due to the fact that knowing the pattern of orthopedic injuries, associated factors and cause of death is the key for identifying appropriate intervention for improvement of quality of care and this study will provide evidence on pattern of cases and outcome of orthopedics patients admitted to AaBET ICU

Another reason is, despite trauma being one of the common reasons of ICU admission there is paucity of published data on orthopedic case ICU admission pattern, common associated injuries and their outcome. Conducting this study will help to measure the magnitude of the problem, help us focus our attention and resource to patients that would benefit from ICU admission and evaluate our orthopedics case critical care. The data obtained in this study, can be used by concerned bodies for planning and evaluating ICU performance, future planning for service expansion, quality improvement and can also be used for preparing admission guidelines. Additionally, the result of the study will be used to provide a feed back to AaBET hospital for better resource allocation, to help plan in improving orthopedics patient outcome. Furthermore, the result of the study will be distributed to orthopedics and traumatology, emergency medicine and critical care department and all concerned bodies as a baseline information for further assessment of outcome of patients.

2. Literature Review

A retrospective done in Aintree University Hospital, London, to assess the cause and outcomes of patients admitted under orthopedic care who needed intensive care input during their inpatient stay. There were 60 patients in the study period. The study showed the “trauma” group accounted for 47% of all ICU admission, it also carried the highest mortality rate with 67% of all mortalities from orthopedic ICU admissions. Common causes included respiratory failure, acute kidney failure and septicaemia. The second group with highest ICU was Elective group with 17 patients, the common procedures are those undergoing total hip replacement 47%, followed by foot and ankle procedures 24%. The main reasons for ICU admission in elective group was for close monitoring reasons and cardiovascular complications. The Polytrauma group contained 11. During the study period 9 patients (21%) died following their admission to ICU, majority of them being from the trauma group(12).

In 2016 a 5-year retrospective study was conducted in Lagos University Teaching hospital to determine the profile of ICU admission and outcome. A total of 647 patients were admitted into the ICU. The study showed Orthopedics case accounted for 2% (13 patients) of all admissions into ICU, the highest mortality in orthopedic group were patient aged between 70-79 years (33.3% of all mortalities). Post-operative surgical care across all specialties accounted for 36.6% (237 cases) of all indications for ICU admission, orthopedics case accounted for 3.5% of post-operative care admission(13).

Retrospective analysis of Intensive Care Trauma patients done in Turkey shows, there were a total number of 86 trauma patients. Of the 86 patients examined, 60(69.7%) had exposed to multiple trauma and 26 (30.2%) had single trauma. The departments where patients are admitted to the ICU, orthopedics department came second next to general surgery with rate of 22.1%. From the orthopedics patients 44 had an extremity fracture, 10 had pelvis injury, scapula fracture and traumatic limb amputation each of them had a single patient(14).

A study done on outcome of trauma admission in an ICU in Niger Delta Region of Nigeria revealed a total number of 529 patients admitted during the period of study. Postsurgical patients contributed 41.4% of all admissions, while 25% of the admission were for trauma cases. From the trauma cases multiple injury and limb fracture accounted to 14.4% and 11.4% respectively. The

outcome based on mortality rate for multiple injury patient was 31.6% and for limb fractures 20%(15).

A retrospective descriptive study done in Botswana to assess epidemiology of traumatic orthopedic injuries at Princess Marina Hospital. There were 506 patients, 372(73.5%) had been admitted with traumatic orthopedic injuries and 134 (26.5%) with non-traumatic orthopedic injuries. In total there were 547 cases of injury, with the most common injury being fractures (75.5%) and the most common fracture site being the lower limbs (45.7%), followed by the upper limbs (21.6%) and pelvis (3.5%). From the traumatic cases fall was the most common mechanism (prevalence of 39%) followed by RTA (25.5%)(16).

A two-year prospective study was done in Lagos University teaching hospital to assess Pattern of extremity injuries in Polytrauma. A total of 291 patient presented during the study period. Male to female ratio was 3:1. RTA was the leading cause of trauma, lower extremity was commonly involved than upper extremity. The most frequently seen fractures were tibia 27.8%, femur and fibula 24.7% each. Around 88.8% had multiple fractures, commonest combination were tibia/fibula and radius/ulna. Most frequently associated injury was head injury 26.8%, spinal and abdominal injuries 13.4% each(17).

In 2018 a study was done in Egypt, Al-Jamhory teaching hospital to assess orthopedic injuries in Poly-Traumatized patients in age group of 15-45 years. There were 64 patients included in the study, the mean age was 20 years, with more than 90% of the patients being male. The most common mechanism of injury was MVA (50%). Upper limbs were affected equally to lower limbs, closed orthopedic injuries were common than open injuries. Head injuries were noted to be the bulk associated injuries with the most serious and fatal outcome(18).

In 2015 a study which assessed pattern of mortalities among orthopedic and trauma admission in Irrua specialist Teaching Hospital, Nigeria was published. There was a total number of 2129 admissions and 45 deaths were recorded, with an overall crude mortality of 2.11%, with M: F death ratio of 3.5:1. Twenty-one (46.67%) of the deceased patients had surgical intervention before death while 24 (53.33%) had none. Medical co-morbidity was present in 17 (37.78%) of the deceased patients, Hypertension with hypertensive heart disease was the most common condition accounting for 13.33%, followed by Diabetes mellitus 8.89%. Head injury with long bone fracture and multiple long bone fracture, were the two most common primary diagnosis of diseased patient, accounting for 26.67% and 20% respectively. Septicaemia was identified as primary cause of death

in 24.44%, thrombo-embolism in 17.78%, head injury in 13.33% and fat embolism in 11.11 % of the patients(19).

In 2019 a descriptive cross-sectional study was done in teaching hospital, Nepal, to assess pattern of injury among orthopedic inpatients. The study showed that the commonest pattern of injury was fracture (70.1%) out of all traumatic cases. Among all the fracture, upper limb fracture was the most common type (32.4%), followed by lower limb fractures (31.8%). Out of all bony injuries of the extremities including pelvis and spinal injuries there were 74.1% closed injuries, 24.1% open injuries and 1.8% both closed and open injuries. Associated other organ system injuries were present in 13.1% of all traumatic cases, head injury was the most common (66.4%) and abdominal injury was least common (4.4%)(20).

From January 2008 to December 2010, a descriptive prospective study of all trauma admission to a multidisciplinary ICU of Bugando Medical Center in Northwestern Tanzania was conducted. There was a total of 312 cases of major trauma admitted in ICU, representing 37.1% of total ICU admission. Males outnumbered females by a ratio of 5.5:1. Isolated injuries occurred in 208 (66.7%) patients while 104 (33.3%) patient had multiple injuries. The musculoskeletal (extremities) regions accounted for 34.6% of cases respectively. Soft tissue injuries and fractures were common type of injuries accounting for 97.8% and 32.4% respectively. A total of 102 patients died giving a mortality rate of 32.7%. There were different predictors of mortality based on univariate and multivariate analysis. Patient with delayed admission were 3.4 times more likely to die than those with immediate admission, those with severe head injuries (GCS <9) were 4.72 times more likely to die than those with less severe head injuries, patient with admission SBP of <90 were eight times more likely to die than those with systolic blood pressure of >90 and those with need of ventilator support were 1.5 times more likely to die (2).

A retrospective study conducted in Gondar University Hospital, to assess the magnitude and patterns of injuries. There were a total of 616 patients, with a male to female ratio of 5:1. The three leading outcomes of injury were bruise or superficial, 215 (34.9%); fracture, 141 (22.9%); and head injury, 106 (17.2%). The common mechanism of injury was blunt assault, 316(51.3%), followed by road traffic accidents, 334 (30.3%). There was a total number of 13 deaths due to injury(21).

Similarly, to assess pattern of trauma admission and outcome of patients who presented to Jimma University Specialized Hospital, a cross- sectional study was conducted from August to December

2015. A total of 211 trauma patients admitted to surgical wards and ICU were included, the male to female ratio of 3.14. The most common mechanism of injury was road traffic collision accounting for 39.8% of cases. According to the system involved in the trauma, 111 (52.6%) were musculoskeletal injuries. The study also revealed in-hospital mortality during the study period was 14.7%, factors associated with risk of death were male sex who were 2.3 times more likely to die than females, patients with GCS of 15/15 were 25 times more likely to survive than those with GCS of <8 and patient admitted with hemoglobin level >10g/L have 75% less chance of dying from trauma than those with lower hemoglobin level(22).

A retrospective study done in a Dutch level I trauma center to identify the incidence and etiology of mortality in polytrauma patients. There were 205 out of 1073 polytrauma patients that died during the study period. The mean ISS score of the deceased was 30.4. CNS injury was the predominant cause of death (63.4%) followed by exsanguination (17.6%). After regression analyses the independent predictor of mortality suggested are: the odds of mortality among female patient was 2 times less likely than, patients with age>59 are 6.2 times more likely to die as compared to patient age<59, the mortality of patients with RTS score<6 were 12.9 times more likely than their counterpart and patients with more than 4 unit of transfusion within 24 hours are 3.6 likely to die than those with smaller amount of transfusion. 45.4% of patient died within 24hr of injury(23).

A 5-year retrospective analysis done in Dilla university to evaluate the pattern and outcome of injuries among trauma patients it showed, RTA as the commonest mechanism of injury. The commonest type of injury was lower extremity injury 35.9%, followed by upper extremity 19.7% and poly-trauma 15.4%. There were 6% death from included samples, poly-trauma was responsible for the majority of deaths 43.5% followed by head injury 39.1%. Time of arrival to institution showed the highest predictive ability of patient mortality. One unit in decreasing GCS was associated with three times higher odds of predicting mortality, mortality was three times more likely in a patient with revised trauma score of <10 and those admitted for less than 7 days were 90% less likely to die than those with more than seven days admission (24).

2.1 Conceptual Framework

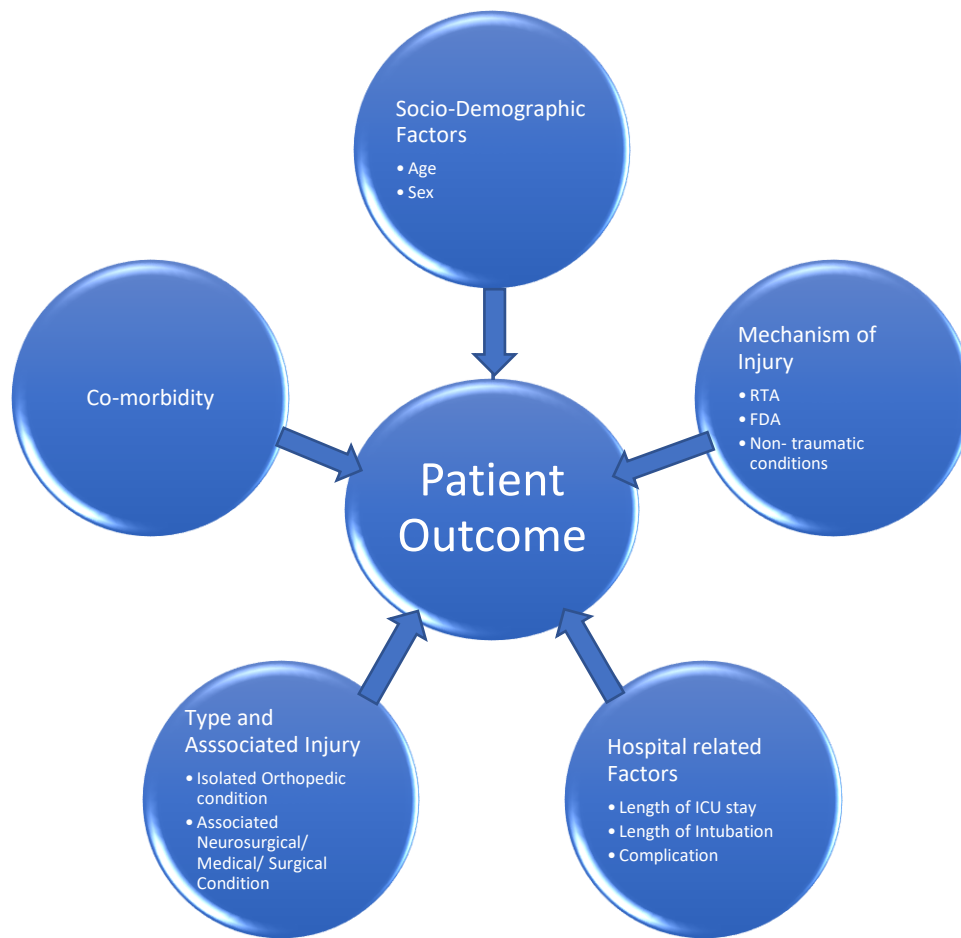


Figure 1. Diagrammatic presentation of the conceptual framework developed by reviewing related literature(2,12,19,23,24)

3. Objectives

3.1. General Objective

To assess admission pattern and factors associated with treatment outcome of orthopedics patient in Intensive care unit of Addis Ababa Burn Emergency and Trauma Hospital (AaBET) Hospital, June 2017 to November 2021 G.C.

3.2. Specific Objectives

To determine pattern of orthopedic cases admitted to AaBET ICU, from June 2017 to November 2021 G.C.

To determine outcome of orthopedic patients admitted to AaBET ICU, from June 2017 to November 2021 G.C.

To determine associated injuries in orthopedic patient admitted to AaBET ICU, June 2017 to November 2021 G.C.

To determine factors that can affect the outcome of orthopedic patient admitted to AaBET ICU, from June 2017 to November 2021 G.C.

4. METHODS AND MATERIALS

4.1. Study Setting:

The study was conducted in Intensive Care Unit of Addis Ababa Burn Emergency and Trauma Hospital, an affiliate of St. Paul's Millennium Medical College, which is located in Addis Ababa, Ethiopia. The hospital was established on 15th July 2015 G.C, it is the first of its kind in serving any emergency patient with special emphasis on trauma. It has been giving orthopedics, neurosurgery, trauma, burn, emergency and critical care service since its establishment. It has a total of 145 beds for all the departments, 4 Operating theatre and 2 recovery rooms.

4.2. Study Period:

Data was collected in two-month period at AaBET hospital from January 1, 2022 to February 28, 2022.

4.3. Study Design:

The present study utilized a cross-sectional design by reviewing record on available medical records related to orthopedics related ICU admission from AaBET Hospital Record department of four and half years from June 2017 to November 2021 G.C.

4.4. Study Population:

Source population are patients admitted to AaBET hospital ICU.

The study population were patients with orthopedic condition admitted to AaBET ICU, from June 2017 to November 2021 G.C, that met the inclusion criteria

Inclusion criteria are patients with orthopedic condition with complete clinical information admitted to AaBET ICU during the study period.

Exclusion criteria are patients with incomplete data, patient managed in the semi- ICU, patient transferred to other hospital before completing their treatment.

4.5. Sample Size:

The sample size was calculated based on the single population proportion formula

$$\text{Sample size (n)} = \frac{(Z_{\alpha/2})^2 \times p(1-p)}{d^2}$$

Where,

n= desired sample size

P= 21% (a study done by Surya Gandham on Orthopedic patients who require Intensive Care admission in Warrington Hospital showed the mortality rate among orthopedics ICU patient to be 21%)(12).

d= the margin of error (5%)

$z_{\alpha/2}$ = critical value at 95% confident interval

Using this formula, the total sample size will be 255 patients, adding 10% contingency the sample size will be 280

Although through examining four years and five-month report (the total duration since ICU registry started) (from June 1, 2017 to November 31, 2021 G.C.) of AaBET hospital ICU registry file, a total of 125 patients were registered in the study period. From the 125 patient 117 patient met the inclusion criteria. So, all patients with orthopedics case treated in ICU of AaBET hospital in the last four years and five-month and met the inclusion criteria will be included.

4.6. Sampling Procedures:

The medical records of orthopedic patient who were treated at the hospital ICU was retrospectively reviewed to assess the treatment outcome and admission pattern. All patients who met the inclusion criteria (117) with in the study period were included.

4.7. Measurement

4.7.1. Study Variables:

Dependent variable

- Outcome of the patient

Independent variable

- Age, sex, Mechanism of Injury, Source of admission, Timing of admission, Length of stay, Vital sign upon admission, Surgical intervention, Mechanical ventilator support and duration, Mental status of patient, type of orthopedic case, co-morbidity, Indication of ICU admission

4.8. Data Collection and Procedures:

The HMIS registration book of ICU department was used to get the card numbers of ICU patients who were admitted during the study period. Data collection conducted by reviewing the case charts (admission register, case file and delivery register) from medical record section of the AaBET hospital. The data sheet was prepared by reviewing patient card. Once the files were obtained, Data sheet was used to record age, sex, date of admission, type of injury and the type and determinants of orthopedic injuries from the patients' files. Each patient card was given a unique identification number. A register of the unique identification numbers and patients' names were kept separately from the data collected. One-day training was given for three General Practitioners who works as data collectors and one orthopedic resident supervisor about how to fill the structured data collection sheet and performed a pre-test after completion of the training. Missing data were coded as missing after two unsuccessful searches for files.

4.8.1 Instruments

Checklist was designed for the study, it was used to document demographic details of the patients, primary diagnosis on admission, associated factors, co-morbidity, type of intervention performed, course of stay and duration of admission. Death certificates was used to arrive at the possible causes of death of deceased patients.

4.9. Operational Definitions:

Outcome: condition of patient written on the medical chart upon completion of treatment (Improved or Died).

ICU Mortality: Patients that died within ICU, during their course of treatment.

Source of Admission: location of patient before admission to the ICU (Emergency, PACU)

Timing of Admission: the amount of days the patient stayed in other part of hospital before ICU admission

Associated Injuries: other associated trauma the patient has apart from the orthopedic injury

Co-morbidity: known disease the patient had before the trauma (e.g. Hypertension, Diabetes Mellitus, Epilepsy, Chronic Kidney Disease)

Length of Stay- the amount of days the patient stayed in the ICU after admission.

4.10. Data Quality Control and Management:

Prior to any data abstraction, coders were carefully trained. Training included a careful review of the variables, the procedural manual, and the data abstraction form. Following this review, data collectors coded several patient records as a pilot test which was used to ensure that all coded elements of the data sheet can be populated. These coded elements were carefully verified by the researcher to ensure accuracy. Any discrepancies in coding was reviewed jointly and discussed to clarify any issues. Supervision was done in-process as well as daily supervision of the completed questionnaires by the PI for any needed clarifications based on the study. During data collection, 5% of sample was randomly selected and tested against the patient card by the principal investigator. The PI was at the site to oversee data collection process and checked all previously completed questionnaires for consistency and completeness. And a unique ID was assigned for each subject/questionnaire.

4.11. Data Analysis Plan and Procedures:

Filled questionnaires was checked for completeness and coded by the PI. Data was entered on SPSS V.25, a statistical package, which also was used to clean and analyze collected data. Frequencies was generated for categorical variables and continuous variables were summarized using means, median, mode and standard deviation. Tables and graphs was used to present the data. Descriptive statistics was used to show the frequency and percentage of the characteristics. Frequency distributions, percentages, tables and charts were also used to show results of univariate analysis. P-values, odds ratios and 95% confidence intervals was used to present results. Logistic regression (bivariable and multivariable) analyses was used to determine the effect of factor(s) on the outcome variable and to control possible confounders. Bivariable analysis was used and variables associated with the dependent variable (with P- value < 0.05) were subjected to multivariable regression. And in multivariable regression variables with (P-value < 0.05) was considered to declare statistical significance.

4.12. Ethical Consideration:

Ethical approval and clearance was obtained for the study from the Research and Publications Office of SPHMMC. All concerned bodies were officially contacted through letters and permission obtained at all level. Access to medical records in hospitals was secured after discussing and getting permission from research directorate. Confidentiality of the information was guaranteed

by not writing the name and anything that enables to identify the patient identity. In addition to that information gathered from the patient`s card was solemnly used for this study only.

4.13. Dissemination of Results:

Final copy of this study finding will be submitted to SPHMMC Research Directorate Office, Department of Orthopedics and traumatology and Department of Emergency medicine and critical care. Efforts will be made to present the finding of this study in different seminars, workshops, and conferences. Publication on the scientific journals will also be sought.

5.Result

5.1. Sociodemographic characteristics of patient's admitted to the ICU:

A total of 117 patients who met the inclusion criteria were admitted in AaBET hospital during the study period. From the study population 101(86.3%) were males and 16 (13.7%) were females. The patients age ranged from 4 to 80. The mean age of the patients was 32.74 (SD=16.495). More than half of the patients were in the age group of 20-29 (32.5%) and 30-39 (24.8%). Most of the patients were from Oromia region 41.9% (n=49) followed by Addis Ababa and Amhara region each accounting for 20.5%.

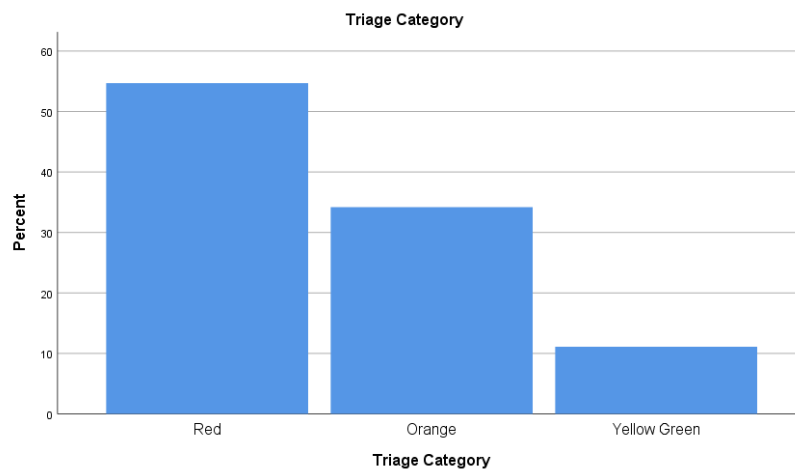
Table 1. Socio-demographic characteristics of orthopedics patient that got admitted into AaBET ICU, June 2017 to November 2021 G.C.

		Number	%
Age	0-9	9	7.7%
	10-19	8	6.8%
	20-29	38	32.5%
	30-39	29	24.8%
	40-49	11	9.4%
	50-59	13	11.1%
	60-69	7	6.0%
	>70	2	1.7%
Sex	Male	101	86.3%
	Female	16	13.7%
Address	Addis Ababa	24	20.5%
	Oromia	49	41.9%
	Amhara	24	20.5%
	Somali	4	3.4%
	SNNP	10	8.5%
	Afar	6	5.1%

5.2. Triage category & admission source of orthopedics patients:

Patient who had an orthopedic injury or condition that eventually got admitted to ICU, during their initial evaluation more than half of them were triaged as Red (54.7%), 40 (34.2%) of the patients were triaged as orange and the rest were initially categorized as a yellow green patient.

Figure 2. Distribution of triage category of orthopedics patients admitted from emergency to AaBET ICU, June 2017 to November 2021 G.C.



Admission from the emergency was the major source, 70 of the patients were admitted into ICU directly from the emergency, the mean length of stay was 3.79 (SD=3.021) days before they got transferred into the ICU. The second major source of admission was PACU, from which 42 (35.9%) patients got admitted and orthopedics ward accounted for 5(4.3%) of admission.

Table 2. Length of stay in emergency department before ICU admission, June 2017 to November 2021 G.C.

		Number	Percent (%)
Days the patient stayed in Emergency	<1 day	8	11.4%
	2-5 days	47	67.1%
	6-10 days	13	18.6%
	11-15 days	1	1.4%
	16-20 days	1	1.4%

Figure 3. Pattern on source of orthopedic patient ICU admission, June2017 to November 2021 G.C.

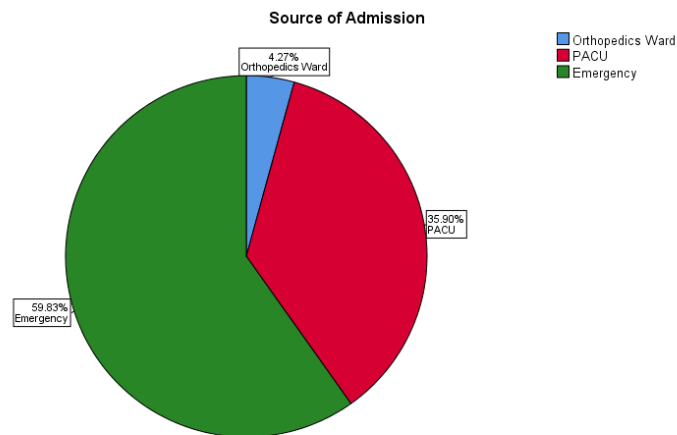


Table 3. Distribution of vital sign, GCS and Saturation of orthopedics patients admitted to AaBET ICU, June 2017 to November 2021 G.C.

		Sex			
		Male		Female	
		Percent			
		Number	(%)	Number	Percent(%)
Blood Presure	<90/60 mmHg	24	23.8%	5	31.3%
	90/60-139/89	65	64.4%	11	68.8%
	mmHg				
	>140/90 mmHg	12	11.9%	0	0.0%
	Unrecordable	0	0.0%	0	0.0%
Pulse rate	<60	0	0.0%	0	0.0%
	60-100	25	24.7%	2	12.5%
	100-140	66	65.3%	13	81.3%
	>140	10	9.9%	1	6.3%
Respiratory Rate	>29	39	38.6%	6	37.5%
	10-29	62	61.4%	10	62.5%
	6-9	0	0.0%	0	0.0%
	<5	0	0.0%	0	0.0%
Glasgow Coma Scale	15-13	49	48.5%	7	43.8%
	12-9	25	24.7%	4	25.0%
	8-6	24	23.7%	5	31.3%
	5-4	3	2.9%	0	0.0%
	3	0	0.0%	0	0.0%
	>95	13	12.9%	2	12.5%

Sat. without	95-90	27	26.7%	3	18.8%
support	90-80	41	40.6%	4	25.0%
	<80	20	19.8%	7	43.8%

Table 4. Pattern of injury in orthopedics patient admitted into ICU, June 2017 to November 2021 G.C.

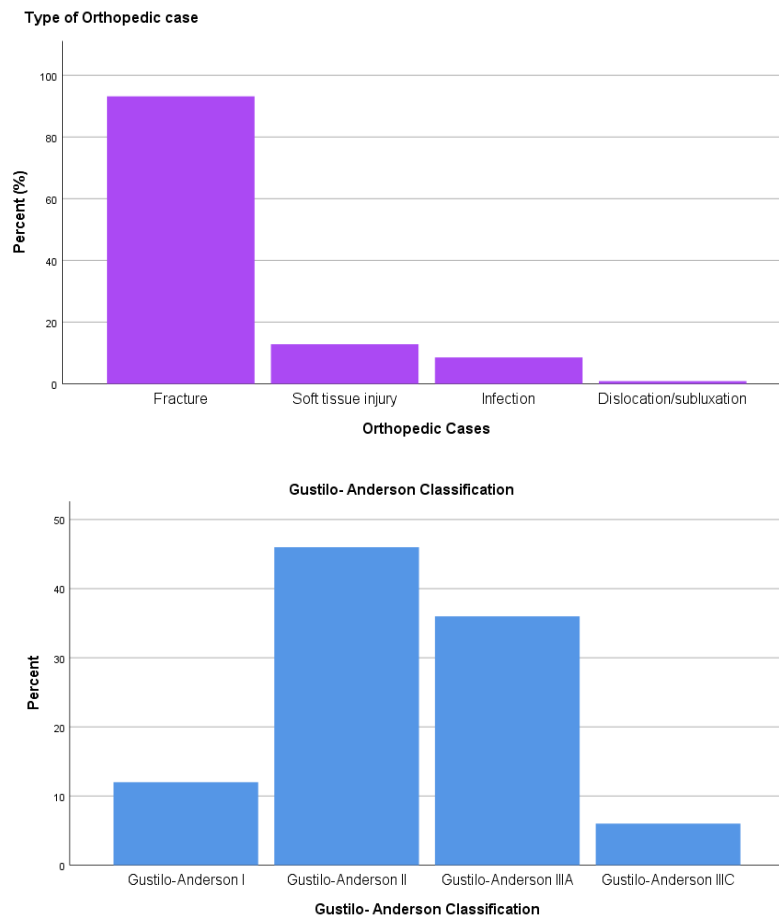
		Frequency	Percent (%)
Traumatic Admission	RTA	88	75.2
	Fall down accident	20	17.1
	Assault including stone and stick injury	1	.9
	Total	109	93.2
Non-traumatic Admission		8	6.8
Total		117	100.0

From the total 117 orthopedic patients that got admitted to ICU, traumatic cause was the most common reason for admission and accounted for 109 (93.2%) patients and the rest were non-traumatic for 8 (6.8%) patients. The non-traumatic admissions were infectious cause that were managed by orthopedics team. The two most common mechanism of injury from the traumatic admissions were RTA 88 (75.2%) and fall down accident from height 20 (17.1%). The least common cause of injury was assault.

5.3. Pattern of injury in orthopedics patient:

When assessing distribution of case, fracture was present in 109(93.2%) patients, soft tissue injury in 15 (12.8%), infection in 10 (8.5%) and the least common was dislocation accounting for a single case. From the patients who had fracture half of them were closed, 26 (23.8%) patients had open fracture and 24 (22%) patients out of the total had a combination of closed and open fracture. Gustilo-Anderson II and Gustilo-Anderson IIIA were the most commonly seen open fracture type accounting for 46% and 36% respectively.

Figure 4. Distribution of orthopedics case and pattern of open fracture among patients admitted into AaBET ICU, June 2017 to November 2021 G.C.



From the total, 109(93.2%) patients that got admitted to the ICU had fracture at different anatomic area. Lower limb was involved in 77.1%, upper limb in 45% and pelvis & acetabulum in 38.5% of cases who had fracture. From those who had fracture, 52 (47.7%) of them had fracture at two or more areas, most common combination was upper limb with lower limb fracture in 18 (16.5%).

Table 5. Distribution of fracture area in ICU admitted orthopedics patient, June 2017 to November 2021 G.C.

Fracture area distribution					
Upper Limb Fracture		Lower Limb fracture		Pelvis/acetabulum #	
Number	%	Number	%	Number	%
49	45.0%	84	77.1%	42	38.5%

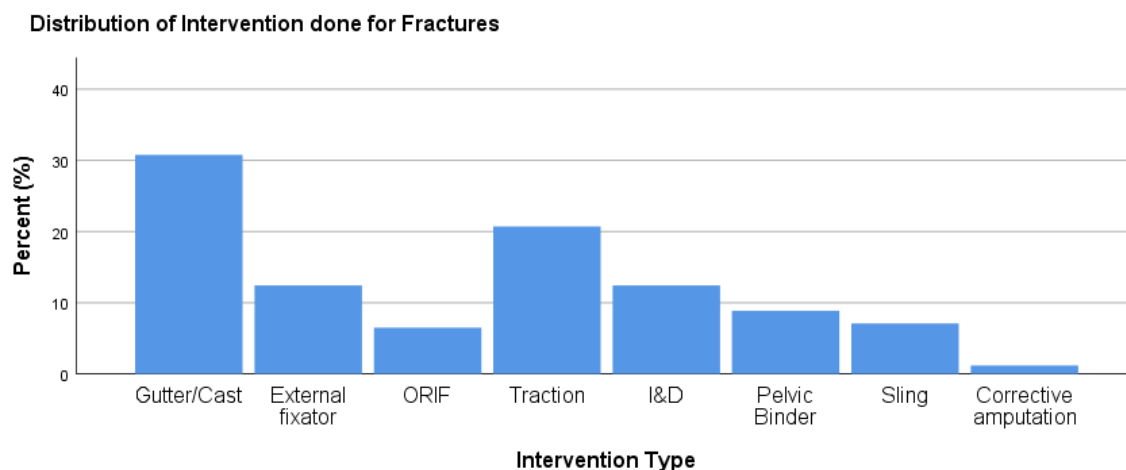
Patients with upper limb fracture the three most frequently involved areas were humeral shaft fracture, fracture around the wrist (distal radius fracture) and clavicular fracture accounting for 25%, 23.3% and 20% of upper limb fracture respectively.

Patients with lower limb fracture, the commonly affected specific anatomic area were tibia & fibula fracture, femur shaft fracture and hip fracture (femur neck and intertrochanteric fracture) accounting for 35.3%, 34.5% and 13.8% respectively.

Tile A 37.8% and Tile B 31.1 % for the pelvic fracture and elementary acetabular fracture (13.3%) for the acetabulum were the commonly encountered fracture around the pelvis.

The common intervention done for patients with fracture were gutter or cast (30.8%), traction (20.7%) and External Fixator (12.4%)

Figure 5. Distribution of intervention done for fractures AaBET ICU, June 2017 to November 2021 G.C.



Out of the total reviewed patients 10 had an infection and there was a single case of knee dislocation for whom open reduction was done. From the patients with infection Osteomyelitis, Necrotizing fasciitis and Disseminated Staphylococcus infection each had 2 patients, whereas Septic arthritis, Wet gangrene, Diabetic foot ulcer and Pyomyositis had a single patient in each

category. I&D (Irrigation and debridement) with antibiotics was the mode of treatment for 7(70%) of patients with infection, and 3 (30%) patients underwent amputation.

Table 6. Pattern of Orthopedics infection and intervention done among ICU patients, June 2017 to November 2021 G.C.

			Number	Percent (%)
Type of Orthopedic Infection	Osteomyelitis		2	20.0%
	Septic Arthritis		1	10.0%
	Necrotizing Fascitis		2	20.0%
	Wet Gangrene		1	10.0%
	Pyomyositis		1	10.0%
	Disseminated		2	20.0%
	Staphylococcus infection			
Intervention done for infection apart from antibiotics	Diabetic Foot Ulcer		1	10.0%
	Antibiotics Only		1	10.0%
	I&D		6	60.0%
	Amputation		3	30.0%

In orthopedics patient that were admitted to the ICU associated medical condition was present in 84(72.4%) of patients, associated general surgery condition in 75 (64.7%) and neurosurgical condition in 74 (63.8%) of patients.

Figure 6. Distribution of associated injuries in orthopedics patient, June 2017 to November 2021 G.C.

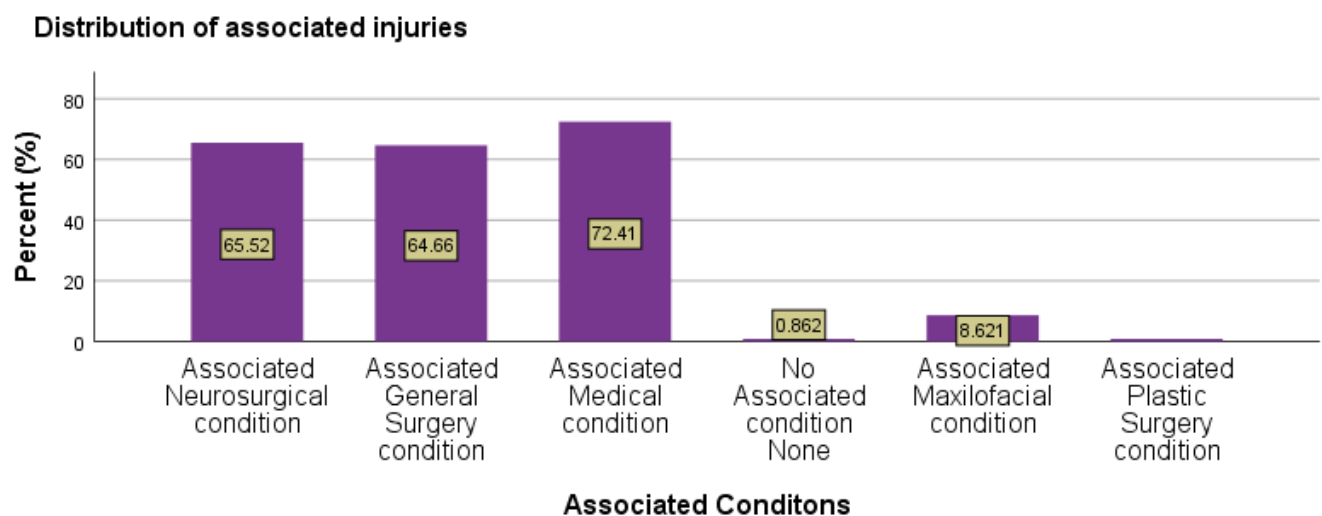


Table 7. Distribution of associated injuries among orthopedics patient admitted into ICU, June 2017 to November 2021 G.C

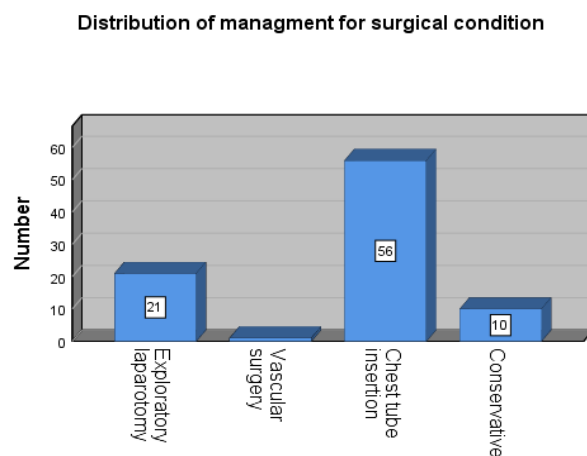
		Number	Percent (%)
Neurosurgical condition	Mild TBI	16	20.5%
	Moderate TBI	29	37.2%
	Severe TBI	31	39.7%
	DAI	43	55.1%
	Epidural Hematoma	5	6.4%
	Subdural Hematoma	3	3.8%
	Contusion	4	5.1%
	BSF	5	6.4%
	DSF	2	2.6%
	TSCI	2	2.6%
Surgical condition	Solid organ injury	23	30.7%
	Rib Fracture	14	18.7%
	Hemothorax	54	72.0%
	Pneumothorax	27	36.0%
	Lung Contusion	19	25.3%
	Hollow organ injury	9	12.0%
Medical condition	Respiratory	61	70.1%
	Infectious	14	16.1%
	Cardiovascular	24	27.6%
	Endocrine	4	4.6%

From the reviewed patients who had a neurosurgical condition, of the total TBI patients 31 (39.7%) were severe TBI ($GCS \leq 8$). The most common CT findings of TBI patient was DAI 43 (55.1%) followed by BSF & Epidural hematoma. Most of the patients with neurosurgical condition were treated conservatively. From surgical condition the three common findings were hemothorax 54 (72%), Pneumothorax 27 (36%) and solid organ injury (including injury to the spleen, liver etc.) 23 (30.7%). Hollow organ injury (which include bowel and bladder injury) was the least common encountered surgical condition. Chest tube insertion 56 (74.7%) was the most common procedure among the surgical patients, followed by exploratory laparotomy 21 (28%).

Table 8. Distribution of intervention done by Neurosurgery for orthopedic ICU patients, June 2017 to November 2021 G.C.

		Number	Percent (%)
Intervention by Neurosurgery	Hematoma evacuation	1	1.3%
	DSF elevation	1	1.3%
	Decompressive craniotomy	2	2.6%
	Conservative	72	94.7%

Figure 7. Distribution of management for surgical condition, June 2017 to November 2021 G.C.



From the reviewed cases 61(52.1%) had a respiratory condition apart from the orthopedic injury, the commonest finding being Type 1 respiratory failure which was found in 59 patients. Hemorrhagic shock was present in 23 and septic shock in 13 patients.

Table 9. Pattern of associated medical condition among orthopedic ICU patients, June 2017 to November 2021 G.C.

System Involved		No	Percent (%)
Respiratory system	Type 1 respiratory failure	59	96.7%
	Type 2 respiratory failure	1	1.6%
	Other	1	1.6%
Infectious	Tetanus	1	7.1%
	Septic shock	13	92.9%
Cardiovascular	Myocardial Infarction	0	0.0%
	Arrhythmia	1	4.2%
	Hemorrhagic Shock	23	95.8%

Endocrine	Severe DKA	3	75.0%
	Thyroid Storm	1	25.0%

Out of all the reviewed cases Respiratory failure 57 (48.7%) was the major reason for admission, followed by monitoring purpose 51 (43.6%) and 9 (7.7%) patients for an indication of hemodynamic support. From those that were admitted to ICU majority 93.2% (n=109) of patients were intubated. The two main reasons for intubation were respiratory failure and airway protection.

5.4. Orthopedics patient course of stay in ICU:

In 113 (96.6%) patient's antibiotics, GI prophylaxis and anti-pain were given during their course of stay within ICU, other common treatment also include sedation, DVT prophylaxis, and hemodynamic support. There were 80 (68.4%) patients who were transfused as part of the hemodynamic support.

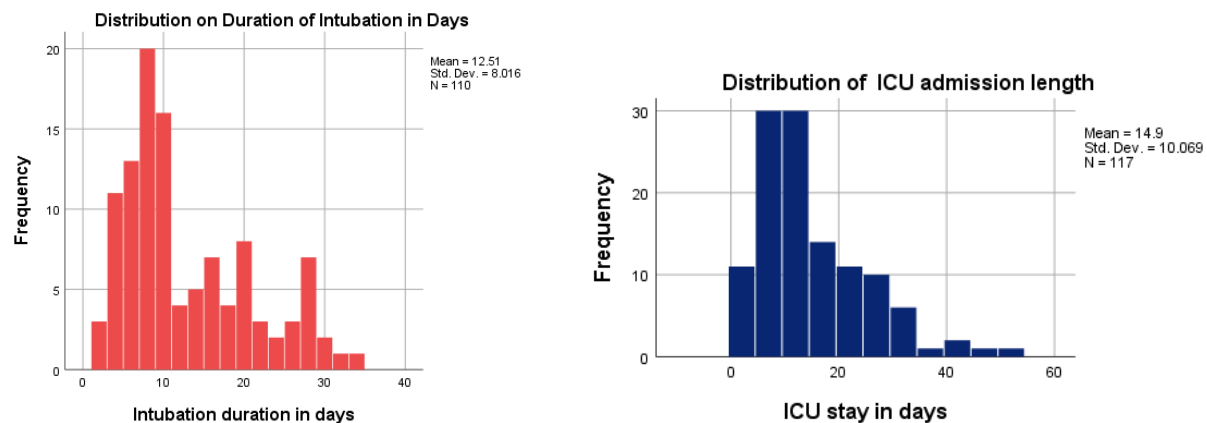
Table 10. Distribution of treatment given for patient in the ICU, June 2017 to November 2021 G.C.

		No	Percent of Case
Treatment in ICU	Mechanical ventilator support	109	93.2%
	Hemodynamic support	77	65.8%
	Antibiotics	113	96.6%
	Diuretics	4	3.4%
	Seizure prophylaxis	57	48.7%
	GI prophylaxis	113	96.6%
	DVT prophylaxis	101	86.3%
	Sedation	105	89.7%
	Anti-pain	113	96.6%

Diabetes mellitus was the most common co-morbidity present in 9 (7.6%) patients, followed by Hypertension and Tuberculosis who was present in 3 patients each.

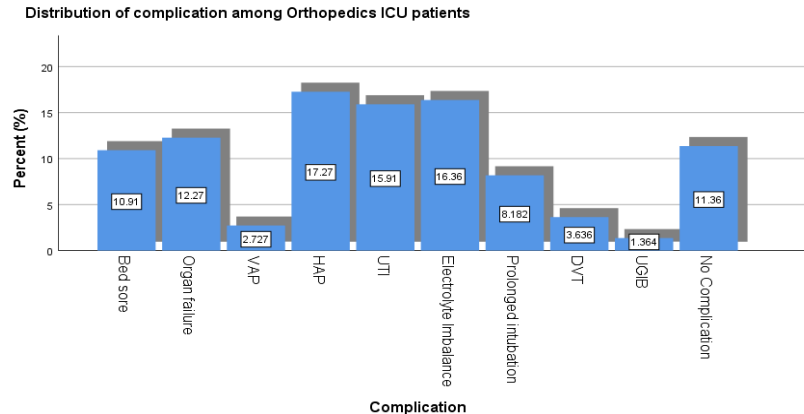
The mean length of intubation who were on mechanical ventilator was 12.51 (SD=8.016) days, the mean length of stay in the ICU of orthopedics patients was 14.9 (SD=10.069).

Figure 8. Distribution of Mechanical ventilator and ICU admission length of orthopedics patient, June 2017 to November 2021 G.C



Complication in the ICU was present in 88.64%. The three most common complication were HAP in 17.27%, electrolyte imbalance in 16.36% an UTI in 15.91%.

Figure 9. Distribution of complication of orthopedics patient admitted to ICU, June 2017 to November 2021 G.C.



5.5. Outcome of orthopedics patient in AaBET ICU:

During the study period 117 patients with orthopedics case were admitted in AaBET ICU, out of whom 93 (79.5%) patient condition improved and were either transferred to their respective ward or discharged home. The overall in ICU mortality was 24 (20.5%). Based on death certificate report of patients who died, cardiopulmonary arrest secondary to refractory septic shock accounted for 9 (37.5%) cases, followed by cardiopulmonary arrest secondary to multi organ failure and respiratory failure each accounted for 6 (25%) cases.

5.6. Determinants of ICU outcome

Based on bivariate analysis, of factors that may affect the outcome of orthopedics patient admitted to the ICU. Age ≤ 40 ($p=.010$) (OR=0.292, 95% CI; .114, .744), Pulse rate 60-100 ($p=.017$) (OR=.145, 95% CI; .029, .712), GCS < 8 ($p=.026$) (OR=2.901, 95% CI; 1.135, 7.416), presence of septic shock ($p=.001$) (OR=8.307, 95% CI; 2.388, 28.906), amount of transfusion within initial 24 hours ($p=.015$) (OR=0.133, 95% CI; .260, .678), presence of complication within the ICU ($p=.047$) (OR=8, 95% CI; 1.024, 62.473) and ICU length of stay ($p=.000$) (OR=8.990, 95% CI; 3.048, 26.519) were significantly ($P<0.05$) associated with the patient outcome.

Based on the multivariate analysis presence of septic shock, GCS and ICU length were determinant of outcome. A patient with severe TBI, GCS ≤ 8 was 4.34 times ($p=.045$) (AOR=4.344, 95% CI; 1.106-17.064) more likely to die than those with higher GCS, those who have mild or moderate TBI. Patients who had a septic shock during their course of ICU stay were 10.5 times ($p=.030$) (AOR=10.495, 95% CI; 1.257, 87.630) more likely to die than patients who didn't. Mortality was 4 times more likely in those who stayed less than 5 days, compared to patients who stayed more than 6 days ($p=.015$) (AOR=4.118, 95% CI; 1.306, 12.986).

According to result of the multivariate analysis presence of septic shock, initial patient of GCS ≤ 8 and ICU length were statistically significantly, and they were retained as determinant of outcome in orthopedics patient admitted to ICU

Table 11. Bivariate and multivariate analysis of factors associated with outcome of orthopedics patient admitted to AaBET ICU, June2017 to November 2021 G.C.

Variable	Category	Outcome		Bivariate analysis		Multivariate analysis	
		Died	Improved	COR.(95% C.I)	P-value	AOR.(95% C.I)	P-value
Age	≤40	12	72	0.292 (0.114-.744)	0.010*	7.972(0.984-64.576)	.052
	≥41	12	21	1		1	
Pulse Rate	60-100	4	23	.145(0.029-0.712)	.017*	3.015(0.035-262.946)	.628
	100-140	14	65	.179(0.048-0.672)	.011*	.867(0.019-38.756)	.941
	>140	6	5	1		1	
GCS	≤8	11	21	2.901(1.135-7.416)	.026*	4.344(1.106-17.064)	.045*
	>8	13	72	1		1	
Associated Medical condition (Septic Shock)	Yes	9	5	8.307(2.388-28.906)	0.001*	10.495(1.257-87.630)	.030*
	No	13	60	1		1	
Amount of transfusion in 24 hours	≤3	11	62	0.133(0.0260-0.678)	.015*	6.254(0.533-73.329)	.144
	≥4	4	3	1		1	
Complication in the ICU	Yes	23	69	8(1.024-62.473)	.047*	.569(0.017-19.128)	.753
	No	1	24	1		1	
ICU Length of Stay	≤5 days	11	8	8.990(3.048-26.519)	.000*	4.118(1.306-12.986)	0.015*
	≥6 days	13	85	1		1	

6. Discussion

The current study showed that 57.3% of orthopedics patient that got admitted into the ICU were in the age group of 20-39 years, with the mean age of 32.74 (SD=16.495). The median age of the patients is comparable to the studies done in Nigeria(25) and Botswana(16) , who had a mean age of 32.8 and 33.5 years respectively. This result shows that a large number of patients were in their productive age year, and subsequently lead to loss of productivity and impact economy of the family and nation. There was also male preponderance with 86.3% (n=101) and male to female ratio of 6.3:1, even though the ratio is larger than other studies, the male predominance is consistent with studies done in developing nations(2,16,19). The young & male predominance maybe as a result of increased level of participation in high risk activities and occupational exposure for trauma, e.g. most drivers are male in our country.

The study also revealed as traumatic cause as a major reason of orthopedic ICU admission 93.2% (n=109). RTA was the leading mechanism of injury accounting for 75.2% of cases, this finding is comparable to study done in developing countries such as, Tanzania(2) and Nigeria(25), which accounted for 70.8% and 74.5% cases respectively and developed country like Turkey(14). The two most common mechanism of injury from the traumatic admissions were RTA 88 (75.2%) and fall down accident from height 20 (17.1%). The least common cause of injury was assault. RTA as common cause of trauma is also supported by other studies(2,14,25).

In this study, more than half, 54.1% (n=59) of patients had a closed fracture, 23.8% (n=26) had open fracture and combination of open and closed was found in 22% (n=24), which was consistent with studies done in Egypt (18) and Nepal (20), who had more closed orthopedics injuries than open injury. The lower extremity fracture (77.1%) holds the dominance in the fracture site followed by the upper limb and pelvis & acetabulum, similarly study in Botswana(16) had a comparable finding with the common fracture site being the lower extremity (45.7%), followed by the upper extremity (21.6%) and pelvis (3.5%). Other studies (12,17) also show lower extremity was the commonly involved fracture site. In contrast, a study by Bidary et al(20) found upper limb fracture as the common site, the disparity of result may be as a result of geographic and sociodemographic difference. Among the lower limb fracture tibia and fibula was the most

common, which is consistent to studies done both in Africa and Asia (17,20). Similarly, from upper limb fracture humeral shaft fracture was the common site accounting for 25%, whereas study by Bidary et al (20) shows wrist and hand fracture as the most common upper limb sites.

Associated injuries was present in all patient but one. From the neurologic aspect TBI of different severity was present in 63.2% (n=74) of the orthopedics patient admitted to the ICU, Respiratory failure from medical condition was present in 50.4 % (n=59) cases followed by Hemothorax from surgical condition was present in 46.1% (n=54) cases. The result from current study shows, majority (94.7%) of neurosurgical case were managed conservatively. Tube thoracostomy (chest tube) was the frequently done intervention by the general surgery. Similarly, studies done by (17–20) has shown that head injury to be the most encountered associated organ injury.

The frequently seen co-morbidity among ICU admitted orthopedic patients was Diabetes mellitus 7.6% (n=9) followed by Hypertension. A study done in Africa(19) shows prevalence of the co-morbidity the other way around, with Hypertension with hypertensive heart disease being the most common followed by Diabetes Mellitus. The dominance of Hypertension in their study may be explained by the mean age of the population of their study which was 44. It is larger from our study and prevalence of Hypertension may increase as well.

In the current study respiratory failure 57 (48.7%) was the major reason for admission, followed by monitoring purpose 51 (43.6%). Study by Gandham et al (12) showed that main reason of ICU admission was for monitoring purpose in anticipation of postoperative complication. Again a study in west Africa (13) also showed postoperative monitoring as main indication of ICU. Length of ICU in the current study ranged from 2 to 54 days, with a mean of 14.9 days (SD=10.069), which again has a different result from study done by Gandham et al (12), who found the average length of stay between 2 to 3 days. The reason for discrepancy between the two results may be explained, by the reason that 45 (75%) of their patient were either elective case or case with single fracture, and most common reason of admission into ICU was in the anticipation of postop complication. So once complication was ruled out patient will be discharged early and the length of stay within ICU will be minimal. Similar study in Tanzania (2) showed overall ICU length of stay ranged from 1 to 59 days (median 8 days).

In the current study the overall in ICU mortality was 24(20.5%), the common reason being refractory septic shock (37.5%) followed by multi organ failure and respiratory failure each accounted for 6 (25%). The overall mortality was comparable to the study done by Gandham et al (12). The common reason of death being septic shock is also supported by a study done in Africa (19).

In this review a lower GCS was associated with increased mortality. Patient with severe TBI, $GCS \leq 8$, was 4.34 times more likely to die than those with higher GCS. In agreement with this, a study done in Tanzania(2) also showed, those with $GCS < 9$ were 4.72 times more likely to die than the respective group, studies in Turkey(14) and Greece(26) also revealed the rate of mortality increased as the GCS values of the patient decreased. The current result is also supported by studies done in Ethiopia (22,24) who showed a reverse relationship between mortality and GCS.

The presence of septic shock was also a major predictor of mortality based on the result of the study. Those patients who had septic shock during their course of ICU stay were 10.5 times more likely to die. The finding is consistent to study done by Matthaios et al(26), which shows increased mortality by 6.2 times compared to patient without septic shock. Similar study in Nigeria(19) also ranked septicaemia as primary cause of death among orthopedics and trauma admission.

The other factor identified in the study was length of stay in ICU. Mortality was 4 times more likely in those who stayed less than 5 days, compared to patients who stayed more than 6 days. Death in early days of admission of ICU is also supported by studies in Jamaica(11), which showed survivors had a statistically significant longer length of stay in ICU compared to the non-survivors. Similar study in Nigeria(25) also revealed mortality was negatively correlated with length of stay, with more than half of the ICU trauma death occurring within 72 hours of admission. A study by Chalya et al(2) also showed that of the non-survivors who were admitted to the ICU, 66.7% of them died by the seventh ICU day. This result may be as a result of different factors like severity of injury, admission of patients with poor prognosis and delayed admission to ICU.

7. Conclusion and Recommendation

7.1. Conclusion

Traumatic cases accounted for the largest proportion of Orthopedics patient to end up in AaBET ICU. From the traumatic admission, Road traffic accident was the major shareholder. More than half of the patients were between age of 20 to 39. Fracture was present in majority of patients, the common anatomic area being lower limb followed by upper limb. Isolated orthopedic injury was rare, bulk of the patients had an associated medical, surgical or neurosurgical condition. The overall in ICU mortality was 24 (20.5%). Factors associated with outcome of patients in ICU were GCS ≤ 8 , septic shock and ICU length ≤ 5 days.

Efforts should be made at reducing the occurrence of road traffic accidents to reduce morbidity. Emphasis made on orthopedics patients who have GCS ≤ 8 , Septic shock and those in their initial 5 days of admission; will help improve the outcome of patients.

7.2. Recommendation

Based on the finding of this study, the following recommendation are made.

For AaBET hospital;

Missing and incomplete charts were one of the challenges faced during the study, so training and encouraging staff in proper chart keeping should be implemented. Digitalizing of patient chart can also be considered to decrease missing chart, to archive data for a long period of time and in maintaining accuracy.

Health professionals involved in management of orthopedic patients should keep in mind the three identified factors that may affect patient outcome, and give emphasis in order to help improve the outcome of patients.

For Ministry of Health;

Majority of ICU admission were young productive age group as a result of RTA, so measures at reducing the occurrence of RTA along with concerned bodies, should be encouraged to decrease the overall morbidity in this age group. Some of this preventive measures can be enforcement of road safety rules, increased public education and improvement of pre-hospital care.

For Future Researchers;

A similar prospective study with larger group will help identify additional factors that may affect the outcome of Orthopedics patient in ICU.

8. Strength and Limitation of study

Strength

The study is the first of its kind in the hospital, to assess specifically orthopedics patient in the ICU, and as a result could generate new ideas for further studies & act as a baseline data. The study is also extensive in looking at different variables of orthopedics patient that were admitted into the ICU. It also tried to identify determinants of outcome, which will be of great importance for quality improvement and can also be used for preparing admission guideline.

Limitations

Missing and incomplete charts was one of the challenge faced during the study.

Since the study used a secondary data source, the result is based on physician note in the patient chart.

Lack of similar study in our country regarding orthopedics patient in ICU, made it difficult to compare and discuss the findings of the result.

9. References

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10. ANNEX 1: Questionnaire

1.MRN-----

2.Age in years-----

3. Sex A. Male B. Female

4. Address

A. Addis Ababa B. Oromia C. Amhara D. Somali E. SNNP F. Afar G. Unrecorded

H. Other specify-----

5. Triage Category

A. Red

B. Orange

C. Yellow green

6. Vital sign during Emergency Department presentation?

6.1. Blood pressure (Specify Systolic) -----

6.2. Pulse Rate-----

6.3. SPO2 (without support) -----

6.4. Random Blood Sugar in Mg/dl-----

6.5. Respiratory Rate-----

6.6.GCS-----

7. If the admission is not from emergency, from where did the patient get admitted?

A. Orthopedics ward B. PACU C. Referred from other center D. Other (Specify)--

8. How long did the patient stay in the emergency department before admission to the ICU?

A.<1 day B. 1-5 days C. 6-10 days D. 11-15 days E. 16-20 days F. 21-25 days G. > 25 days

9. What was the mechanism of Injury?

- A. RTA B. Fall down accident C. Assault including stone and stick injury D. Machine injury E. Gunshot F. Other specify -----

10. What type of orthopedic case did the patient have? (You can choose more than one answer)
(If the patient has fracture go to question 11, if the patient has infection go to question 19, if patient has dislocation go to question 21)

- A. Fracture B. Soft tissue Injury C. Infection D. Dislocation/subluxation E. Other (Specify)-----

11. If the patient had a fracture, what type?

- A. Closed B. Open C. Both

12. If the patient had open fracture, what type?

- A. Gustilo-Anderson I B. Gustilo-Anderson II C. Gustilo-Anderson IIIA D. Gustilo-Anderson IIIB E. Gustilo-Anderson IIIC

13. If the patient had fracture(s), which area was involved? (You can choose more than one answer)

- A. Upper Limb B. Lower Limb C. Pelvis and acetabulum D. Other(Specify) -----

14. If the patient had fracture of Upper limb, which location was involved? (You can choose more than one answer)

- A. Proximal Humerus B. Humeral shaft C. Elbow region D. Forearm E. Wrist F. Carpal & Metacarpal bones G. Clavicle H. Scapula I. Other (Specify)-----

15. If the patient had fracture of Lower limb, which location was involved? (You can choose more than one answer)

- A. Hip Fracture B. Proximal Femur C. Femur shaft D. Knee region E. Tibia & Fibula shaft F. Pilon & Ankle fracture G. Tarsal & Metatarsal H. Other(Specify)-----

16. If the patient had fracture of the pelvis and acetabulum, what was the type? (You can choose more than one answer)

- A. Tile A B. Tile B C. Tile C D. Elementary acetabular fracture E. Associated acetabular fracture F. Other (Specify)-----

17. What intervention was done for the fracture(s)? (You can choose more than one answer)

- A. Gutter/Cast B. External fixator C. Open reduction and internal fixation (ORIF) D. Traction E. I&D F. Other (Specify)-----

18. If the orthopedic case was infection, what type? (You can choose more than one answer)

- A. Osteomyelitis B. Septic Arthritis C. Necrotizing Fascitis D. Gas gangrene E. Other (specify)-----

19. What was done for the infection?

- A. Antibiotics B. I&D C. Amputation D. Other (Specify)-----

20. If the patient had subluxation/ dislocation which anatomic area was involved? & what was done?

- A. Shoulder B. Elbow C. Hip D. Knee E. Ankle F. Other(Specify)-----

21. What was done for subluxation/dislocation?

- A. Closed reduction B. Open reduction C. Arthrodesis D. Other(specify)-----

22. Apart from the orthopedic injury, what associated injuries did the patient have? (You can choose more than one answer) (If only neurosurgical condition go to the next question, if Surgical condition go to question 26, if medical condition go to question 28)

- A. Neurosurgical condition B. Surgical Condition C. Medical Condition D. None
E. Other (specify)-----

23. If the patient had associated neurosurgical condition, what was the condition? (You can choose more than one answer)

- A. Mild TBI B. Moderate TBI C. Severe TBI D. DAI E. Epidural Hematoma F. Subdural Hematoma G. Contusion H. BSF I. DSF J. Other (Specify)-----

24. If Neurosurgical intervention done, what type?

A. Hematoma evacuation B. DSF elevation C. Decompressive craniotomy D. Other
(specify)-----

25. If the patient had surgical condition, what was the condition? (You can choose more than one answer)

A. Solid organ injury B. Rib Fracture C. Hemothorax D. Pneumothorax E. Lung Contusion
F. Other(specify)-----

26. If surgical intervention done, what type?

A. Emergency laparotomy B. vascular surgery C. Chest tube insertion D. Other (Specify)-----

27. If the patient had medical condition, which system was affected? (You can choose more than one answer) (If respiratory condition go to next question, if infectious go to question 30, if cardiovascular go to question 35, if endocrine go to question 32)

A. Respiratory B. Infectious C. Cardiovascular D. Endocrine E. Other (specify)-----

28. If respiratory system affected what is the diagnosis? (You can choose more than one answer)

A. Type I respiratory failure B. Type 2 respiratory failure C. Severe asthmatic attack D.
Other (specify)-----

29. If infectious what is the diagnosis?

A. Tetanus B. GBS C. Septic shock D. Others (Specify)-----

30. If cardiovascular what is the diagnosis? (You can choose more than one answer)

A. Myocardial Infarction B. Arrhythmia C. Cardiogenic shock D. Cardiogenic pulmonary
edema D. Others(specify)-----

31. If Endocrine what is the diagnosis?(You can choose more than one answer)

A. Severe DKA B. Adrenal crisis C. Thyroid storm D. Other (specify)-----

32. What was the reason for ICU admission?

A. Monitoring B. Hemodynamic support C. Respiratory failure D. Other (specify)-----

33. What comorbidity did the patient have? (You can choose more than one answer) (if none go to question 35)

A. Diabetes mellitus B. Hypertension C. Cardiac disease D. Renal disease E. Neoplasia

F. Epilepsy G. HIV H. Other (specify)-----

34. Was the patient intubated?

A. Yes B. No

35. If the patient was intubated, the reason for intubation was?

A. Airway protection B. Respiratory failure C. Hemodynamic support D. Others (specify)-

36. Treatment given in ICU? (You can choose more than one answer)

A. Mechanical ventilator support B. Hemodynamic support C. Antibiotics D. Diuretics E. Seizure prophylaxis F. GI prophylaxis G. DVT prophylaxis H. Sedation I. Anti-pain J. Other (Specify)-----

37. Was the patient transfused during hemodynamic support?

A. Yes B. No

38. How many units did the patient get transfused in the first 24 hour?

A. 1 unit B. 2 unit C. 3 unit D. > 4unit

39. How long did the patient stay on mechanical ventilator (in days)?-----

40. Complication in the ICU? (You can choose more than one answer)

A. Bed sore B. Organ failure C. VAP D. HAP E. UTI F. Electrolyte Imbalance G. other (specify)---

41. Length of stay in the ICU (in days)?-----

42. Outcome of the patient

A. Improved (Transferred to ward/ Discharged home) B. Died

43. If the patient died, what was the immediate cause of death?

A. Multi organ failure B. Refractory septic shock C. Respiratory failure D. Arrhythmia

E. Electrolyte imbalance F. Other (specify)-----