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HEALTH COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE DEPARTMENT OF ANESTHESIA

SEVERITY OF PAIN AND ITS ASSOCIATED FACTORS AMONG TRAUMA PATIENT AT EMERGENCY DEPARTMENT IN SELECTED PUBLIC HOSPITALS: AN INSTITUTION BASED MULTI CENTER CROSS-SECTIONAL STUDY IN ADDIS ABABA ETHIOPIA, 2023

A THESIS SUBMITTED TO THE DEPARTMENT OF ANESTHESIA, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY, FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT OF A MASTER DEGREE IN ANESTHESIA

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Name of investigator	Yeabtsega Alemayehu (BSc in Anesthesia)
Name of Advisor(s)	Mr. Fissiha Fentie (BSc. MSc in Anesthesia) Mr. Leulayehu Akalu (Assistant Professor in Anesthesia)
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Address of investigator	Tel: +251972695904. Mail : yabialex859@gmail.com

Declaration

I, the undersigned, declare that this thesis is my original work in partial fulfillment of the Requirements for the Master of Science degree in Anesthesia. I understand that plagiarism will not be tolerated and all directly quoted material has been appropriately referenced.

Submitted by:

Yeabtsega Alemayehu _____ _____

Investigator Signature Date

This thesis work has been submitted for examination with my approval as an advisor.

Approved by advisors:

1. Mr. Fissiha Fentie(BSc. MSc in Anesthesia) _____ _____

Signature Date

2. Mr. Leulayehu Akalu (Assistant Professor in Anesthesia)

_____ _____

Signature Date

Approved by board of examiners:

_____ _____ _____

External Examiner Signature Date

_____ _____ _____

Internal Examiner Signature Date

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ACRONYMS/ABBREVIATION

AaBET- Addis Ababa Burn, Emergency and Trauma Hospital

AAU - Addis Ababa University

BMI – Body mass index

ED - Emergency Department

ER - Emergency Room

EMS - Emergency Medical Services

GCS -Glasgow Coma Scale

HO – Null Hypothesis

HA- Alternative Hypothesis

IASP - International Associations for the Study of Pain

LOS -Length of Emergency Stay

NRS - Numeric Rating Scale

PTSD - Post traumatic stress disorder

SD - Standard Deviation

SPSS -Statistical Package for Social Science

TASH –Tikur Anbessa Specialized Hospital

US - United States of America

VAS - Visual analogue scale

VRS - Verbal rating scale

WHO - World Health Organization

ABSTRACT

Background: Traumatic pain is very high in African countries such as Ethiopia due to the fact that they have no acute traumatic pain management guidelines and are the most neglected. Thus, the current study aimed to describe factors associated with severe trauma pain and to support healthcare professionals in planning actions and programs that prioritize the evaluation and control of trauma victims' pain in emergency units.

Objectives: To assess the severity of pain and its associated factors among trauma patients at the emergency department in selected Addis Ababa public hospitals, Ethiopia, 2023.

Method: A multi-center cross-sectional study was conducted in selected Addis Ababa public hospitals from February 1 to April 30; 2023.The pain intensity was evaluated at the time of admission to the emergency department within 20 minutes prior to analgesic administration by the data collectors. A numerical rating scale (NRS) was used to assess the pain intensity. The collected data were coded, entered into EpiData version 3.1 and analyzed by SPSS version 26 statistical software. A bi-variable analysis was performed to determine each of the independent variables, and only variables with a P-value < 0.2 were entered into the multivariable analysis. The strength of the association was determined by the odds ratio and its 95% confidence interval.

Result: The prevalence of moderate-to-severe traumatic pain in patients who sustained trauma at triage in the ED was 82.3%. Being female**(**AOR=5.601, 95%CI 1.723-18.2), alcohol consumption (AOR=4.212, 95%CI 1.22–14.4), ambulance transport (AOR=5.763, 95%CI 1.72-19.3), road traffic accident (AOR=7.286,95%CI1.004-52.8), fracture (AOR=5.239,95%CI 1.077-25.4), trauma site (AOR=7.642,95%CI 1.499-38.9) were significantly associated with severe trauma pain in multivariable logistic regression.

Conclusion: The current study shows that the prevalence of trauma pain was high in the emergency ward. Therefore, the assessment of moderate to severe trauma pain in the ED could be improved by increasing the use of pain rating scales and identifying factors that are associated with severe trauma pain.

Keywords: Severity of pain, emergency department, trauma, pain measurement.

CHAPTER ONE

INTRODUCTION

1.1 Background

Trauma is an injury of tissue and organs' resulting from mechanical, thermal, chemical and electrical mechanisms above the body's resilience to tolerate. Traumatic injuries are responsible for the death of more than 5.8 million people annually and many more were left with emotional and physical suffering due to injuries. Amongst them road traffic accidents (RTA), falls and burns are the most common mechanism of injury (1). Trauma is the main etiology of acute pain and its pain prevalence goes beyond 70% worldwide (2)

According to the International Association for the Study of Pain (IASP) definition, "pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage." (3). As the WHO report, it is a worldwide problem and the usual medical and surgical complaint in all settings of health care services (4). The painful conditions recorded in the USA and Canada account for around 70% of ED visits. Out of this, traumatic pain accounts for 40 (44%), urologic pain accounts for 13 (52%), abdominal pain accounts for 13 (39%), and non-traumatic musculoskeletal pain accounts for 7 (10%) (5).

In Africa, the magnitude of traumatic pain is extremely elevated. For instance, in East Africa, the prevalence of pain in ED tends to be around 83% (6) (7). Numerous countries on the continent have no acute pain management guidelines, and it has been a mostly neglected area, yet it has continued to be deleterious to the health and well-being of injured patients (8). It's to curb this negligence towards pain in an emergency setting that the guidelines and researchers recommend pain as a vital sign in emergency care (9).

Acute pain is physiologically used as a warning sign of tissue damage and, in most cases, is present in the setting of acute tissue injury and usually lasts a few hours or days. In contrast, chronic pain persists over months and years, with intermittent worsening of symptoms. Very importantly, inadequately treated acute pain gives way to chronicity (10). Pain is not purely a perceptual phenomenon rather it is a complex physiologic body reaction that disrupts the bodies

homeostatic regulatory mechanisms. Thereby, producing stress and initiating complex mechanisms required to reverse the body back to normal (11).

This stress response has a delicate balance between protecting our body from the incited tissue injury and the negative physiologic consequences. It causes significant damage to individuals and has social and health costs. However, it hasn´t been studied in the same proportion. However, some authors have assessed the underlying factors that may affect the average pain, including the socio-demographic characteristics of the patient, pre-hospital care, duration, and type of patient transfer to the hospital(1)(12).

Therefore, inadequate evaluation and inappropriate and late therapeutic interventions for acute traumatic pain may trigger various organ and immediate emotional types of distress like hyperventilation, increased cardiac workload, decreased peripheral perfusion, tachycardia, and anxiety, and they might also bring chronic pain(13).

This distress alone justifies the importance of the healthcare professionals handling the pathophysiological changes that occur due to trauma. They should adequately assess the presence and intensity of pain, and the subjective aspects involved in the experience of the individual trauma victims and implement appropriate treatment promptly.

The primary essence of our profession is alleviating a patient's suffering! This is a terrible feeling, as it is nicely described by Albert Schweitzer: "Pain is a more terrible lord of mankind than even death itself". Therefore, this study aimed to allow us to better treat our patients' pain in the future by assessing the effect of different parameters on pain severity in patients with trauma.

1.2 Statement of problem

Trauma is a global health burden, with a reported 973 million injuries needing some level of medical attention, 4.8 million trauma-related deaths, and 247.6 lost disability-adjusted life years in 2013 alone (14).Trauma-related deaths account for 9% of total deaths worldwide. Predominantly, it affects the younger, economically productive segment of the population (15). The Ethiopian experience with trauma is similar to the global trend concerning the age groups affected and their impact(14).

Pain is often the main complaint of trauma patients and is reported by up to 70% of patients in pre-hospital settings and 91% in EDs (burden). Painful conditions cause over 70% of all ED visits in the US and Canada, with the most common being traumatic pain 40(44%), urologic pain 13(52%), abdominal pain 13(39%), and non-traumatic musculoskeletal pain 7(10%). Those numbers are even higher in African countries and resource-limited countries like Ethiopia (14)(15).

Acutely, unrelieved pain is associated with a variety of potential negative physiologic outcomes, including an increase in sympathetic outflow, peripheral vascular resistance, myocardial oxygen consumption, the production of carbon dioxide, hypercoagulability, and decreasing gastric motility and immune function. Unfortunately, poorly treated acute pain can contribute to the development of chronic pain syndromes and vegetative symptoms, as well as increasing the need for higher analgesic dosing during the recovery period(16).

In the African pre-hospital setting, little is known about acute pain, with no studies reporting on the epidemiological characteristics of acute traumatic pain and limited studies describing pain management practices(17).Inadequate control of pain may diminish trust within the medical team, which may negatively affect the treatment outcome. Moreover, it may contribute to the development of chronic pain and some psychiatric disorders, such as depression and PTSD (18).

In addition, when considering the ethical and human rights concerns related to acute pain, all healthcare providers (HCPs) should make it a priority to alleviate suffering and minimize the coinciding adverse effects(19).After psychological relief, when pain is reduced, it has been shown that pain management in trauma patients reduces morbidity and mortality (18).

Traumas, regardless of their economic and health burden on society, have never been given the appropriate type of emphasis in our country. Injuries in general and road traffic injuries in particular are a growing national concern in Ethiopia. In the year 2014/15 alone, there were 15,086 road traffic crashes, which caused an estimated economic loss of 7.3 million USD. Since injuries have a significant impact on the lives of individuals, their families, and the community, they need multifaceted intervention and a comprehensive approach (20).

Therefore, the care of these individuals is disqualified since there is undervaluation and under treatment of pain in emergency units, which increases morbidity and the duration of hospital stays. Yet, adequate and organized pain management for trauma patients has not always been practiced in many trauma centers, especially in developing countries(14)(21).

1.3 Significance of the study

Trauma is among the leading causes of morbidity and mortality all over the globe, with a great frequency in low-income countries (LICs) (22). Trauma and pain are strongly correlated to one another, as proved by studies showing the prevalence of pain upon admission and discharge among trauma patients to be 91% and 86%, respectively. Their relationship is far-reaching and possibly lifelong(23). However, adequate and organized pain management for trauma patients has not always been practiced in many trauma centers, especially in developing countries.

Furthermore, given that the literature reports that acute pain in the African in-hospital setting is highly prevalent and poorly managed (14), this reflects emergency care training, trauma pain assessment, and identifying factors that increase the level of trauma pain, such as scopes of practice or analgesic resources, which require further research, especially in Africa. For this reason, the current study emphasizes assessing the prevalence of severe trauma pain and identifying those factors that increase the level of trauma pain. By means of this, we can prioritize the patient who needs immediate pain intervention and minimize the potential occurrence of untreated pain-related complications.

All of this enables the medical practitioner to shorten these patients' hospital stays by clearly identifying the element that intensifies their trauma pain and treating them correctly. Moreover, the findings of the study might also magnify pain as the fifth vital sign that should be assessed and treated properly. As well as being used as baseline data for future researchers.

CHAPTER TWO

LITERATURE REVIEW

2.1. Prevalence of Pain and Pain Intensity Assessments in Emergency

According to the study done in Rwanda, trauma is the main etiology of acute pain, and traumatic pain prevalence is greater than 70% worldwide (24). Painful conditions prompted over 70% of all ED visits, and traumatic pain 40(44%), urologic pain 13(52%), abdominal pain 13(39%), and non-traumatic musculoskeletal pain 7(10%) were among the pain conditions overwhelming the emergency department in the US and Canada(14)(15).

Moreover, pain is one of the most common reasons for admission or readmission. Pain prevalence in sub-Saharan Africa could be as high as 83% due to the low availability of opioids. Emergency room visits and advice seeking were higher among participants reporting pain, suggesting that poorly managed pain following discharge may have a significant impact on healthcare utilization(25).Among ED women, patients report more pain and are perceived by the provider as having more pain than their male counterparts. Elderly patients are also at risk of inadequate pain management in the ED(26)(27).

Few studies done in Africa show a high prevalence of poor pain control. A study done at Gonder University found that of 203 patients with acute surgical conditions, no analgesia was given to 34% of the 69 patients with severe pain (7). Furthermore, 57% of patients who were given some kind of analgesia still had severe residual pain. The problem has yet to be seen in developed countries.

Pain assessments were often done based on expert opinion and clinical observation rather than validated pain assessment tools (28). There are several pain assessment tools that could be classified into two major groups: one-dimensional assessment tools and multi-dimensional assessment tools. The former is designed for quick, easy-to-use, and repeated measurement, but it doesn't measure all aspects of pain and holistic pain management.

Visual Analogue Scale (VAS), Verbal Numerical Rating Scale (VNRS), and Verbal Rating Scale (VRS) are grouped here. The latter is used to measure an in-depth pain assessment and holistic pain assessments including the interferences of pain with daily activities.

It's generally used for assessments of chronic pain, and the current study is using the one-dimensional pain assessment for an acute pain study (29)(30). Undervaluation and scarce accuracy during the assessment of pain resulted in under treatment and inadequate management of pain therapy in the ED (3)(31).

2.2Factors associated with severe Pain in Traumatic Patients

As explained by the International Association for the Study of Pain, there are multiple causes of inadequate pain treatment in the ED, including failure to acknowledge the pain, failure to assess initial pain, failure to have pain management guidelines in the ED, failure to document pain and assess treatment adequacy, and failure to meet patients' expectations regarding pain management(3).

In addition, some researchers suggest that multiple barriers preclude an ED physician from proper pain management, which include ethnic bias, gender bias, age bias, inadequate knowledge and formal training in acute pain management, opio-phobia, or a lack of supply potency(22).

In spite of that, some authors have tried to assess the underlying factors that may affect the average trauma pain, including demographic and individual characteristics of the patient as well as pre-hospital care, like the duration and type of patient transfer to the hospital.(12).

However, the majority of previous studies focused on the prevalence of acute trauma pain and its management practice without considering the analysis of the stratification as important features as the socio-demographic, injury, and relief measures implemented for pain (32). Depending on the above information, this study aimed to identify factors associated with the level of pain at admission in trauma victims cared for in an emergency unit.

2.3 conceptual framework

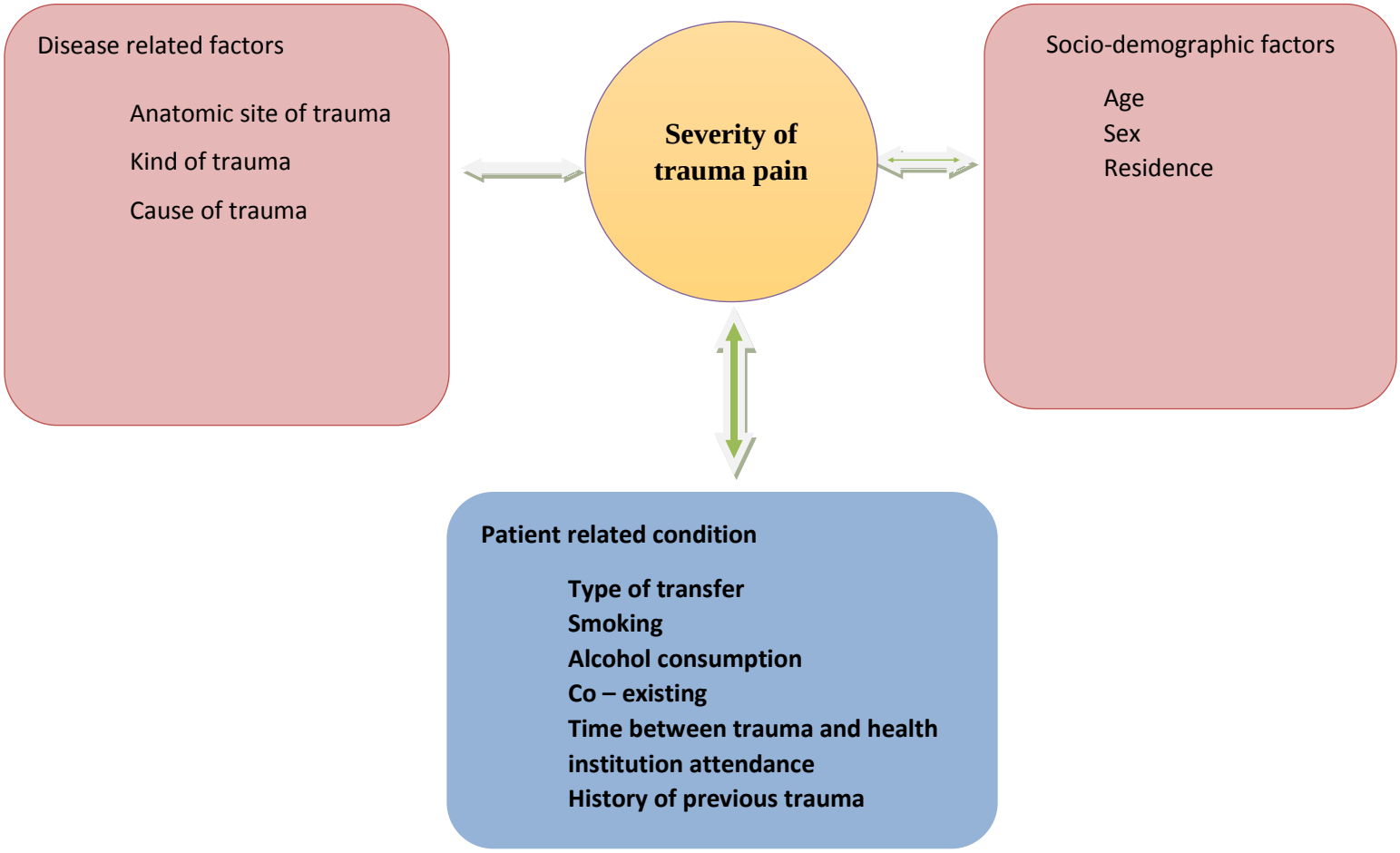


Figure 1- Conceptual framework adapted from different pieces of literature (12) (32).

CHAPTER THREE

OBJECTIVE

3.1. General Objective

The study aimed to assess the severity of pain and its associated factors among trauma patients at the emergency department of a selected Addis Ababa public hospital in Ethiopia in 2023.

3.2. Specific objectives

- ✓ To assess the severity of pain among trauma patients at the emergency department of a selected Addis Ababa public hospital, Ethiopia, in 2023.
- ✓ To identify factors associated with pain severity among trauma patients at the emergency department of a selected Addis Ababa public hospital, Ethiopia, in 2023.

3.3. Research hypothesis

- **HO -** There is no association between severity of trauma pain versus age, residence, smoking, co-existing and time between trauma and health institution attendance.
- **HA –** There is significant association between severity of trauma pain versus sex, alcohol consumption, type of transport vehicle, kind of trauma, cause of trauma and site of pain.

CHAPTER FOUR

METHODS AND MATERIALS

4.1 Study area

The study was conducted in Addis Ababa's government hospitals. Ethiopia's capital city, Addis Ababa, is divided into three levels of governance: the city government is at the top, followed by 11 sub-cities at the second level, and then the woreda at the third level. In Addis Ababa, there are 13 state hospitals and 46 private hospitals, but only three public hospitals and four private hospitals have trauma care units. Three of these seven trauma centers were specifically chosen; taking into account their patient loads and levels (predominantly trauma or referral centers for trauma care). Therefore, the Alert, AaBET, and Tikur Anbessa hospitals' emergency departments in Addis Ababa, Ethiopia were used for the research.

St. Paul's Hospital Millennium Medical College includes the AaBET hospital. It is a center specifically for emergencies that offers level 3 traumas cares. It offers services in orthopedics, neurosurgery, general surgery, and plastic surgery, as well as emergency and urgent care. There are 300 beds in the hospital altogether, with 60 beds in the emergency room. About 400,000 people in Addis Ababa and the neighboring areas are served by the hospital. The hospital's emergency department (ED) admits 41–55 patients per day or 15,000–20,000 patients annually.

The second-largest trauma facility in Addis Ababa, Ethiopia, is ALERT. It became a component of the ALERT institution in 2015. Residents of Addis Ababa and the rest of Ethiopia are cared for by the ALERT hospital trauma center, which today offers medical services in such fields as orthopedics, neurosurgery, plastic and reconstructive surgery, emergency and critical care. With a total of 68 beds, including 12 beds (4 resuscitation beds, 6 beds for yellow-green patients, and 2 triaging coaches), 4 ICU beds with mechanical ventilators, 4 semi-ICU beds without MV and monitor, and 38 beds for elective and emergency surgeries, the ALERT hospital trauma center has its own ICU, wards, OR, CT scan, laboratories, and pharmacy.

On average, it treats about 20 trauma cases per day. Tikur Anbessa Specialized Tertiary Hospital is found in Addis Ababa, Ethiopia. The hospital has 800 beds, with more than 130 specialists and 50 nonteaching doctors. It offers diagnostic testing and treatment for approximately 370,000–400,000 patients per year.

The TASH emergency room treats 18,000 patients annually, beginning at the age of 13, and has 28 residents in addition to nine consultants. The emergency department (ED) sees 50 patients each day on average, many of whom need immediate medical attention or resuscitation.

4.2 Study design and period

A multi-center cross-sectional study was conducted in selected Addis Ababa public hospitals from February 1 to April 30, 2023.

4.3 Source of population

All adult trauma patients who were hospitalized at the emergency department at Addis Ababa public hospitals during the study period were used as a source population.

4.4 Study population

All eligible adult trauma patients were hospitalized at the emergency department of selected Addis Ababa public hospitals from February 1 to April 30, 2023.

4.5. Inclusion and exclusion criteria

4.5.1 Inclusion criteria:

- ✓ Patients presented with injuries due to trauma,
- ✓ Patients ≥ 18 years of age,

4.5.2 Exclusion criteria

- ✓ patients who refused to give consent
- ✓ patients who were referred for further management
- ✓ Glasgow coma scale score <13
- ✓ Patients who require cardiopulmonary resuscitation, endotracheal intubation, or transferring to intensive care units during data collection were excluded from the study.

4.6 Sample Size and Sampling technique

4.6.1 Sample size

The sample size was determined by using a single population proportion formula:

$n = \frac{\left(Z_{\alpha/2}\right)^2 p(1-p)}{d^2}$ Plus 10% non-response rate

(Where, n= minimum sample size required for the study, Z= standard normal distribution (Z=1.96) with a confidence interval of 95% and a=0.05, P= prevalence of severe pain in the emergency department in Ethiopia (80.1%) which is taken from a study done at AaBET hospital (21)and d= level of precision or tolerable margin of error=5%).

Accordingly, the sample size for this study:

$$n_o = \frac{(1.96)^2 * 0.801(1-0.801)}{0.05^2} = 245$$

Three months prior to this there were 1262 (denoted by" N") traumatic patients admitted to the triage of the AaBET, Alert and Tikur anbessa hospitals which was <10,000 for which correction formula was used and the sample sized calculated to be

$$\mathrm{n} = \frac{\mathrm{n_o}}{1+\frac{\mathrm{n_o}}{\mathrm{N}}} + 10\%\ \mathrm{non-response\ rate} = \frac{245}{1+\frac{245}{1262}} + 10\% = 226$$

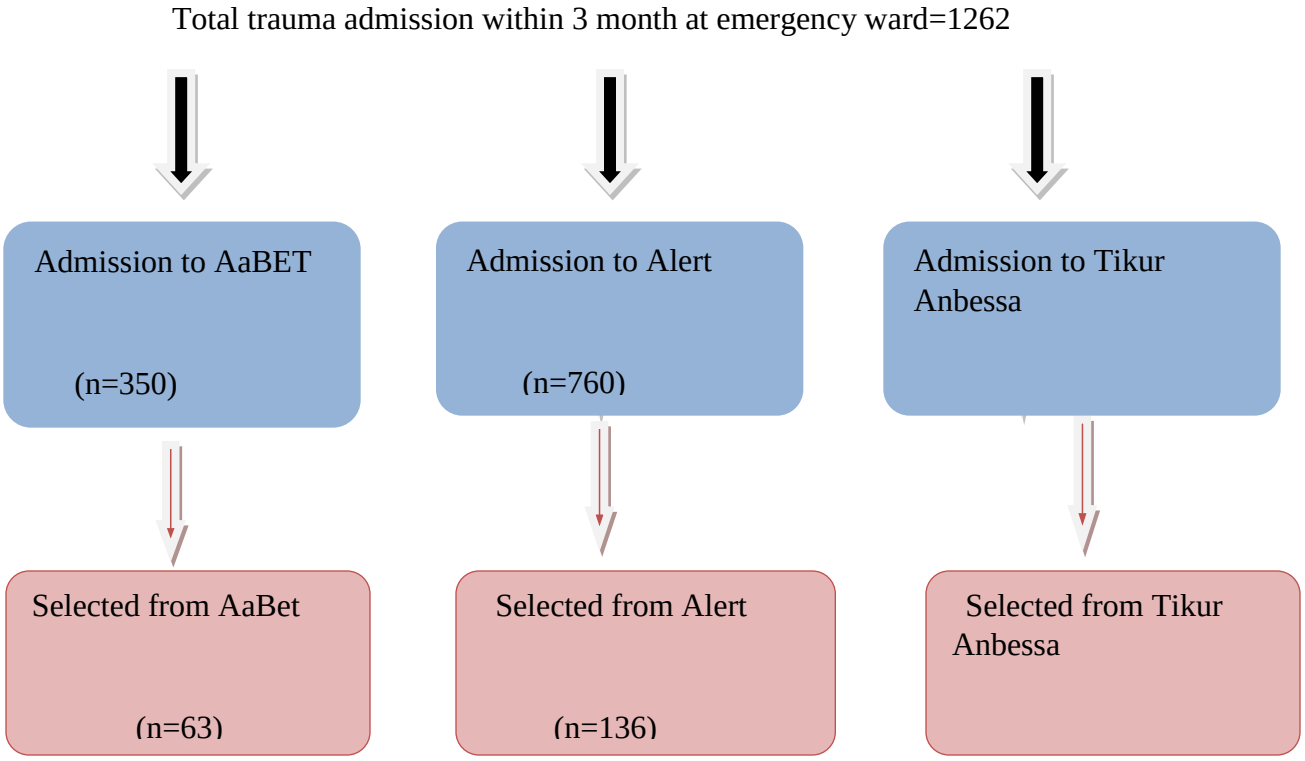
4.6.2 Sampling technique and Sampling procedure

In Addis Ababa, there are 13 state hospitals and 46 private hospitals, but only three public hospitals and four private hospitals have trauma care units. Three of the seven hospitals that include trauma centers were purposely chosen; taking into account their patient loads and levels (predominantly trauma or referral centers for trauma care). So, in Addis Ababa, Ethiopia, the Alert, AaBET, and Tikur Anbessa hospitals' emergency rooms served as the site of this investigation. Trauma patient admissions at the emergency departments at Tikur Anbessa Hospital 152, AaBET Hospital 350, and Alert Hospital 760 were admitted to the emergency ward after situational analyses were completed for the previous three months at each hospital. Finally, based on each hospital's typical three-month report, a proportional sample size was

assigned to each one. To get the necessary sample size during the study period, a systematic sampling method was employed. The first study participant was selected by lottery method and the rest of participant were based k=5 and this technique was continued until the calculated sample size was achieved during the study period.

K= N/n, where n= total sample size =245

N= Population the last three month 1262, sample interval =1262/245=5



Sample size selected from three hospitals = 226

Figure 2: proportional allocation for sample size

4.7 Study variables

4.7.1 Dependent Variable

- ✓ severity of trauma pain

4.7.2 Independent variables

- ✓ **Socio-demographic**: Age, sex, residence.

- **Patient-related factors**: Alcohol consumption, smoking, co-existing, type of transfer, Time b/n trauma and health institution attendance, history of previous trauma.

- ✓ **Disease-related factors:** The anatomic site of trauma, kind of trauma, the cause of trauma.

4.8 Operational definitions

Numeric Rating Scale: This is a valid pain intensity assessment tool that involves asking a patient to rate pain from 0 to10 (on an 11-point scale) with the understanding that 0 is equal to no pain and 10 is equal to the worst possible pain(33). It was found to be a reliable and valid one-dimensional measure for assessing one's own level of acute pain in the emergency department. An NRS is more useful than a VAS, simpler for most people to understand, and requires no paper, a pen, or clear vision.(33)(34).

Mild Pain - when the rate of pain is between 1, 2, 3 on the numerical pain scale.
Moderate pain–when the rate of pain is between 4, 5, 6 on numerical pain scale.
Severe Pain- when the rate of pain is ranging from 7, 8,9,10 on numerical pain scale.
No pain - rate of 0 on the numerical pain scale.
Pain-Is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage(3).

4.9 Data Collection tools and Procedures

The severity of the pain was measured using a numerical Rating Scale (NRS). On a scale from 0 to 10, where 0 represents no pain and 10 represents the worst suffering, each patient was asked to rate the intensity of their pain. The NRS was demonstrated to have a strong correlation with the patients' reported pain, and its viability in clinical research was established. (33). The data collectors assessed the patient's pain level at the time of admission to the ED within 20 minutes before administering analgesics at the initial interview (when the patient arrived or, if the patient was seen right away, directly after the medical examination) (35). The data collectors were rated and recorded the pain intensity of the traumatic patient. Thus, the cut-off points used for pain intensity were 0 for no pain, 1 to 3 for mild pain, 4 to 6 for moderate pain, and 7 to 10 for severe pain.

4.10. Data quality management

The data collectors, who are nurses working in the emergency room, received one-day training to ensure the accuracy of the data. Regarding the goal, applicability of the study, confidentiality of the information, respondent's rights, informed permission, and data collection method, appropriate information and instructions were provided. In order to ensure that the questions were clear, comprehensive, and consistent, 10% of the total sample size took part in a pre-test at Tikur Anbessa Hospitals. Questions that caused difficulty or ambiguity were reworded and modified. A few pointless inquiries were skipped over. The method of gathering data was overseen by the investigator.

4.11. Data Analysis

Socio-demographic variables, severity of pain, and its associated factors among hospitalized trauma patients were checked, coded and entered into EpiData 3.1 version, and they were transferred to SPSS 26.00 version statistical software for analysis. Descriptive statistics were conducted to summarize patients' information and determine the severity of trauma pain. To determine the association between severities of trauma pain and potential predictors, the chi-square test was employed.

A binary logistic regression analysis was conducted to identify factors associated with the severity of trauma pain, and a bi-variable analysis was performed to determine each of the independent variables. Only variables with a P-value<0.2 during the bivariate analysis were entered into the multivariate analysis.

The adjusted odds ratios (AORs) with 95% confidence intervals (CIs) for the pain score and risk factors were estimated, using bivariate and multivariable binary logistic regression analyses. Finally, data is presented by using numbers, frequencies, percentages, figures, and tables. A p-value less than or equal to 0.05 were considered statistically significant. For the data goodness of fit test, the Hosmer and Lemeshow tests were done. As it is observed from this data, since the P-value of 0.698 is greater than the level of significance at 5%, we can conclude that the data fits the model well (table 6).

4.12. Ethical Clearance

An institutional review board (IRB) approval was obtained from the anesthesia department, College of Health Science, AAU. After obtaining permission from the IRB, an official letter was submitted to the selected hospital, and each study hospital was consulted before proceeding with the data collection process. Each study participant was informed about the purpose of the study and its potential risk (time to be spent), and those willing to participate were included. The confidentiality and privacy of study participants were ensured during the interview, and all information accessed was kept confidential and restricted from any access. Thus, identifiers like the name and address of the patient were not recorded in the data abstraction formats.

4.13. Dissemination of plan

The final thesis will be submitted and presented to Addis Ababa University, College of Health Science, and School of Anesthesia. One copy will be sent to institutions involved in the study and other concerned bodies. Finally, the manuscript will be published in a reputable journal.

CHAPTER FIVE

RESULTS

5.1 Distribution and prevalence of trauma pain on Socio-Demographic Characteristics and patient related factors among the study participants

A total of 226 patients who sustained traumas during the study period were included. Of these, 128 (56.6%) were males, and the remaining were females. Among those patients, 170 (75.2%) were aged <50 years, while 56 (24.8%) were aged ≥50 years. The majority of patients were urban dwellers, representing 191(84.5%) of the total enrollment. This study showed that nearly half of the patients had a history of alcohol consumption 98(43.4%) and the time between trauma and health institution attendance found during this study was 30- 60minute 117(51.8%)(Table1).

The majority of patients in the aged 25–49 years old experienced severe trauma pain 118(52.2%). One hundred eighteen (52.2%) male patients reported severe trauma pain. From the type of transfer, patients who came with ambulance were associated with severe trauma pain 91(41.2%) and of these, patients who have a history of alcohol consumption were associated with severe trauma pain 89(39.3%) and total time transfer (30–60min) accounted for 107(47.3%) but were not statistically significant (Table 2).

Table1. Distribution of Socio-demographic characteristics and patient related factors among the Study Participants in selected Addis Ababa, public hospitals, 2023 (n=226)

Variables	Category	Frequency (n)	Percent(%)
Sex	Male	128	56.6%
	Female	98	43.4%
Age	<25	52	23%
	25-49	118	52.2%
	50-60	27	11.9%
	>60	29	12.8%
Residence	Urban	191	84.5%
	Rural	35	15.5%

Alcohol consumption	Yes No	98 128	43.4% 56.6%
Smoking	Non smoker Smoker	183 43	81% 19%
The time between trauma and health institution attendance	<15min 15-30min 30-60 min >60 min	19 44 117 46	8.4% 19.5% 51.8% 20.4%
Type of transfer vehicle	Hospital Ambulance Private car/motor vehicle	105 121	46.5% 53.5%
Co- existing disease	DM HTN ASTHMA Other* No	30 42 27 48 79	13.3% 18.6% 11.9% 21.2% 35%
History of previous trauma	Yes No	39 187	17.3% 82.7%

*****(Connective tissue disorders, cancer, heart disease, lung disease)

Table 2: A cross-tabulation of socio-demographic characteristics and patient related factors and their association with severe trauma pain among trauma patient at emergency department of selected hospitals, Addis Ababa, Ethiopia from feburary1 to April 30, 2023

Variables	Category	Severity of trauma pain	
		Mild pain	Moderate to severe trauma pain
Sex	Male Female	30(13.2%) 10(4.42%)	98(43.3%) 88(38.9%)
Age	<25 25-49 50-60 >60	14(6.19%) 10(4.42%) 9(3.9%) 7(3.09%)	38(16.8%) 108(47.7%) 18(7.96%) 22(9.7%)
Residence	Urban Rural	31(13.7%) 9(3.98%)	160(70.7%) 26(11.5%)
Alcohol consumption	Yes No	9(3.9%) 31(13.7%)	89(39.3%) 97(42.9%)
Smoking	Non smoker Smoker	35(15.4%) 5(2.21%)	148(21.2%) 38(16.8%)
The time between trauma and health institution attendance	<15min 15-30min 30-60 min >60 min	6(2.6%) 11(4.86%) 10(4.4%) 13(5.7%)	13(5.7%) 33(14.6%) 107(47.3%) 33(14.6%)

Type of transfer vehicle	Hospital Ambulance Private car/motor vehicle	10(4.4%) 30(13.2%)	95(42%) 91(40.2%)
Co- existing disease	DM HTN ASTHMA Other* No	6(2.6%) 5(2.2%) 7(3%) 11(4.8%) 11(4.8%)	24(10.6%) 37(16.3%) 20(8.8%) 37(16.3%) 68(30%)
History of previous trauma	Yes No	7(3.9%) 33(14.6%)	32(14.1%) 154(68.1%)

5.2 Baseline Disease Characteristics and prevalence of pain among the Study Participants

Nearly half of the study participants 106(46.9%) were admitted to the trauma center due to fractures, followed by burns 49(21.7%) and lacerations and wounds 40(17.7%) and other kind of trauma 31(13.7%). The cause of trauma mainly found during this study was a road traffic accident in 93 (41.2%) of the study participants, followed by a fall in 49 (21.7%) of the study participants, a fight in 22 (9.7%) of the study participants, another in 50 (22.1%) of the study participants, and a collision in 5 (2.2%) of the study participants. Extremities of the body were the most common parts of the body where the feeling of pain was observed in 114 (50.4%) of the participants, followed by the trunk and head in 54 (23.9%) and 34 (10%) of the participants, respectively. Although the other sites of pain were reported at 24 (10.6%) (Table 3).

The majority of patients 98 (43.3%) who sustained fractures had experienced severe trauma pain. This study also addresses the fact that 87 (38.4%) of the patients involved in road traffic accidents reported severe trauma pain. The majority of patients with 106 (46.9%) anatomical sites of pain in the extremities of the body reported severe trauma pain (Table 4).

Table.3 Baseline Disease Characteristics among the Study Participants in selected Addis Ababa, public hospital, 2023 (n=226)

Variable	Categorical	Frequency (n)	Percent (%)
Kind of trauma	Laceration and wounds	40(17.7%)	17.7%
	Burn	49	21.7%
	Fracture	106	46.9%
	Other*	31	13.7%
Cause of trauma	Collision	12	5.3%
	Road traffic accident	93	41.2%
	Fall	49	21.7%
	Fight	22	9.7%
	Other**	50	22.1%
Site of pain	Extremities	114	50.4%
	Trunks	54	23.9%
	Head	34	15%
	Other***	24	10.6%

*Deep cuts, pierces on the skin, concussions, contusion and stretching

** Fire, building collapse, operating machine, electrical injuries

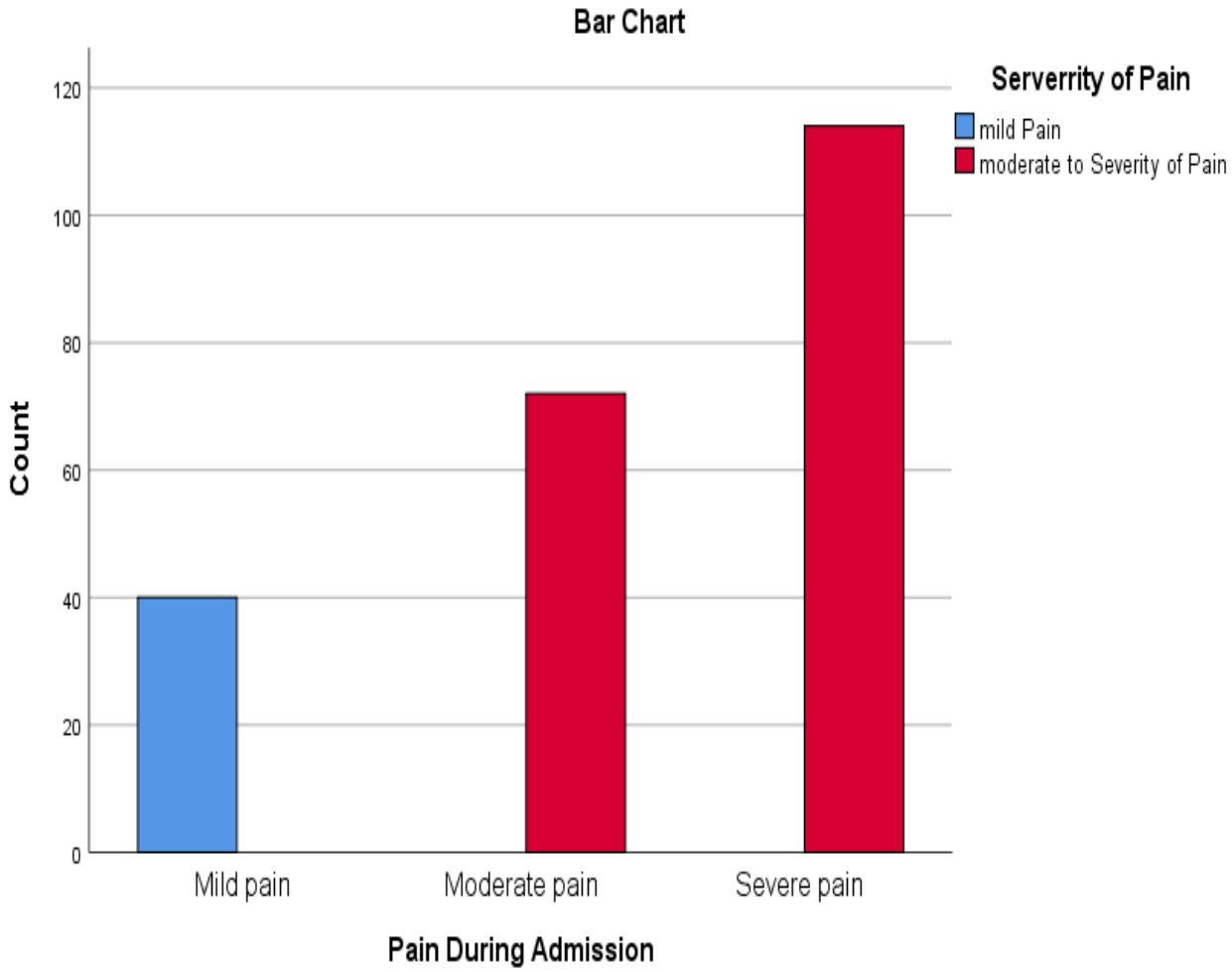
*** Neck, ear, eye

Table 4: A cross-tabulation of diseases related factors and their association with severe trauma pain among trauma patient at emergency department of selected hospitals, Addis Ababa, Ethiopia from feburary1 to April 30, 2023

Variables	Category	Severity of trauma pain	
		Mild pain	Moderate to severe trauma pain
Kind of trauma	Laceration and wounds	11(4.8%)	29(12.8%)
	Burn		
	Fracture	11(4.8%)	38(16.8%)
	Other*		
		8(3.5%)	98(43.3%)
		10(4.4%)	21(9.2%)
Cause of trauma	Collision	6(2.6%)	6(2.6%)
	Road traffic accident	6(2.6%)	87(38.4%)
	Fall		
	Fight	12(5.3%)	37(16.3%)
	Other**	5(2.2%)	17(7.5%)
		11(4.8%)	39(17.2%)
Site of pain	Extremities	8(3.5%)	106(46.9%)
	Trunks		
	Head	12(5.3%)	42(18.5%)
	Other***	11(4.8%)	23(10.1%)
		9(3.9%)	15(6.6%)

The Prevalance of trauma pain after injury at emergency ward

In this study,all patients experianced mild to severe pain after sustaing injuries.



Mild pain 40%

Moderate to severe pain 70 – 82.3%

Figure 3: The prevalence of trauma pain among the study participants among traumatic patients in selected Addis Ababa public hospitals in 2023

5.3 Factors Associated with Severe of trauma pain at emergency

The bi-variable logistic regression showed that sex, age, residence, alcohol consumption, time between trauma and health institution attendance, type of transfer vehicle , co-existing, cause of trauma, kind of trauma and site of pain were associated with severe trauma pain at a P-value<0.2 and were candidates for multivariable logistic regression.

Severe trauma pain was significantly associated with sex, alcohol consumption, type of transfer cause of trauma, kind of trauma and site of pain. Being female were 5.6 times **(**AOR=5.601, 95%CI 1.72-18.2) more likely to develop moderate to severe pain than those with men patient. The odds of having moderate to severe trauma pain were 4.2 times (AOR=4.212, 95%CI 1.22–14.4) greater among patient who have history of alcohol consumption than among those who don't have alcohol consumption, according to this study.

Moderate to Severe trauma pain was more common with a patient came with ambulance transport 5.763 times (AOR=5.763, 95%CI 1.72-19.3) than patient came with private car. Patient who sustained road traffic accident associated with moderate to severe trauma pain 7.2 times (AOR=7.286, 95%CI 1.004-52.8) than other cause of trauma. The odds of moderate to severe trauma pain among patient who sustained fractures were5.2 times (AOR=5.239, 95%CI 1.077-25.4) higher as compared to patient who sustained other type of traumas. In this study, the odds of moderate to severe pain among the site of pain the extremity of the body 7.6 times (AOR=7.642,95%CI 1.499-38.9)greater when compared to other site of pain.

Table 5. Bi-variable and multivariable binary logistic regression showing – factors associated with severe trauma pain among trauma patient at emergency department in selected governmental hospitals, Addis Ababa Ethiopia 2023, (n=226%)

Variable	Category	Severity of trauma pain		COR (95%CI)	AOR (95%CI)
		Mild pain (N, %)	Moderate to severe pain (N, %)		
Sex	Male	30(13.2%)	98(43.3%)	1	1
	Female	10(4.42%)	88(38.9%)	2.694(1.246-5.826)	5.601(1.723 18.203)
Age	<25	14(6.19%)	38(16.8%)	1	1
	25-49	10(4.42%)	108(47.7%)	3.979(1.631 – 9.706)	2.024(0.570 -7.192)
	50-60	9(3.9%)	18(7.96%)	0.373(0.269 – 2.019)	0.947(0.203 – 4.425)
	>60	7(3.09%)	22(9.7%)	0.737(0.269- 2.019)	1.612(0.329- 7.904)
Residence	Urban	31(13.7%)	160(70.7%)	1.787(0.764 – 4.180)	1
	Rural	9(3.98%)	26(11.5%)	1	1.506(0.273– 8.318)
					6.998((1.184 – 41.368)
					2.820(0.458– 17.386)
Alcohol consumption	Yes	9(3.9%)	89(39.3%)	3.160 (1.426 – 7.005)	2.626 (0.548 –12.571)
	No	31(13.7%)	97(42.9%)	1	1
Smoking	Non - smoker	35(15.4%)	148(21.2%)	1	4.212 (1.227 – 14.461)
	Smoker	5(2.21%)	38(16.8%)	1.797(0.660-4.898)	1
The time between trauma	<15 min	6(2.6%)	13(5.7%)	1	1

and health institution attendance	15-30 min 30-60min >60 min	11(4.86%) 10(4.4%) 13(5.7%)	33(14.6%) 107(47.3%) 33(14.6%)	1.395(0.424-4.523) 4.938(1.541-15.823) 1.172(0.367-3.741)	 1.277(0.225 – 7.251) 3.239(0.635 – 16.527) 0.818(0.139 – 4.835)
Type of transfer vehicle	Hospital Ambulance Private car/ motor	10(4.4%) 30(13.2%)	95(42%) 91(40.2%)	1 3.132(1.448 – 6.778)	5.763(1.720 – 19.314) 1
Co - existing -	DM HTN Asthma Other No	6(2.6%) 5(2.2%) 7(3%) 11(4.8%) 11(4.8%)	24(10.6%) 37(16.3%) 20(8.8%) 37(16.3%) 68(30%)	0.647(0.216 – 1.940) 1.197(0.387 – 3.707) 0.462(0.158 – 1.348) 0.544(0.215 – 1.375) 1	 -
History of previous trauma	Yes No	7(3.9%) 33(14.6%)	32(14.1%) 154(68.1%)	0.980(0.398-2.410) 1	 -
Kind of trauma	Laceration wounds Burn Fracture Other	11(4.8%) 11(4.8%) 8(3.5%) 10(4.4%)	29(12.8%) 38(16.8%) 98(43.3%) 21(9.2%)	1.255(0.451 – 3.496) 1.645(0.600 – 4.511) 5.833(2.057-16.542) 1	1.498(0.328 – 6.849) 0.879(0.165 – 4.680) 5.239(1.077 – 25.485) 1
Cause of trauma	Collision Road traffic accident Fall Fight	6(2.6%) 6(2.6%) 12(5.3%) 5(2.2%)	6(2.6%) 87(38.4%) 37(16.3%) 17(7.5%)	1 14.500(3.569 – 58.903) 3.083(0.836 - 11.377) 3.400(0.752 –	1 7.286(1.004 – 52.865) 1.603(0.250 – 10.295) 1.625(0.213 – 12.407)

	Other	11(4.8%)	39(17.2%)	15.364) 3.545(0.952 – 13.201)	7.003(0.707– 69.328)
Site of pain	Body of Extremities Trunk Head Other	8(3.5%) 12(5.3%) 11(4.8%) 9(3.9%)	106(46.9%) 42(18.5%) 23(10.1%) 15(6.6%)	7.950(2.659 – 23.768) 2.100(0.738 – 5.978) 1.255(0.420 -3.750) 1	7.642(1.499 – 38.957) 0.785(0.150– 4.120) 2.532(0.467– 13.716) 1

Table 6: Goodness of fit (Model Diagnostic)

Hosmer and Lemeshow Test

Step	Chi-square	Df	Sig.
1	5.542	8	.698

CHAPTER SIX

6.1 Discussion

The study revealed that the overall prevalence of moderate to severe pain was 82.3% in patients who sustained trauma at triage in the emergency department. This was low when compared to studies from developed countries, which have reported a pain scoring rate as high as 91% (23). But well correlated with other studies that are done in Addis Ababa. Ethiopia(21)(25).This study has shown that seven risk factors present on hospital admission can reliably predict trauma patients who will develop severe trauma pain. Previous studies partially support the current study findings on factors associated with severe trauma pain, although comparability is limited due to differences in the study populations.

According to this study, sex, alcohol consumption, type of transfer, kind of trauma, cause of trauma, and site of pain were independent predictors of moderate to severe trauma pain. Research conducted in Britain and Libya comparing men and women undergoing stimulation tests to pain showed that men had a higher tolerance, and the pain numeric scale used lower levels to express the intensity of pain they felt (36). This was in line with the result of the current study.

This might be because of the cultural aspect of our society; men are expected to show less pain and emotion than women. Some researchers suggest that testosterone appears to be protective in nature, helping to alleviate pain (Craft, Mogil, &Aloisi 2004). Perhaps a higher number of men and a high incidence of trauma in the age range of 25–49 years were seen in this study due to the fact that these groups were young and active, more exposed to social activities, and more likely to be involved in accidents. This result corresponds with previous studies in terms of age range and sex (37).

Based on the findings of the current study, the patient who has a history of alcohol consumption is correlated with severe trauma pain, which is in line with previous studies in China, Ghana, India, Mexico, Russia, and South Africa (38)(39).

In this study, 51.8% of patients reached the initial health facility within 30–60 minutes, which was comparable to studies done in Addis Ababa, Ethiopia, two years ago (56.1% 40), southwest Nigeria (57%), and Kenya (66.2%) arriving within the first hour of trauma (41).But compared to the study conducted in Iraq, patients with trauma were often transferred to the hospital in less than 30 minutes (12), and a study from the Greater Accra region showed the average arrival time from the incident to the hospital took 16.9 minutes (43).

This significant variation may be related to differences in the availability of nearby facilities, transport infrastructure, and community awareness of where and when to go. Time to the health facility is a crucial factor for trauma patients. Based on the "golden hour concept, one hour is determined to be a determinant for patients' better survival(44).Nevertheless, this variable has not demonstrated a statistically measurable difference in multivariate analysis. This result contradicts previous studies, which were done in Iraq. (12). The explanation for this may be due to other independent variables more closely correlated with moderate to severe pain when compared to total time transferred to the hospital.

Regarding means of transportation to the initial health facility, this study has shown that private cars were the most common (53.5%), followed by ambulances (46.5%). This was in keeping with studies done in Tikur Anbessa (59.04%), India (66%), and Saudi Arabia (58%), where the majority of patients were transported by taxi and private vehicles(45)(46)(47). On the other hand, a study done in Britain (96%), reported that most people who sustained trauma were transferred to the hospital by ambulance(48).

This much difference may be due to inadequate distribution, poor infrastructure, and a lack of community awareness on how to get them. Even so, the percent of patients who come with ambulances is low when compared to private cars, but the prevalence of pain is higher in both private cars and ambulances. This may be because people with severe trauma were transferred to the trauma center hospital by ambulance.

According to the results of the current study, the highest score of pain was related to a kind of trauma. Among the kinds of trauma, musculoskeletal traumas are correlated with moderate to severe pain in 46.9% of cases. This was in accordance with the findings of previous studies which were done in Iraq and Brazil (12)(32).In this study, burns were the other type of trauma

that caused moderate to severe pain, followed by musculoskeletal traumas, which were statistically non-significant.

The present study indicates that the main cause of trauma during the study period was a road traffic accident (41.2%). This has a significant correlation with severe trauma pain (p 0.04) and is similar to previous studies, which were done in Iraq (12) and Brazil (32).Conversely, a retrospective chart review and questionnaire survey conducted among 560 patients who sustained road traffic accidents in Korea by Kwanghwi Kim et al. reported that road traffic accidents were not associated with severe trauma pain (49). This might be due to the study design they used, and some data may have contained errors and omissions due to computer or human errors.

From this study, a finding that is worth mentioning is the anatomical site of pain. This study showed that the body's extremities were highly correlated with moderate to severe trauma pain (50.4%). Similarly, in a descriptive cross-sectional study conducted in a public emergency service in southern Brazil, the anatomical sites of pain showed that the upper and lower limbs, as well as the abdomen, were associated with moderate to severe trauma pain(32).

Thus, for proper patient care, the evaluation of trauma victims' pain location is essential in addition to the measurement of pain and the evaluation of its location since it allows the identification of internal trauma to adjacent organs. Specifically in relation to the members, it is important to detail the location of the pain, as it can proceed anatomically structured as joint, bone, muscle, tendon, and ligaments, which, depending on the affected site, change the clinical management of health professionals.

CHAPTER SEVEN

Strength and limitations of the study

7.1 Strength

- This study is the first of its kind in the country to assess factors related to the severity of trauma pain in the emergency department, which was not given enough attention.
- In addition, the study tried to assess the prevalence of severe trauma pain together with its associated factors and to maximize the accuracy and minimize the bias of measurement by using validated instruments.

7.2 Limitations of the study

The limitations of this study are the exclusion of children under the age of 18 and the exclusion of polytrauma patients who were unable to answer the pain questionnaire.

CHAPTER EIGHT

CONCLUSION AND RECOMENDATION

8.1 Conclusion

The result of this study revealed that socio-demographic characteristics (sex, BMI), alcohol consumption, type of transfer vehicle, kind of trauma, cause of trauma, and site of pain were significantly associated with severe trauma pain in patients who sustained trauma at selected Addis Ababa public hospitals in 2023. Identifying those factors that can increase the level of trauma pain is a necessary first step toward optimizing pain assessment and management in trauma patients at the ED.

8.2 Recommendation

- **Health professionals**
  - Based on this result, health care providers should be aware of and prioritize the patients who will experience severe trauma pain and ensure appropriate treatment.
- **Researchers**
  - In future studies, it is recommended to consider prehospital trauma care as a factor that increases the level of trauma pain.

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Annex

Annex-I: Information sheet

Hello.

My name is_____ I am a member of researchers and I have been attending postgraduate program in the field of Anesthesia at Addis Ababa University. I am going to conduct research on severity of pain and its associated factors among trauma patients at emergency department in selected public hospital, Addis Ababa Ethiopia, from February 1, – April 30, 2023. The information going to be obtained will help the government and other responsible bodies to improve pain management by assessing the severity of pain and its associated factors among hospitalized trauma patient. Your participation is very valuable for the success of this project. Also be mindful that whatever we will get here is for research purposes only and the information will not be used by any other person apart from this research and therefore, confidentiality can be guaranteed. However, your names will not be mentioned or be attached to anything that you say. Do you want to continue yes---------- No---------- (Thank you in advance for your help!)

Name and contact address of investigator: Yeabtsega Alemayehu

Mail: yabiale859@gmail.com , phone number: +251972695904

Annex- II: Data collection tool

A. Socio demographic characteristics			
NO	**Questions**	**Response**	**Code**
1	Sex	1. Male 2. Female	
2	Age	----------yrs.	
3	Residence	1. Urban 2. Rural	
4	Alcohol consumption	1.Yes 2.No	
5	Smoking habits	1.Non-smoker 2.smoker	
6	The time between trauma and health institution attendance	1.<15 min 2.15-30 3.30-60 4.>60	
7	Type of transfer vehicle	1.Ambulance 2.Private car/motorcycle	
8	Co-existing disease	1.DM 2.HTN 3.ASTHMA 4. Other……. 5.no …….	
9	History of previous trauma	1.yes 2.no	
B. Baseline disease characteristics of the patient			
10.The kind of trauma 1. Laceration and wounds _____ 2.Burn _____ 3. Fracture _____4. Other_____			
11.The cause of the trauma 1.Collision _____ 2.Road traffic accident (RTA) _____ 3. Fall_____ 4.Fight _____ 5. Other_____			
12.The site of pain 1.Upper and lower limbs _____ 2.Trunk_____ 3. Head _____ 4.Other_____			
c. In hospital and short term outcomes during follow-up			

13.Pain intensity	
Time(min)	20min
Score	
Intensity	

The Numeric Rating Scale (NRS)