



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

GRADUATE STUDY PROGRAM

**DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL
CARE**

**PATTERN AND OUTCOME OF GERIATRIC TRAUMA
PATIENTS AT AABET HOSPITAL**

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PATTERNS AND OUTCOME OF GERIATRIC TRAUMA PATIENTS PRESENTING TO AABET HOSPITAL EMERGENCY DEPARTMENT

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Abstract

Background: Older adults constitute a significant and growing portion of the trauma population. Exploring their specific injury patterns and outcomes is crucial to better meet their needs. This study aimed to assess the temporal changes in the demographic and trauma characteristics, injury pattern, associated factors, and outcomes of geriatric trauma patients at a major urban trauma center in Ethiopia.

Objective: The primary objective was to determine the pattern and outcome of geriatric trauma patients presenting to AaBET Hospital Emergency Department.

Methods: An institution based retrospective cross-sectional study was conducted at AaBET Hospital. Data were extracted from the HMIS registry and patient medical records for all geriatric trauma patients (aged ≥ 60 years) presenting to the ED between October 1, 2023 and September 30, 2024. Data analysis was performed using IBM SPSS Statistics. Bivariate and multivariate logistic regression was used to assess the association between the independent and dependent variables. Association with a p-value < 0.05 was considered statistically significant.

Result: The study included 210 patients with a mean age of 68.1 ± 7.9 years and a nearly equal gender distribution. Falls were the dominant injury mechanism (52.4%), followed by road traffic accidents (29.1%). Most patients (65.7%) were residents of Addis Ababa. The triage distribution was Green (41.8%), Yellow (37.4%), Orange (14.1%), and Red (6.8%). The Overall mortality rate was 1.4%, and 9.5% of patients Left Against Medical Advice (LAMA). Multivariate analysis identified Orange triage category (AOR=3.55), “other” injury mechanisms (AOR+2.84) as independent predictors of severe outcomes (admission or death). A paradoxical protective effect was observed for the oldest age group (≥ 80 years, AO=0.21).

Conclusion: Geriatric trauma in Addis Ababa is characterized by a fall predominance, significant acuity levels, and modifiable outcome predictors. The findings underscore the need for geriatric-specific trauma protocols, enhanced fall prevention, and improved patient education to address the high LAMA rate.

Key Words: Geriatric Trauma, Geriatric, Fractures, Falls, Frailty, Outcomes, Ethiopia

Acronyms and Abbreviation

Acronym	Definition
AABET	Addis Ababa Burn Emergency Trauma
AOR	Adjusted Odds Ratio
CI	Confidence Interval
ED	Emergency Department
GCS	Glasgow Coma Scale
HMIS	Health Management Information System
ICU	Intensive Care Unit
LAMA	Left Against Medical Advice
LMICs	Low- and Middle-Income Countries
LOS	Length of Stay
RTA	Road Traffic Accident
SD	Standard Deviation
SPHMMC	St. Paul's Hospital Millennium Medical College
UN	United Nations
WHO	World Health Organization

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1. Introduction

1.1. Background

Trauma is a major global public health issue, accounting for almost 5 million deaths annually. Tens of millions more people suffer non-fatal injuries each year, resulting in emergency department visits and hospitalizations. These injuries often cause temporary or permanent disabilities that require long-term physical and mental healthcare and rehabilitation, leading to increased healthcare costs and loss of productivity, which imposes a tremendous economic burden on nations (1,2). Inadequate access to emergency trauma care services exacerbate the consequences of injuries, particularly in low- and middle-income countries (LMICs). The World Health Organization (WHO) report that about 90% of injury-related deaths occur in these vulnerable settings (1,3,4).

Injury is the leading cause of morbidity, disability, and mortality in Ethiopia (2). It accounts for approximately 8% of all deaths in Ethiopia, which is more than the combined number of deaths from tuberculosis and malaria (2,5).

Geriatric trauma refers to physical injuries sustained by older adults. With an aging global population, trauma in elderly patients has become a significant public health concern. Injury surveillance systems that can support the development of successful prevention and trauma care programs are absent from the majority of LMICs (4). Older individuals are at increased risk for trauma due to age-related physiological changes such as decreased bone density, frailty, and slower recovery times, alongside higher incidences of comorbidities (6). In LMICs like Ethiopia, where trauma care systems are less developed, geriatric trauma presents unique challenges, such as delayed diagnoses, inadequate management, and poorer outcomes in emergency settings. Understanding the patterns and outcomes of geriatric trauma patients in settings like the Addis Ababa Burn Emergency and Trauma (AaBET) Hospital is critical for improving clinical care and healthcare policies tailored to this vulnerable population.

1.2. Statement of the problem

Traumatic injury is the leading cause of morbidity and mortality among individuals under 40 years of age (5). However, as populations age worldwide, trauma is becoming an increasingly important concern among older adults. Over the next three decades, the number of people aged 60 years and above is projected to double, reaching more than 2 billion people in 2050, with the most rapid growth occurring in Africa (7,8). Africa's growing aging population is set to outpace any other region and is expected to reach 235 million by 2050, three times the estimates of 2020. It is projected to be the only continent to experience a consistent increase for every successive decade, with the number of older Africans expected to grow above 40 percent per decade (8).

In Addis Ababa, Ethiopia's capital, rapid urbanization and population growth have led to an increase in trauma-related injuries, including road traffic accidents, falls, and violence(2). The city's aging population, projected to double in the coming decades, places additional pressure on an already strained healthcare system(9,10). Despite this, trauma care in Ethiopia remains under-resourced, with insufficient focus on the specific needs of elderly patients, such as polypharmacy, multiple comorbidities, and prolonged recovery times. AaBET Hospital is a key referral center for trauma care, yet it lacks detailed research on the specific outcomes and treatment patterns for older trauma patients, making it difficult to fully assess the extent of the problem. This gap highlights the need for systematic research into geriatric trauma patterns in this context.

Several risk factors contribute to the high vulnerability of elderly individuals to trauma(11). Falls are the leading cause of injury in older adults, accounting for the majority of hospitalizations, functional impairments, and fatalities(12). Other significant contributors to geriatric trauma include motor vehicle accidents, which are more common among elderly drivers or pedestrians, and interpersonal violence, which affects particularly vulnerable groups such as those with cognitive impairments or living in unsafe environments(11–13). In older adults, trauma often leads to more severe injuries, slower recovery times, and a higher risk of complications like infections, deep vein thrombosis, and delirium(13).

In Ethiopia, the growing elderly population faces a series of unique challenges that increase the risk of trauma. Limited access to healthcare, underdeveloped trauma systems, and poor road infrastructure are among the contributing factors. Environmental risks such as unsafe housing and

lack of fall prevention programs further exacerbate the problem. Elderly trauma patients in Ethiopia, as in other LMICs, quite possibly experience higher mortality rates and poorer functional outcomes due to delays in seeking care, inadequate emergency medical services, and the lack of specialized geriatric trauma care. Thus, there is a dire need for research on the specific patterns and risk factors associated with geriatric trauma in the country, highlighting the need for more focused studies in this area.

The proposed study seeks to fill critical gaps in the understanding of geriatric trauma in Addis Ababa, Ethiopia, by analyzing the patterns, outcomes, and risk factors among elderly trauma patients. Despite the increasing burden of trauma in the elderly population, there is insufficient data on the specific challenges they face in LMIC settings. By focusing on the Addis Ababa Burn Emergency and Trauma Hospital, one of the largest trauma centers in Ethiopia, this research aims to provide essential insights into the unique needs of geriatric trauma patients, such as age-related physiological vulnerabilities and the impact of comorbidities on trauma outcomes. Addressing these gaps is crucial for developing evidence-based interventions to improve trauma care and reduce mortality and morbidity in elderly patients in Ethiopia.

1.3. Significance of the study

The geriatric population is growing internationally and more recently in Ethiopia. There is a need for studies to evaluate the common emergencies with which they present, so that, better quality care can be provided. While currently a small percentage of patients are geriatric, a foreseen exponential increase is expected due to general improvements in the quality of life and healthcare. As medical facilities increase and national healthcare improves, the need to evaluate the requirements of this specific group, which differs from the pediatric and general adult population, has been identified.

The geriatric population is often excluded from the majority of studies evaluating diseases because they are elderly, fragile, , may be incapable of making decisions, and have numerous comorbidities. It is therefore challenging for doctors to provide these patients with high-quality care due to a dearth population-specific management data (14). This study aimed to fill this critical gap by providing essential insights into the patterns, outcomes, and risk factors of geriatric trauma at a major Ethiopian hospital.

2. Literature Review

Geriatric trauma refers to the injuries sustained by older adults, typically defined as individuals aged 65 years and older. However, different cut-off levels have been suggested, arguing that chronological age does not correspond perfectly with the biological age (15). In the developed world, protocols are being created to address the special needs of geriatric trauma patients as their prevalence has grown (16). But there are different category classifications for geriatric patients, which can lead to misunderstandings about which patients require geriatric-specific guidelines (16,17).

The United Nations (UN) and the World Health Organization (WHO) commonly define older adults as those aged 60 or 65 years or more (1,18). The WHO also provides an alternative definition, classifying older individuals as those who have surpassed the median life expectancy at birth (16). A large multicenter analysis aimed to identify a clinically significant increase in mortality based on age. It strongly suggested that trauma patients older than 55 years should be considered for inclusion in geriatric trauma protocols, due to the increased incidence of comorbidities and physiological changes that alter the response to trauma that present with aging (16,17).

The increasing prevalence of geriatric trauma has prompted the development of specialized care protocols, but inconsistent definitions of "geriatric" patients can create challenges. A large multicenter analysis aimed to establish age-based mortality thresholds to guide age-specific trauma care. The study identified significant increases in mortality at ages 55, 77, and 82, suggesting that trauma patients older than 55 years should be considered for geriatric protocols. Among 255,099 patients analyzed (mean age 59.3 years, 45.7% female, 92.6% blunt injuries), mortality rates increased with age, with adjusted odds ratios (AORs) showing mortality risks 2.42 times higher for ages 55–76, 4.70 times for 77–81, and 6.43 times for those 82 and older. Additionally, comorbidities, dementia prevalence, ground-level falls, and discharges to skilled nursing facilities rose significantly after age 55. These findings highlight the importance of age-specific interventions in trauma care (16,17).

2.1. Magnitude of the problem

Globally, trauma is among the leading causes of mortality and morbidity. As the world's population ages, particularly in the developed nations, the increasing incidence of trauma among elderly people has emerged as a critical issue (19). Studies from high-income countries report that trauma accounts for a significant portion of healthcare expenditure due to the high cost of treatment, rehabilitation, and long-term care for elderly trauma patients. In Australia, for example, in comparison to documented population trends, a study done in 2013 confirmed the disproportionate annual growth (4.9%) of hospital admissions due to major trauma among older patients over the period of 20 years(20). A similar study done in the UK has also encountered a profound change in the demographics of major trauma with the majority of patients being over 50 years old, implying that the actual prevalence of major trauma in the elderly is far higher than previously thought (21). Since 2014, older adults have accounted for the majority of admissions in Level-1 trauma centers in the Canadian province of Quebec, according to a 15-year multi-center retrospective cohort study (22).

Africa's impending aging population is a call to action given that the age definition is closely related to access to the policies and services required to guarantee the well-being among the elderly (23). The UN Department of Economics and Social Affairs projected on the 2023 World Social Report, “Over the next three decades, Northern Africa and Western Asia and sub-Saharan Africa are projected to have the fastest growth – or highest growth rate – of the population aged 65 or above.” (15). The question of what age in Sub-Saharan Africa qualifies as "old" has continued to be contentious among governments and academics. A study surveyed 78 Gerontology and Social Work professionals from Sub-Saharan Africa to determine perspectives on defining “old age” for policy and research. The analysis revealed that 50 years old was the most endorsed marker of old age (33.3%), significantly lower than the UN’s standard of 60 years. Respondents highlighted health status (73.6%), retirement age (61.1%), and quality of life (56.9%) as key factors for defining old age. Age 60 was considered most appropriate for aging program eligibility (45.1%) and later-life research (43.5%). The study recommends age guidelines for Sub-Saharan Africa be tailored to regional contexts rather than adopting standards from the Global North (23).

Ethiopia has recognized old people as vulnerable in several nationwide legal and policy documents, including the constitution, population policy, and development plans (24). According

to the world databank, Ethiopia has the second largest population aged ≥ 65 in the sub-Saharan Africa (25). This geriatric population is expected to reach 12 million according the UN World Population Projection by 2050, from the 4.2 million in 2024, and the 1.7 million at the beginning of the millennium (25). A 2023 desk review assessing the country's existing frameworks in relation to the Madrid International Action on Aging concluded that "although Ethiopia is facing demographic transition, no specific old-age policies, programs, or interventions have been implemented to address the health of the elderly in particular." (24). It suggested "the government and relevant stakeholders should strive to design and implement an old-age policy outlining cost-effective interventions for elders." (24).

There's limited research on geriatric trauma in LMICs. In Ethiopia, the situation is less well-documented, often viewed as a secondary concern on the broader context of general trauma care. A retrospective medical record review to identify injury epidemiology and emergency department length of stay between April 2021 and March 2022 at Addis Ababa Burn, Emergency, and Trauma Hospital provided the closest data distribution of injured patients based on age, emergency department zone, mechanism of injury, and injured body regions. Of the total injury cases ($n=6991$), age ≥ 60 years was 619 (8.9%), 493 (79.6%) triaged to Yellow/Green zone. The two main injury mechanisms were fall ($n=267$) and RTI ($n=242$), accounting for more than 80% presentations, with majority of injured body parts including the head ($n=178$), lower limb ($n=192$) in these demographics. The multivariate binary logistic regression model used to assess the associated factors with length of stay in the emergency department found among other factors, that the age group of ≥ 60 years had a greater odd of staying more than 24 hours [AOR: 1.38, 95% CI (1.03–1.85)] (4).

The evaluation and management of elderly trauma patients requires knowledge of ageing physiology, a focused triage based on assessing frailty and early activation of trauma protocol to improve outcomes (16,26). The lack of comprehensive trauma data for the elderly in Ethiopia further exacerbates the challenge of understanding the true extent of geriatric trauma in the region. These gaps highlight the need for localized studies to recognize the pattern and outcome of trauma on the elderly. The rest of this literature review will focus on the causes, intrinsic and extrinsic risk factors, as well as the specific considerations that need to be addressed while encountering the elderly trauma patient.

2.2. Risk factors

The risk factors for geriatric trauma are diverse and can be categorized into intrinsic (biological and medical) and extrinsic (environmental and social) determinants (12). Intrinsic risk factors include age-related physiological changes such as frailty, decreased muscle mass, reduced bone mineral density, and diminished sensory perception, all of which increase the likelihood of falls and severe injury from trauma (13,27). Older adults are also more likely to have chronic conditions, such as hypertension, diabetes, and cardiovascular disease, which not only affect mobility but also complicate recovery after trauma, increasing the risk of complications like infection, deep vein thrombosis, and delayed wound healing (12,28). Polypharmacy is another significant risk factor, as many elderly patients take multiple medications that can increase the risk of adverse drug interactions, dizziness, and falls (12).

Extrinsic risk factors include environmental hazards, such as inadequate housing, poor lighting, and slippery walkways, which increase the likelihood of falls (12). In Ethiopia, road traffic accidents are a major cause of trauma, and elderly pedestrians are at particular risk due to unsafe roads, lack of pedestrian infrastructure, and heavy traffic (24). Social determinants such as poverty, limited access to healthcare, and social isolation further increase the vulnerability of elderly individuals to trauma and its consequences. Lack of awareness about fall prevention and trauma care in both the community and healthcare settings contributes to poor outcomes among elderly trauma patients (24).

2.3. Rational for the proposed study

While there is a growing body of literature on geriatric trauma in high-income countries, there is a significant gap in knowledge regarding geriatric trauma in low- and middle-income settings, particularly in Ethiopia (29). Existing studies in Ethiopia have primarily focused on trauma in younger populations or have not specifically addressed the needs and outcomes of elderly patients. By focusing on this underserved population, the proposed study will contribute valuable data that can inform healthcare policy and improve trauma care for the elderly in Ethiopia. Given the country's rapidly aging population and increasing trauma burden, understanding the specific challenges faced by geriatric trauma patients is critical to developing targeted, effective interventions that can reduce mortality and morbidity in this vulnerable group.

3. Objectives

3.1. General Objectives

To assess the pattern and outcome of geriatric trauma patients presenting to the Emergency Department at Addis Ababa Burn, Emergency, and Trauma (AaBET) Hospital.

3.2. Specific Objectives

1. To describe the sociodemographic (e.g., age, sex, residence) and clinical (e.g., time of arrival, vital signs, comorbidities) characteristics of geriatric trauma patients at ED presentation.
2. To identify the common mechanisms (e.g., falls, road traffic injuries, violence) and types (e.g., fracture, blunt, penetrating) of trauma among elderly patients in the ED.
3. To determine the short-term clinical outcomes (e.g., discharge, admission, ED mortality, length of hospital stay) of geriatric trauma in the ED.
4. To analyze the key factors associated with the clinical outcomes among geriatric trauma patients.

4. Methodology

4.1. Study Setting

The study was conducted at Addis Ababa Burn, Emergency, and Trauma (AaBET) Hospital, a public hospital affiliated with St. Paul's Hospital Millennium Medical College in Addis Ababa, Ethiopia. The city has an estimated population of four million and is home to about 16% of Ethiopia's urban dwellers, but it only accounts for 3.6% of the country's projected 110 million people in 2024 (10). The administrative division of Ethiopia consists of nine regional states and two chartered cities (Addis Ababa and Dire Dawa). The regional states include Amhara, Oromia, Southern Nations, Nationalities, and Peoples' Region (SNNPR), Tigray, Afar, Somali, Harari, Gambella, and Benishangul-Gumuz. The Oromia region, which is the largest in the country, surrounds Addis Ababa. Recently, two Sidama and Southwest Ethiopia regional states separated from the SNNPR and formed their own new states. Since the residential addresses of the majority of the patients will be recorded in the patients' logbooks using the former SNNPR, we will use this regional name for this study.

AaBET Hospital is the main emergency and trauma referral hospital in Ethiopia, providing specialized and sub-specialized trauma care to both patients presenting primarily and those referred from other hospitals and health facilities in Addis Ababa, the surrounding Oromia areas and other parts throughout the country. The hospital has 250 inpatient beds and 14 Intensive Care Unit beds, serving as Ethiopia's main trauma care center. Very few studies have used the hospital's trauma surveillance system to assess the burden of injury and characterize trauma patients that present to the hospital (4).

AaBET Hospital provides 24-hour emergency and critical care services, orthopedic services, neurosurgery services, general surgery services, and burn care (30). The ED has four zones (or wards) to treat patients according to the Emergency Severity Index scale. These zones are identified by color-coded triage zones, which include green, yellow, orange, and red. Patients arriving at the ED are first assessed by emergency triage officers (physicians/nurses). Those patients, who are stable or have mild/minor severity are triaged to the yellow/green zone, while

those with moderate severity are triaged to the orange zone. The red ward is used for severe patients who require extra care and stabilization (4,30).

Data recording is started as soon as the patient received a medical chart from the ED. All records for every patient are kept in a folder that also includes several charts that are crucial for documenting each activity during the course of care and treatment. The chart follows a patient's journey from one zone or department to another within the hospital. Then, the nurses at the ED record all of the data from the chart into the patient logbook as part of the HMIS. Then, data from the logbook are manually entered into a Microsoft Excel worksheet by the HMIS personnel.

The logbook has information on the medical registration number, date and time of patient's arrival, name, age, sex, region, admission date, diagnosis, mechanism of injury, injured body part, pathology, route of transfer from ward to ward, disposition, and disposition date.

4.2. Study Design

A hospital-based retrospective cross-sectional study design was used to collect data from the HMIS trauma registry and patient medical records. It involved the review and analysis of existing medical records of geriatric patients who were admitted to AaBET Hospital with trauma-related conditions. All geriatric patients admitted to the hospital after a visit to the ED following trauma will be included. This approach enabled an in-depth evaluation of patient patterns and outcomes over the defined timeframe, leveraging the hospital's digital and analogue medical record system.

4.3. Study Population

The target population comprised of all geriatric patients (aged 60 years and above) who presented to the ED at AaBET Hospital over a 12-month period. The source population included all geriatric patients who present to the ED with evidence of injury as determined by clinicians. The study population was based on eligibility criteria and the sampling procedure.

4.3.1. Inclusion Criteria:

- Geriatric patients (aged 60 years and older) who presented to AaBET Hospital with injury during the study period
- Patients whose medical records contain comprehensive information on demographics, injury characteristics, treatment provided, and outcomes.

4.3.2. Exclusion Criteria

- Patients who were pronounced dead upon arrival at the ED
- Medical records that are incomplete or lack critical data required for the study.

4.4. Study Variables

The study focused on the following outcomes:

4.4.1. Outcome Variable

- **Primary Outcome**
 - ED mortality
- **Secondary Outcome**
 - Treated and Discharged from ED
 - Admission to ward or ICU from ED
 - Transfer to another facility
 - ED length of stay
 - Readmission after discharge

4.4.2. Exposure Variable

- Age (continuous or grouped: 60-69, 70-79, 80+)
- Sex
- Residence
- Living Status
- Date/Month of Arrival
- Time from injury to ED arrival

- Mode of arrival
- Place of occurrence
- Place of injury
- Referral status
- Vital signs on arrival
- GCS at triage
- Triage Category
- Comorbidities
- Medications (polypharmacy)
- Functional Status prior to trauma
- Alcohol use prior to the injury
- Intent of injury
- Mechanism of injury
- Anatomical injury site
- Nature of injury
- Interventions in the ED
- Use of advanced airway/mechanical ventilation in the ED
- Use of Blood Products in the ED
- Emergency length of stay

4.5. Sample Size Calculation

The sample size calculations were performed as follows:

Primary Outcome: Pattern of Geriatric Trauma

To estimate the pattern of geriatric trauma with a 95% confidence level and a 5% margin of error, a prior estimate of geriatric trauma proportion of 8.9% was used (4). The calculated sample size was:

$$n = \frac{Z^2 \cdot P \cdot (1 - P)}{E^2}$$

Where:-

- Z = 1.96 (standard normal deviate for a 95% confidence level)
- P = estimated proportion of favorable outcomes (assumed to be 0.5 for maximum variability)
- E = margin of error (0.05)

$$n = (1.96^2 * 0.089 * (1-0.089)) / (0.05)^2 = 124 \text{ participants}$$

Secondary Outcomes: The required sample sizes for the secondary outcomes were calculated using as follows:

- Mortality rate (2.1%): Required sample size = 32 participants.
- ICU admission rate (15%): Required sample size = 196 participants.
- Hospital length of stay (SD = 5 days): Required sample size = 96 participants.
- Complication rate (15%): Required sample size = 196 participants.

Final Adjusted Sample Size

The largest sample size required is 196 participants (for pattern ICU admission rate), which also ensures sufficient power for primary and all secondary outcomes. Adjusting for 10% missing data, the final sample size becomes 210 participants.

4.6. Sampling Procedures

According to previous epidemiological studies done at AaBET hospital, the proportion of geriatric trauma patients was represented as 619 of 6991 total trauma patients in the year 2021/2022 (4).

The required number of individuals for this study were selected at random from the sampling frame by using Simple Random Sampling technique which were selected from the one year study period.

4.7. Data Collection Methods

4.7.1. Data Collection Tools and Procedures

Data was collected through a retrospective record review of all geriatric trauma patients seen in the ED for 12 consecutive months from October 1, 2023 to September 30, 2024. The data collection tool was a standardized data collection form, based on recommendations by the World Health Organization (WHO) injury surveillance guideline (31). Using the WHO's modified data collection form (see appendices), data was retrieved and extracted from medical records in Microsoft Excel worksheets by researcher. After the data are extracted, patient names were deleted from the Microsoft Excel worksheet, and all de-identified data were kept confidential and not shared or disclosed to third parties (4).

4.7.2. Data Quality Control and Assurance Techniques

On each day, the data collector thoroughly reviewed each questionnaire for its completeness. Data quality assurance techniques were given for data collectors, day to day activities during data collection. Supervisors evaluated data daily before the next day's activity. Data quality Assurance were conducted by using a well-designed checklist. It was managed by the supervision of data collectors. The data was checked for completeness and consistency by the researcher before receiving from the data collectors.

4.7.3. Data Management and Analysis Procedures

The processing of the data began by checking the gathered data for accuracy and completeness. Each completed questionnaire was assigned a unique code and was directly exported to SPSS version 26.00 (IBM, Armonk, NY, USA) for further analysis. The summary of the data was presented using frequency distributions, cross-tabulations, chi square test and graphs. Continuous variables were presented as mean and standard deviation (SD) and categorical variables as frequency and percentages. Bi-variate and multivariate logistic regression were used to assess the association between independent and dependent variables. Statistical significance was determined at a p-value of < 0.05 .

4.8. Operational Definitions

Geriatric Patient – Any patient aged 60 years and older, in line with sub-Saharan Africa definitions (32,33)

Traumatic Injury- An injury which is any physical damage to the body caused by an intolerable level of energy (31). Injury cases will refer to a person who has been injured, regardless of the number of injuries sustained (4).

Mechanism of Injury - How the injury was inflicted, i.e. how the person was hurt. Refers to mechanisms (e.g., fall-related trauma, motor vehicle accident, assault, burns). If more than one mechanism, record the one that precipitated the injury(31).

Nature of Injury - The physical nature of the injury, real or suspected, which brought the person to the agency. Which include anatomical locations (e.g., head, chest), and types of injury (e.g., fractures, soft tissue injury). If more than one injury, focus on the most serious (31).

Severity of Injury - Assessment of the degree of injury. Which will be measured using the Revised Trauma Score (RTS) calculated using GCS, SBP and RR(3). Categorized as Mild/Delayed (e.g. bruises, minor cuts), Moderate/Urgent, requiring some skilled treatment (e.g. fractures, sutures), and Severe/Immediate, requiring intensive medical/surgical management (e.g. internal hemorrhage, punctured organs, severed blood vessels) (31)

Time to Presentation – The time interval between the trauma incident and the patient's arrival at AaBET hospital

Comorbidities – Chronic medical conditions present before the trauma. Examples include hypertension, diabetes, heart disease, Asthma/COPD, Stroke, renal disease.

Trauma Outcome - The result of the trauma management process. Includes mortality (in-hospital), discharge, complications, and length of hospital stay.

Complications - The proportion of patients experiencing medical or surgical complications during their hospital stay. Examples include Infections, pressure ulcers, venous thromboembolism (VTE), or delayed wound healing.

4.9. Ethical Considerations

All the information collected from participants was recorded anonymously and confidentiality was assured throughout the study. Ethical clearance was obtained from SPHMMC department of ECCM ethical committee. The recorded data were not accessed by a third person, except the principal investigator, and was kept secure.

5. Results

Demographic Characteristics

The study population demonstrated distinctive demographic patterns that reflect both the aging population dynamics and healthcare utilization patterns in urban Ethiopia. As shown in Table 1, there was a nearly equal gender distribution with a slight male predominance. The age distribution followed expected patterns for geriatric populations, with the majority belonging to the “young-old” category (60-69), and decreasing representation in older age groups, consistent with population pyramids in LMICs.

Table 1. Demographic Characteristics of Geriatric Trauma Patients (N=210)

Characteristic	Category	N	%
Sex Distribution	Male	110	52.4%
	Female	100	47.6%
Age Distribution	60-69 years	121	57.6%
	70-79 years	63	30.0%
	≥80 years	26	12.4%
Mean Age ± SD		68.1 ± 7.9 years	
Geographic Distribution	Addis Ababa	138	65.7%
	Oromia region	59	28.1%
	Other regions	13	6.2%

Geographically, most patients (65.7%) were residents of Addis Ababa, reflecting the urban catchment area of AaBET Hospital, while substantial proportions came from the surrounding Oromia region (28.1%), indicating the hospital’s role as a national referral center. The demographic profile suggests that geriatric trauma care at this institution serves both urban and peri-urban populations, with implications for injury prevention strategies and resource allocation.

Clinical Presentation and Injury Severity

The clinical presentation of geriatric trauma patients revealed important patterns in physiological stability and injury severity. As detailed in Table 2, most patients presented with stable vital signs, though triage distributions indicated a spectrum of acuity levels requiring different intensities of care.

Table 2. Clinical Presentation and Injury Characteristics (N=210)

Parameter	Category	Mean $\pm$ SD/n	Range/%
Vital Signs	Systolic BP (mmHg)	135.2 $\pm$ 22.3	80-210
	Heart Rate (bpm)	83.4 $\pm$ 13.9	54-122
	Respiratory Rate	19.5 $\pm$ 5.5	14-87
	Spo2	94.4 $\pm$ 3.3	82-99
GCS Score		14.6 $\pm$ 1.6	3-15
Triage Category	Green	86	41.8%
	Yellow	77	37.4%
	Orange	29	14.1%
	Red	14	6.8%
Length of stay(hrs)		75.0 $\pm$ 129.6	1-720

The triage distribution followed a typical pyramid pattern with 41.8% classified as Green (low acuity), 37.4% as Yellow (medium acuity), 14.1% as Orange (high acuity), and 6.8% as Red (highest acuity). This distribution suggests that while most geriatric trauma cases were of moderate severity, a substantial proportion (20.9%) required urgent or immediate attention. The Glasgow Coma Scale scores indicated that most patients (mean 14.6) presented with relatively preserved consciousness, though the standard deviation of 1.6 reflects the inclusion of patients with significant traumatic brain injuries.

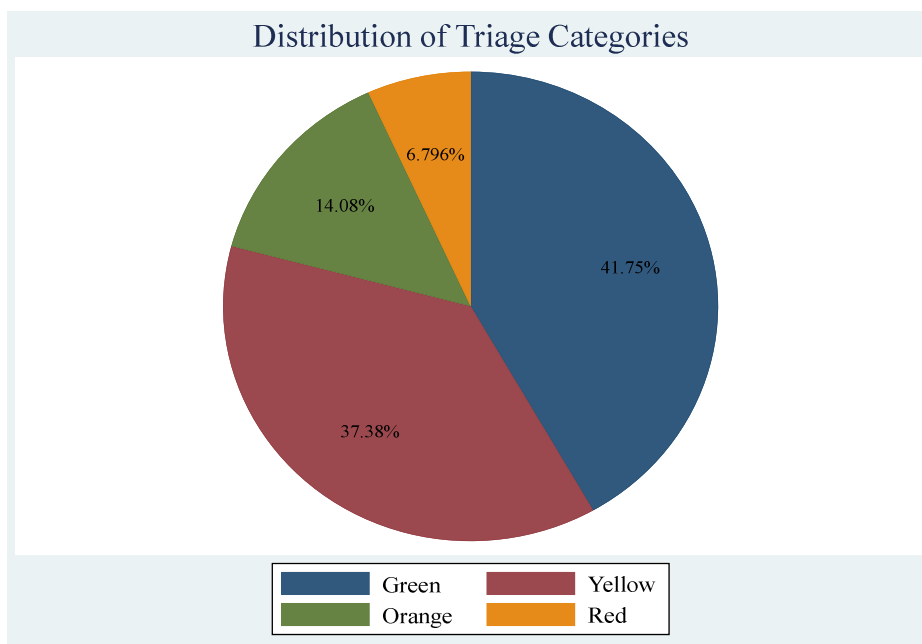


Figure 1: Distribution of Triage Categories

Oxygen saturation (SpO₂) measurements revealed that the majority of geriatric trauma patients (191/209, 91.4%) maintained SpO₂ levels of 90% or above upon presentation. However, a clinically significant portion (18/209, 8.6%) demonstrated substantial hypoxemia with SpO₂ below 90%, including 13 patients (6.2%) with severe hypoxemia (85-89%) and 5 patients (2.4%) with critical hypoxemia (<85%).

Emergency department length of stay revealed substantial variability, with a mean duration of 75.0 hours (approximately 3.1 days) and a wide range from 1 hour to 30 days, reflecting the diverse clinical complexity of geriatric trauma presentations. The distribution across stay categories showed that nearly one-third of patients (32.4%) had short stays (≤ 6 hours), while a comparable proportion (29.5%) experienced extended stays exceeding 3 days. This bipolar distribution underscores the heterogeneous nature of geriatric trauma, encompassing both straightforward cases requiring brief management and complex presentations necessitating prolonged emergency department care, with admitted patients demonstrating significantly longer mean stays (119.5 hours) compared to discharged patients (56.2 hours).

Temperature recordings were available for only 30 patients (14.3% of the cohort). This highlights challenges in comprehensive vital sign documentation in a busy emergency department setting and represents an important area for quality improvement.

Analysis revealed that 37.3% (78/209) of geriatric trauma patients presented with at least one pre-existing chronic illness, highlighting the substantial comorbidity burden in this population.

Injury Epidemiology and Patterns

The injury epidemiology revealed falls as the dominant mechanism, accounting for over half of all cases (52.4%). Among the 109 fall-related injuries, ground-level falls (<1m) constituted the overwhelming majority (84.4%, n=92), while high-level falls (≥ 1 m) accounted for the remaining 15.6% (n=17). Road traffic accidents were the second largest category (29.1%), with pedestrians being disproportionately affected (78.7% of RTA cases). The temporal distribution showed daytime predominance (61.0%) in emergency department presentations.

Table 3. Injury Patterns and Circumstances

Characteristic	Category	n (%)	Notable Subtypes
Mechanism of Injury	Falls	110,(52.4%)	Ground-level falls (92), High-level falls (17)
	RTA	61 (29.1%)	Pedestrian (48), Vehicle occupant (13)
	Assault	12 (5.7%)	Interpersonal violence (10), Intentional self-harm (2)
	Gunshot wounds	3 (1.4%)	-
	Others	24 (11.4%)	Animal-related (8), Burns (4), Crush (3), Other (9)
Nature of injury	Fracture	73 (36.87%)	-
	Head/Brain Injury	19 (9.60)	-
	Soft Tissue/Wound	83, (41.92%)	-
	Spinal/Neurological	8 (4.04%)	-
	Internal Organ	15 (7.58%)	-
Time of Presentation	Daytime (8:00-18:00)	128,(61.0%)	-
	Nighttime (18:00-8:00)	82 (39.0%)	-

Analysis of injury types revealed distinct mechanistic and demographic patterns. Fractures constituted the most common injury type (36.9%), demonstrating strong mechanistic specificity with over half (51.4%) occurring in falls victims. Soft tissue injuries were the second most

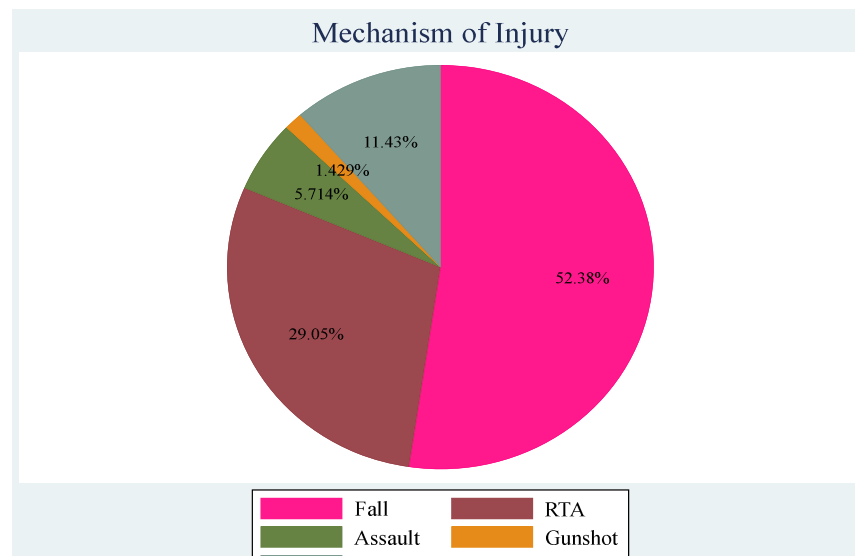


Figure 2: Mechanism of Injury

prevalent (41.9%) but showed a different mechanistic profile, predominating in road traffic accidents (62.5%) and assaults (58.3%). Head and brain injuries, while less common overall (9.6%), demonstrated significant age variation, being more prevalent in the oldest age group (15.4% in ≥ 80 years vs 10.7% in 60-69 years).

Outcome Analysis

The disposition outcomes revealed that slightly over half of patients (54.3%) were discharged directly from the ED, while 30.0% required hospital admission. The Left Against Medical Advice (LAMA) rate was notable at 9.5%, predominantly among fall victims. The mortality rate was 1.4%, with all fatalities occurring in the Red triage category.

Table 4. Emergency Department Disposition and Outcomes

Outcome Category	n (%)	Mean Age	Common Mechanisms	Triage Distribution
Discharged	114,(54.3%)	68.1 $\pm$ 7.7	Falls (50.0%), RTA (33.3%)	Green (51.8%)
Admitted	63 (30.0%)	66.3 $\pm$ 7.2	Falls (47.6%), RTA (30.2%)	Yellow (36.7%), Orange (25.0%)
Transferred	10 (4.8%)	76.6 $\pm$ 10.8	Falls (80.0%)	Yellow (60.0%)
LAMA	20 (9.5%)	69.8 $\pm$ 7.1	Falls (75.0%)	Yellow (57.9%)
Died	3 (1.4%)	65.0 $\pm$ 5.0	RTA (66.7%), Gunshot (33.3%)	Red (100%)

Bivariate analysis

Age-related Patterns

The relationship between age and outcomes demonstrated several important patterns. Transferred patients were significantly older than other groups (mean age 76.6 years, $p=0.002$), suggesting possible age-based triage decisions or increased complexity in the oldest patients. However, in the multivariable analysis, the oldest age group (≥ 80 years) showed a paradoxical protective effect against severe outcomes, potentially indicating selection bias or different injury patterns in the oldest old.

Mechanism-Outcome Relationships

The mechanism of injury showed strong associations with final disposition ($\chi^2=52.96$, $p<0.001$). A significant age difference was observed between fall mechanisms, with high-level fall victims being substantially younger than those sustaining ground-level falls ($p=0.0095$). Despite this age differential and the expected energy disparity between fall mechanisms, clinical outcomes demonstrated remarkable similarity between the two groups. Both ground-level and high-level falls showed comparable distributions across all disposition categories including discharge, admission, transfer, and leaving against medical advice ($p=0.921$). Glasgow Coma Scale scores also showed no significant difference between the groups ($p=0.1475$), suggesting similar neurological impact regardless of fall height. Falls dominated the LAMA category (75%), possibly reflecting patient perception of fall injuries as less severe. Road traffic accidents accounted for two-thirds of mortality cases (66.7%), highlighting their lethal potential in the geriatric population.

Triage-Outcome Correlations

The triage system demonstrated strong predictive validity for outcomes ($\chi^2=62.22$, $p<0.001$). The stepwise increase in admission rates across triage categories (Green: 20.9%, Yellow: 28.6%, Orange: 51.7%, Red: 35.7%) reflected appropriate acuity assessment, though the slightly lower admission rate in Red category may reflect immediate mortality or rapid transfers.

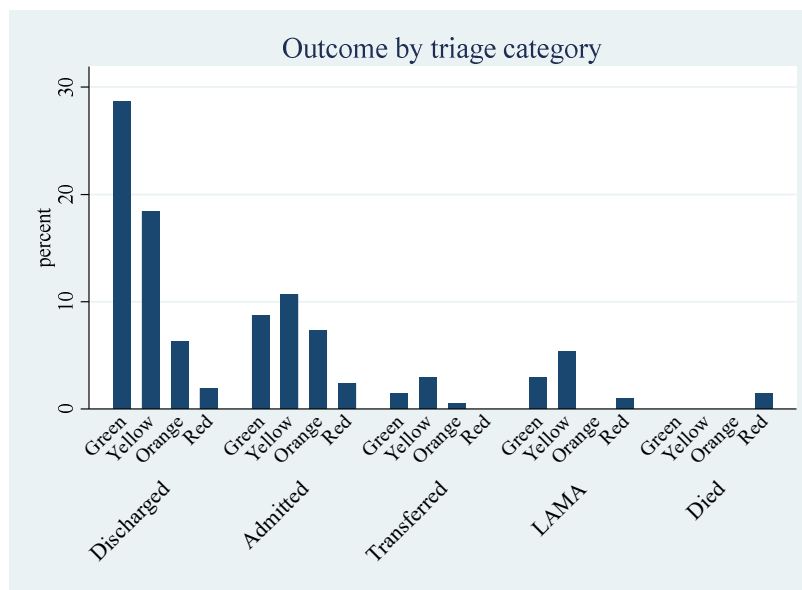


Figure 3: Outcome by Triage category

Nature of injury and Outcome patterns

Injury type showed a strong association with clinical outcomes ($\chi^2=57.95$, $p<0.001$). Fracture and head/brain injuries were disproportionately represented in admitted patients, comprising 45.8% and 22.0% of admissions respectively. Conversely, soft tissue injuries predominated among discharged patients (57.4%) but also accounted for all mortality cases.

Physiological Parameters

GCS scores showed expected variation across outcomes, with mortality cases demonstrating profoundly depressed consciousness (mean GCS 6.7). Vital signs remained relatively stable across most outcome groups, suggesting that in geriatric trauma, mechanism and anatomical injury may be more predictive than physiological parameters alone.

Oxygen Saturation Patterns

Oxygen saturation demonstrated significant variation across outcome groups ($F=3.63$, $p=0.007$). Patients who died had substantially lower mean SpO₂ ($88.7\pm4.7\%$) compared to discharged patients ($94.8\pm3.1\%$, $p=0.037$). Severe hypoxemia presents in 66.7% of mortality cases, underscoring the prognostic significance of oxygenation status in geriatric trauma outcomes. SpO₂ also correlated strongly with triage category ($\chi^2=83.39$, $p<0.001$), with normal SpO₂ predominant in Green triage (54.1%) versus only 20.7% in Orange triage.

Emergency Department Length of Stay

Length of stay varied significantly across outcome groups ($F=2.62$, $p=0.036$). Admitted patients had substantially longer mean length of stay (119.5 ± 167.4 hours) compared to discharged patients (56.2 ± 111.1 hours, $p=0.055$). Length of stay categories showed significant association with outcomes ($\chi^2=21.43$, $p=0.044$), with extended stays (>3 days) comprising 42.9% of admissions. All mortality cases occurred in the short-stay category (≤ 6 hours), reflecting rapid clinical deterioration. In contrast, complications during the clinical course were relatively uncommon, affecting 6.0% (11/183) of patients, suggesting generally favorable acute care outcomes despite the complexity of geriatric trauma management.

Multivariable Analysis

The multivariable model ($\chi^2=37.50$, $p=0.003$, Pseudo $R^2=0.15$) identified several independent predictors of severe outcomes. Orange triage category conferred 3.5-fold increased odds of severe outcomes, while "other" injury mechanisms (including animal injuries, burns, and crush injuries) carried nearly 3-fold increased odds. Head/brain injuries emerged as a powerful independent predictor of severe outcomes, conferring over five-fold increased odds (OR=5.63, 95% CI: 1.24-25.49, $p=0.025$), while soft tissue injuries were strongly unrelated with severe outcomes (OR=0.18, 95% CI: 0.05-0.64, $p=0.009$). Each additional hour of emergency department stay was associated with a 0.5% increase in the odds of severe outcomes (OR=1.005, 95% CI: 1.001-1.008, $p=0.004$). Patients with moderate hypoxemia (SpO2 90-93%) had nearly three-fold increased odds of severe outcomes compared to those with normal oxygenation (OR=2.84, 95% CI: 1.10-7.33, $p=0.032$). The protective effect of advanced age (≥ 80 years) warrants further investigation, potentially reflecting different injury mechanisms, selection bias, or altered healthcare-seeking behavior in the oldest patients.

Table 5. Logistic Regression Model for Severe Outcomes (Admission or Death)

Predictor	Category	Adjusted OR	95% CI	p-value
Age Group (ref: 60-69 years)	70-79 years	0.48	0.22-1.06	0.068
	≥ 80 years	0.21	0.06-0.79	0.021*
Triage Category (ref: Green)	Yellow	1.91	0.84-4.35	0.121
	Orange	3.55	1.30-9.71	0.014*
	Red	4.00	0.60-26.75	0.153
Mechanism (ref: Falls)	RTA	1.04	0.46-2.37	0.921
	Other mechanisms	2.86	1.05-7.81	0.040*
Nature of injury (ref: Fracture)	Head/Brain Injury	5.63	1.24-25.49	0.025*
	Soft Tissue/Wound	0.18	0.05-0.64	0.009*
	Spinal/Neurological	0.11	0.01-1.80	0.122
	Internal Organ	0.15	0.02-1.08	0.060
GCS Score		0.88	0.63-1.24	0.461
Length of Stay (per hour)		1.005	1.001-1.008	0.004*
Spo2	Moderate hypoxemia (90-93%)	2.84	1.10-7.33	0.032*

Subgroup Analysis

Gender-Based Differences

Males and females demonstrated similar age distributions and injury mechanisms, though males had slightly higher representation in road traffic accidents (55.7% of RTA cases) while females were overrepresented in fall-related injuries (52.7% of all cases).

Regional Variation

Urban residents (Addis Ababa) showed different injury patterns compared to rural counterparts, with higher proportions of road traffic accidents (32.6% vs 23.6%) and lower proportions of agricultural injuries.

6. Discussion

This study provides a comprehensive analysis of geriatric trauma patterns and outcomes at a major emergency department in Addis Ababa, Ethiopia.

The demographic profile of our cohort, with a mean age of 68.1 years and predominance of the "young-old" (60-69 years), reflects the demographic transition occurring in Ethiopia, where life expectancy has increased from 45 years in 1990 to 66 years in 2020 (25). The nearly equal gender distribution contrasts with studies from high-income countries that often show male predominance in trauma populations, possibly indicating different social roles and risk exposures among Ethiopian elders.

Injury Mechanisms

The predominance of falls (52.4%) as the leading mechanism of injury aligns with global geriatric trauma epidemiology. Studies from both high-income and low-income settings consistently identify falls as the primary cause of geriatric trauma, though the proportions vary. Our finding is particularly concerning given that ground-level falls, which might be perceived as minor in younger populations, result in significant morbidity and healthcare utilization in the elderly. This

underscores the need for fall prevention programs tailored to the local context, considering environmental hazards and age-related physiological changes.

The high proportion of road traffic accidents (29.1%), particularly among pedestrians, highlights infrastructure and road safety issues in urban Ethiopia. This finding correlates with national data showing increasing RTA rates in rapidly urbanizing areas. The vulnerability of elderly pedestrians suggests inadequate pedestrian infrastructure and possibly age-related impairments in mobility and sensory function.

Nature of Injury

The analysis of injury types reveals critical insights that both align with and expand upon existing geriatric trauma literature. The strong mechanistic patterning with fractures predominating in falls and soft tissue injuries in road traffic accidents echoes findings from multiple international studies. Our finding that fractures constituted 51.4% of fall-related injuries closely mirrors research by Pederson et al. (2019) who reported 48-54% fracture rates in geriatric falls across multiple trauma centers, reinforcing the universal vulnerability of aging bone tissue to low-energy mechanisms.

The powerful independent association between head/brain injuries and severe outcomes (OR=5.63) aligns with established literature demonstrating the particular vulnerability of the aging brain to traumatic insult. This finding is consistent with research by Thompson et al. (2006) who documented that geriatric patients with traumatic brain injuries have 2-3 times higher mortality than younger cohorts with similar injury severity. However, our observed odds ratio exceeds most reported values, potentially reflecting the compounded effects of limited physiological reserve and comorbid conditions in our Ethiopian cohort.

The age-related increase in head/brain injuries among our oldest patients (15.4% in ≥ 80 years vs 10.7% in 60-69 years) supports the cerebral senescence hypothesis advanced by Gangavati et al. (2009), where age-related cerebral atrophy and fragile vasculature increase susceptibility to intracranial injury regardless of mechanism energy. This pattern, combined with the fracture predominance in falls, suggests that targeted assessment protocols based on both mechanism and injury nature could enhance triage accuracy, particularly in resource-limited settings where comprehensive imaging may not be immediately available.

Triage Acuity and Outcomes

The triage distribution in our study, with 20.9% of patients requiring urgent or immediate attention, demonstrates the substantial acute care needs of geriatric trauma patients. The strong association between triage category and outcomes ($p < 0.001$) validates the use of triage systems in low-resource settings, consistent with findings from similar contexts (Caterino et al., 2016).

The paradoxical finding that patients aged ≥ 80 years had lower odds of severe outcomes in multivariable analysis ($OR = 0.21$, $p = 0.021$) warrants careful interpretation. This may reflect the "survivor effect," where the oldest old represent a select population of resilient individuals (Brooks and Peetz, 2017). Alternatively, it may indicate under-triage or different injury mechanisms in the oldest age group, a phenomenon documented in other geriatric trauma studies (Caterino et al., 2016).

Resource Settings and Outcome

The substantial Left Against Medical Advice (LAMA) rate of 9.5%, predominantly among fall victims, raises concerns about patient education and healthcare accessibility. This finding suggests that some patients or families may underestimate the severity of fall injuries or face barriers to continued care. Similar patterns have been observed in other resource-limited settings where financial constraints and health literacy issues influence healthcare decisions (Seid and Babbel, 2023).

The mortality rate of 1.4% appears low compared to high-income country reports, but this must be interpreted cautiously given the predominance of lower-acuity cases and potential loss to follow-up. All fatalities occurred in the Red triage category, emphasizing the critical nature of this patient subgroup and the need for rapid intervention capabilities.

Limitations

The single-center design may limit generalizability, though AaBET Hospital serves as a major referral center. Missing data for certain physiological parameter particularly temperature reflects real-world challenges in emergency documentation but may affect the completeness of clinical assessment. The study also could not account for pre-hospital factors and long-term outcomes, which are crucial for understanding the full impact of geriatric trauma.

Recommendations

The findings of this study lead to the following concrete recommendations

- Development of geriatric-specific trauma protocols that account for the unique physiological responses and injury patterns in elderly patients.
- Enhanced fall prevention programs targeting home safety and community awareness, adapted to local living conditions and cultural contexts.
- Improved pedestrian infrastructure in urban areas, with particular attention to the needs of elderly citizens with mobility limitations.
- Strengthened patient education to address the high LAMA rate, emphasizing the potential severity of seemingly minor injuries in the elderly.
- Investment in emergency department documentation systems to improve data completeness and facilitate quality improvement initiatives.

Conclusion

This study demonstrates that geriatric trauma in Addis Ababa presents distinct patterns characterized by fall predominance, significant acuity levels, and modifiable outcome predictors. The findings highlight the growing importance of geriatric trauma care in Ethiopia's evolving healthcare landscape and provide a foundation for targeted interventions to improve outcomes for this vulnerable population. The identified factors, such as triage category, injury mechanism, hypoxemia, and length of stay, can help clinicians risk-stratify patients and guide allocation.

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8. Annexes

8.1. Appendix I : Data Collection Tool

1. Patient Demographics

1	Identification code		
2	Age	(in years)	
3	Sex	Male	
		Female	
4	Residence	Addis Ababa	
		Outside Addis Ababa	
5	Time of Arrival	Day	
		Night	
		Unknown	
6	Day of Arrival	Weekday	
		Weekend	
7	Date/Month of Arrival		
8	Living Status	Alone	
		With family	
		Care home	
		Unknown	

2. Pre-hospital

1	Time from Injury to ED		hrs.
2	Mode of Transport	Ambulance	

		Taxi	
		Private	
		Police	
		Other	
3	Place of Occurrence	Home	
		Street/Highway	
		Other	
		Unknown	
4	Place of Injury	Addis Ababa	
		Outside Addis Ababa	
5	Referral Status	Self-referral	
		Hospital/health center	

3. Clinical Status

1	Vital Signs (on arrival)	SBP	
		HR	
		RR	
		SpO ₂	
		Temp	
2	GCS	Mild 13-15	
		Moderate 9-12	
		Severe 3-8	
3	Triage Category	Red	
		Orange	
		Yellow	

		Green	
4	Comorbidities	Hypertension	
		Diabetes Melitus	
		Stroke	
		Asthma/COPD	
		Renal Disease	
		Cardiovascular Disease	
		Other (Dementia, Cognitive, Visual or hearing impairment)	
5	Medications (Polypharmacy)	≥5 medications	Yes
			No
6	Functional Status before trauma	Independent	
		Assisted	
		Bedridden	
7	Alcohol Use Prior to the Injury	Yes	
		No	
		Undetermined	

4. Trauma Characteristics

1	Intent	Accidental (Unintentional)	
		Intentional (Assault, Interpersonal Violence)	
		Intentional self-harm (Suicide, Attempted Suicide)	
		Other (Specify)	
		Unknown	

2	Mechanism of Injury	RTA	Pedestrian	
			Car Crash (Passenger, Driver)	
			Motorcycle	
		Fall	Ground Level <1m	
			High Level ≥1m	
		Assault		
		Stab/Cut		
		Gun shot		
		Bull gore injury		
		Choking or hanging		
		Burn and electrical injuries		
		Drowning or near-drowning		
		Poisoning		
		Other (Specify)		
		Unknown		
7	Anatomical Injury Site (Specify) Superficial, Open Wound, Fracture, Dislocation, Internal Organs...	Head		
		Neck, Cervical Spine		
		Thorax, Thoracic Spine		
		Abdomen, lower back, lumbar spine and Pelvis		
		Shoulder and Upper Arm		
		Elbow and Forearm		
		Wrist and Hand		
		Hip and Thigh		
		Knee and Lower Leg		
		Ankle and Foot		

		Polytrauma	
		Other (Specify)	
9	Nature of Injury	Bruise, Splinter, Contusion (Superficial Injury)	
		Laceration, Puncture, Bite (Open Wound)	
		Dislocation, Sprain, Strain of Joint/Ligament	
		Traumatic Amputation	
		Fracture	Closed
			Open
		Chest	Chest Wall Fracture
			Tension pneumothorax
			Open pneumothorax
			Hemothorax
			Lung contusion
			Other (Specify)
		Abdomen	Blunt
			Penetrating
			Internal Injury
		Head	Scalp laceration
			Skull fracture
			Concussion
			Epidural hematoma
			Subdural hematoma
			Contusion
			Intracerebral hematoma
			Other

		Spinal Cord Injury	Cervical	
			Thoracic	
			Lumbar	
			Sacral	
			Coccyx	
		Pelvic	Fracture	
			Genitourinary Injury	
		Other Nature of Injury (Vascular, Muscular...)		

5. ED Management

1	Intervention in ED	Advanced Airway Used	Yes	No
		Oxygen Supplemented	Yes	No
		IV Fluids Given	Yes	No
		Blood Transfusion	Yes	No
		Bleeding Control	Yes	No
		Pain Management	Yes	No
		Immobilization	Yes	No
		Other (Specify)		
2	Surgical Intervention	Bedside/Procedure Room		
		OR		
3	Imaging Done	X-ray		
		EFAST		
		CT Scan		
		None		
4		Orthopedics		

	Additional Specialty Departments Involved	Neurosurgery	
		Plastic Surgery	
		General Surgery	
		ENT	
		Other (Specify)	
		None	

6. Patient Outcome

ED Disposition	Treated and Discharged		
	Admitted	ICU	
		Ward	
	Transferred		
	Died		
	Left against medical advice		
ED Length of Stay			Hrs.
Readmission after ED Discharge	≤30 days	Yes	No
ED Mortality	ED death and/or ≤24hrs	Yes	No