HAWASSA UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCES SCHOOL OF NURSING

MAGNITUDE AND ASSOCIATED FACTORS OF EARLY MORTALITY AMONG DEATHS IN ADULT EMERGENCY DEPARTMENT, AT PUBLIC HOSPITALS, HAWASSA, SIDAMA, ETHIOPIA,2023.

MSc IN EMERGENCY MEDICINE AND CRITICAL CARE NURSING

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HAWASSA UNIVERSITY, HAWASSA, ETHIOPIA

NOVEMBER, 2023

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THESIS SUBMITTED TO HAWASSA UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE SCHOOL OF NURSING, HAWASSA UNIVERSITY, HAWASSA, ETHIOPIA.

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR MASTER OF EMERGENCY MEDICINE AND CRITICAL CARE NURSING.

NOVEMBER, 2023

Approval sheet

This is to certify that the thesis entitled "Magnitude and associated factors of early mortality among deaths in adult emergency department at public hospitals Hawassa, Sidama, Ethiopia, 2023," submitted in partial fulfillment of the requirements for the degree of Master's with specialization in emergency medicine and critical care nursing, the Graduate Program of the School of Nursing, and has been carried out by Gelane Geleto, under our supervision. Therefore, we recommended that the student has fulfilled the requirements and, hence, can submit the thesis to the department.

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Declaration

I confirm that this MSc thesis is my original work, that it has not been submitted for a degree at any other university, and that all sources of material utilized for this thesis have been properly cited.

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Equivalent thesis has been submitted for Examination with my approval as thesis advisors.

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Abbreviation and Acronym

AOR: Adjusted Odd Ratio

AGH: Adare General Hospital

C/C: Chief Complaint

COR: Crude Odd Ratio

ED: Emergency Department

EMCCN: Emergency Medicine and Critical Care Nursing

HIV/AIDS: Human Immune Virus-Acquired Immune Deficiency Syndrome

Hrs: Hours

HUCSH: Hawassa University Comprehensive Specialized Hospital

LIC: Low Income Country

LMIC: Low and Middle-Income Country

MOF: Multiple Organ Failure

SPSS: Statistical Package for Social Science

RTA: Road Traffic Accident

TEWS: Triage Early Warning Score

TPH: Tula Primary Hospital

ABSTRACT

Background: early mortality defined as death with 72 hours of emergency department presentation**.** In low-income countries with limited resources, adult emergency department mortality remains high. The majority (59.8%) of those deaths occur within the first three days of admission to the emergency department in Ethiopia. Previously, only single-center studies at tertiary hospitals were conducted in Ethiopia.

Objective: to assess the magnitude and associated factors of early mortality among deaths in adult emergency departments at selected public hospitals in Hawassa, Sidama, Ethiopia, from January 2021 to December 2022.

Methods: An institutional-based cross-sectional study design was applied. A systematic random sampling technique was used to select 369 charts of patients who died in adult emergency departments of selected public hospitals in two years. The data was collected using a pre-tested data abstraction tool entered into the Kobo toolbox, then entered into EpiData version 4.6.0 and exported to SPSS version 27 for analysis. By using binary logistic regression Bivariate and multivariate analyses were run. Finally, statistical significance was declared at p-value <0.05, and an adjusted odds ratio with a 95% confidence interval was used to report the strength of the association

Result: This study result shows that 50.2% of the participants were between the ages of 25-54 with mean average 40.6 ± 17.5 and 67.7% were male. 288 (78%) died within 72 hours. Lack of prehospital care [(AOR = 4.2; 95% CI: 2.23, 7.87), P = 0.007], road traffic accidents [(AOR = 4.1; 95% CI: 1.403, 12.076), P = 0.013], red triage categories [(AOR = 3.9; 95% CI: 1.6, 9.4), P = 0.003], had lack of investigation[(AOR = 3.4; 95% CI: 1.2, 9.4), comorbid illness [(AOR = 3.2; 95% CI: 1.558, 6.49), P = 0.001] and delayed initial intervention [(AOR = 2.338; 95% CI: 1.259, 4.339), P = 0.007] were significantly associated with early mortality.

Conclusion: In this study, a greater early mortality rate was detected. Early morality was increased by a lack of prehospital treatment, road traffic accidents, a red warning score, a lack of investigation, comorbidity, and a delay in the first intervention.

Key words: Early Mortality, Adult Emergency, Hawassa, Ethiopia

CHAPTER ONE; INTRODUCTION

1.1 Background

Emergency departments are multifunctional facilities where patients can get emergency health care services 24 hours a day, seven days a week, at any level of hospital. It serves as the primary point of contact for critically ill patients in need of standardized advanced intervention to lower the risk of early mortality among emergency department (ED) admitted patients. (Stefanovski, Vladimir Radkov et al. 2017).

According to Ethiopian hospitals transformation guideline the maximum time length stay at ED were 72 hours. Death can happen while giving emergency treatment; it might happen early or late. The term "early mortality" refers to death that occurs within three days of presenting to the emergency room. This category of "early" death includes the most severely ill patients who are most likely to benefit from ED interventions (Hunchak, Teklu et al. 2015, Abebe, Habtamu et al. 2023).

The causes of emergency department mortality in Ethiopian hospitals due to injuries and medical conditions are mainly unclear. Causes were thought to be multiple, including a high prevalence of trauma and emergency conditions as well as a lack of access to quality care and enough resources. However, the top four medical causes were septic shock (36.7%), respiratory disease (30%), renal disease (11.3%), and cardiovascular disease (11.1%), and the primary cause of trauma death was road traffic accidents and fall-down injuries, with cardiopulmonary arrest, hypoxia, and hypovolemia being the most immediate causes of death.(Hirshon, Risko et al. 2013, Stefanovski, Vladimir Radkov et al. 2017, Yosha, Tadele et al. 2021, Dode, Alemayehu et al. 2022).

Many factors contribute to hospital deaths in emergency departments around the world. The severity of the injury or illness, the inadequacy of medical equipment and lack of trained personnel, the patients' residence and an unsuitable road network, the lack of rapid patient transfers for definitive treatment, These and other factors, such as inadequate pre-hospital care, duration of chief compliant, and comorbidities, have a direct relationship with early ED mortality (Lozano, Naghavi et al. 2012, Opiro, Wallis et al. 2017, Abebe, Habtamu et al. 2023).

This study aims to determine the magnitude of early mortality in the emergency department and to characterize associated factors of early mortality among patients admitted and died at public hospitals in Hawassa City.

1.2 Statement of the problem

Globally, emergency department mortality is estimated to be 15–16% of all hospital mortalities, totaling 28.3 million fatalities. The rate is 11.5% in low-income countries and 5.1% higher in low and middle-income countries (LMICS) in Sub-Saharan Africa, notably in the center, east, and west. Medical emergencies accounted for 50.7% of all fatalities and 41.5% of the overall burden of illness in low-income country (LIC). Emergency mortality was 52%, and mortality from emergency diseases was 12% higher than mortality from non-emergency diseases. The burden is unacceptably high due to measurable limitations in health-care resources, leadership, and awareness of responsible bodies. Much of the disease burden is avoidable with low-cost interventions (Obermeyer, Abujaber et al. 2015, Razzak, Usmani et al. 2019). In Ethiopia, about 59.8% of deaths occurred within three days, and 45% of deaths occurred in the emergency department within two days of presentation due to a lack of human resources and a sparse and insufficient acute care infrastructure, despite efforts of the Ministry of Health and its allies to improve it (Yosha, Tadele et al. 2021, Dode, Alemayehu et al. 2022).

Working-age (25–64) mortality increased in the adult emergency department. Therefore, middle-class and low-income people faced economic problems such as accessing well-paying jobs and income, rising housing and health-care costs, and difficulties ensuring that their children received a good education. It was discovered that a single person's death reduces gross domestic product (GDP) by US$0.01828. This prolonged economic difficulty had physiological consequences, such as stress, anxiety due to a fear of mortality, depression, and unhealthy coping behaviors. It became more common in low-income countries like Ethiopia, where the mean age of early ED mortality was 43.5 years (Becker, Majmundar et al. 2021, Yosha, Tadele et al. 2021).

The high early mortality rate in ED had a social impact, such as a significant decrease in life expectancy. By the end of June 2021, the life expectancy of the global population had decreased by one year annually. It decreased by six years in American countries. However, many African countries, including Ethiopia, lack sufficient data (Heuveline 2022).

On the other hand, evidence from low-income countries, particularly Ethiopia, suggests that the epidemiology of mortality and morbidity is shifting toward noncommunicable diseases and injuries (Fenta, Sisay et al. 2021).

This change has an immediate impact on the number of ED admissions and, by extension, the risk of early mortality in the emergency department. In addition, rapid urbanization and motorization, a building boom, an increase in the communicable disease burden on the emergency department, and recent public unrest had an impact on early mortality in the emergency department. All of these factors have contributed to early mortality in the emergency department, making mortality a significant issue and necessitating well-coordinated and resilient emergency care services (Obermeyer, Abujaber et al. 2015, Chang, Hsieh et al. 2018).

Currently , a significant proportion of the burden of death and patient mortality has been aggravated in the ED (Opiro, Wallis et al. 2017, Stefanovski, Vladimir Radkov et al. 2017).

Clinical measures such as standardized emergency and trauma center protocols have already been found to reduce early mortality in middle-income countries. However, it has not been thoroughly studied in low-income countries' emergency departments (Kesinger, Nagy et al. 2014).

The first action for a critically ill patient is difficult, yet it is vital to reduce early mortality. To save life, trained emergency responders must make patient-centered, timely, and competent judgments to deliver treatment that is supported by diagnostics, suitable equipment, and facilities. It should be supported in order to provide effective acute care (Hansen, Boyle et al. 2020).

Previously, only single-center studies at tertiary hospitals were conducted in Ethiopia. Furthermore, studies on early mortality in the emergency department have not been conducted in Hawassa City. Despite the fact that a few studies have been conducted in Ethiopia, there is a gap in the evidence showing the burden of early mortality in the adult emergency department and associated factors. This multi-center study on early mortality in the adult emergency department is crucial for determining the magnitude of early mortality, identifying associated factors of early mortality, and assisting all levels of hospitals in improving the quality of emergency and trauma care to initiate timely and basic emergency and critical care.

1.3 Significance of study

The study findings may be used as baseline data to reduce the risk of early mortality among critically ill patients as well as those waiting for treatment.

Death rates in any hospital's emergency department are indicators of clinical care and leadership quality, so this study may provide crucial information for providers for planning and evaluation. It will be used as evidence for quality improvement on potentially reversible conditions (Pakniyat, Nikouei et al. 2020).

Further, this study may benefit health institutions by providing insight into the larger society's current health challenges, evaluating the health care system, and helping with resource allocation for health services.

Additionally, it will help to determine the prevalence of early mortality in the emergency department. It will also be used to identify associated factors of early mortality in the emergency department at various hospital levels. It also provides data that will contribute to the advancement of emergency medical services. Finally, it will be used as scientific evidence in nursing research and by the scientific community as a whole.

CHAPTER TWO; OBJECTIVE

3.1 General objective

To assess the magnitude and associated factors of early mortality among deaths in the adult emergency department at selected public hospitals in Hawassa, Sidama, Ethiopia, from January 2021 to December 2022.

3.2 Specific objectives:

- To determine the magnitude of early mortality among deaths in the adult emergency department at selected public hospitals in Hawassa, Sidama, Ethiopia, from January 2021 to December 2022.
- To identify associated factors of early mortality among death in the adult emergency departments at selected public hospitals in Hawassa, Sidama, Ethiopia, January 2021 to December 2022.

CHAPTER THREE; LITERATURE REVIEW

2.1 Magnitude of early mortality at the emergency department

Globally, in 2019, there were 55.4 million deaths. At the most collective threshold, communicable, maternal, neonatal, and nutritional causes accounted for 30.7% of global deaths. And the data shows that mortality from non-communicable diseases and injuries continues to rise (from 2010 to 2019, it was 30.8% for non-communicable diseases and 8.6% for injuries). About 40.8 million annual deaths due to non-communicable diseases occur in the emergency department (WHO 2019).

A cohort study of emergency departments in the United States from 2010 to 2020 revealed that 30.18916 million people died, accounting for 11.3% of all deaths. The proportion of total deaths that occurred in the ED decreased by 0.27% per year, while the percentage of ED encounters that resulted in death decreased by 0.11% per year (Elmer, Mikati et al. 2022).

According to a cross-sectional study conducted at a Swiss university, 277 patients died out of a total of 105,501 who visited the ED between January 2013 and December 2016, with a mortality rate of 2.6% per 1000(Heymann, Wicky et al. 2019).

A cross-sectional study at Lumbini Medical College Teaching Hospital from January 2014 to June 2017 revealed 110 deaths with mortality rates of 36.4%, 33.6%, 28.2%, and 1.8%. The majority of patients died within 6–12 hours of ED admission (n = 52; 47.3%) (Shakya, Adhikari et al. 2017).

According to a retrospective cohort study conducted from 2018 to 2019 at a tertiary hospital emergency department in a low-income country, a total of 6,858 patients, including 2,228 trauma patients, were admitted to the emergency department. There were 256 deaths among trauma admissions within 72 hours, for a mortality rate of 11.5% (Amaefule, Dahiru et al. 2020).

A retrospective chart review of death certificates conducted in Nairobi from January to June of 2014 shows injury-related deaths accounted for 1,208 of the total 11,443 records, or 10.6% of all recorded deaths(15%) (Botchey Jr, Hung et al. 2017).

According to a cross-sectional study conducted at Tikur Anbesa specialized tertiary hospital, a total of 30,086 adult patients visited the ED. During a two-year study, 846

(2.8%) deaths were recorded in the ED. Based on times from ED arrival to patient death, 506 (59.8%) died within 72 hours, and 274 (54%) died within 24 hours (Yosha, Tadele et al. 2021).

From January 2020 to June 2022, a retrospective chart review was conducted in the adult emergency department of Saint Paul Hospital, Millennium Medical College. In the ED, 693 (3.02%) deaths were recorded, and 388 patient charts were reviewed. deaths within 24 hours were 173 (45%), for a 0.75% ED death rate within 24 hours) (Dode, Alemayehu et al. 2022)**.**

2.2. Factors associated with early mortality at adult emergency department

A case-control study done in Tehran, Iran, from 2009 to 2010 shows that 2907 patients were evaluated. Multivariate regression analysis revealed that presenting with cardiovascular complaints (AOR = 7.3; 95% CI: 3.5–16.1; p 0.001), a history of hypertension (AOR = 5.4; 95% CI: 1.2-12.3; p 0.001), severe trauma (AOR = 4.6; 95% CI: 2.0–13.2; p 0.001), and age over 60 (AOR = 3.8; 95% CI: 1.8–7.8; p 0.01), shows patients over 60 were diagnosed with sepsis. And a final diagnosis of renal disease (AOR = 3.4; 95% CI: 2.1–6.4; p 0.001) were factors that increased the risk of mortality in patients referring to the ED (Alimohammadi, Bidarizerehpoosh et al. 2014).

A cross-sectional study on the association between prehospital care time and hospital mortality in the victims of traffic accidents indicated that the lack of a prehospital emergency medical system significantly increased mortality in the first two days after admission to the emergency room (AOR =2.31; 95% CI [1.95-2.73])]) (LA MORTALIDAD 2020).

A comparative observational study performed in Egypt at Alexandria University Hospital within the first three months evaluated 9766 patients, and in the subsequent six months, 22936 patients were evaluated. From multivariate logistic analysis, medical emergencies (AOR = 1.92; 95% CI: 0.71, 3.68; P = 0.021), time of initial intervention > 60 min (AOR = 2.27; 95% CI: 0.96, 4.62; P = 0.007), and longer ED length of stay (AOR = 2.31; 95% CI: 1.41, 4.67; P = 0.008) were significant predictors of early ED mortality (Sabry, Abdel Salam et al. 2023).

As per a cross-sectional study done at Tikur Anbesa specialized tertiary hospital from 2012 to 2013, 220 patients' charts were reviewed. Significant associated factors of death within 6 hours were symptom duration four-forth eight hours (4–48 hrs. vs. <4hrs: AOR = 0.20, 95% CI 0.07, 0.53, p < 0.01) and symptom duration >48 hrs. vs. <4 h: AOR = 0.27, 95% CI 0.09, 0.81, p = 0.02) (Hunchak, Teklu et al. 2015).

A retrospective chart review conducted at Tikur Anbesa Tertiary Hospital revealed residence in Addis Ababa (p-value 0.01 AOR = 2.78, 95% CI: 1.36–5.68), Oromia (p-value 0.001 AOR = 3.23, 95% CI: 1.58–6.54), and co-morbid HIV/AIDS (p-value 0.05 AOR = 2.72, 95% CI: 1.01–7.30) were positively associated with very early ED mortality. Whereas, triage category red according to TEWS (p-value 0.001 AOR = 0.24, 95% CI: 0.10–0.55) and duration of symptoms 4–24 h (p-value 0.02 AOR = 0.47, 95% CI: 0.26–0.87) were negatively associated with very early ED mortality (Yosha, Tadele et al. 2021).

Retrospective chart reviews in the adult emergency department of Saint Paul Hospital Millennium Medical College show that the orange triage category (p-value 0.022 AOD = 0.101, 95% CI 0.014-0.718), duration of C/C 3h (p-value 0.003 AOR = 0.101, 95% CI: 0.03-1.368), duration of chief compliant 3-6h (p-value 0.002 AOR = 0.121, 95% CI: 0.031-0.477), respiratory illness (p-value 0.046 AOR = 0.124, 95% CI: 0.016-0.959), liver diseases (p-value 0.027 AOR = 0.085, 95% CI: 0.01-0.758), DM and its complications (p-value 0.029 AOR = 0.067, 95% CI: 0.066-0.754), and severe anemia (p-value 0.026 AOR = 0.059, 95% CI: 0.005-0.715) were negatively associated with early ED mortality (Dode, Alemayehu et al. 2022).

A case-control study conducted at Jimma University Medical Center shows that 261 patient charts were evaluated. Multivariate logistic regression analysis revealed that: red triage category [(AOR=2.3; 95% CI: 1.10, 5.55) P=0.001)], aged patients (≥65 years of age) [(AOR=3.2; 95% CI: 1.74, 7.23) P=0.003)], cardiovascular disease (AOR=4.79; 95% CI: 1.73, 13.27), rural residence [(AOR=6.57; 95% CI: 1.39, 31.13), and respiratory failure [(AOR=3.2; 95% CI: 1.04, 7.69) P=0.013] were associated with early mortality (Abebe, Habtamu et al. 2023).

2.3 Conceptual frame work

The conceptual framework was adapted after reviewing different pieces of literature on early mortality in emergency departments (Yosha, Tadele et al. 2021, Dode, Alemayehu et al. 2022, Abebe, Habtamu et al. 2023) that reflect the relationship between early mortality and independent variables.

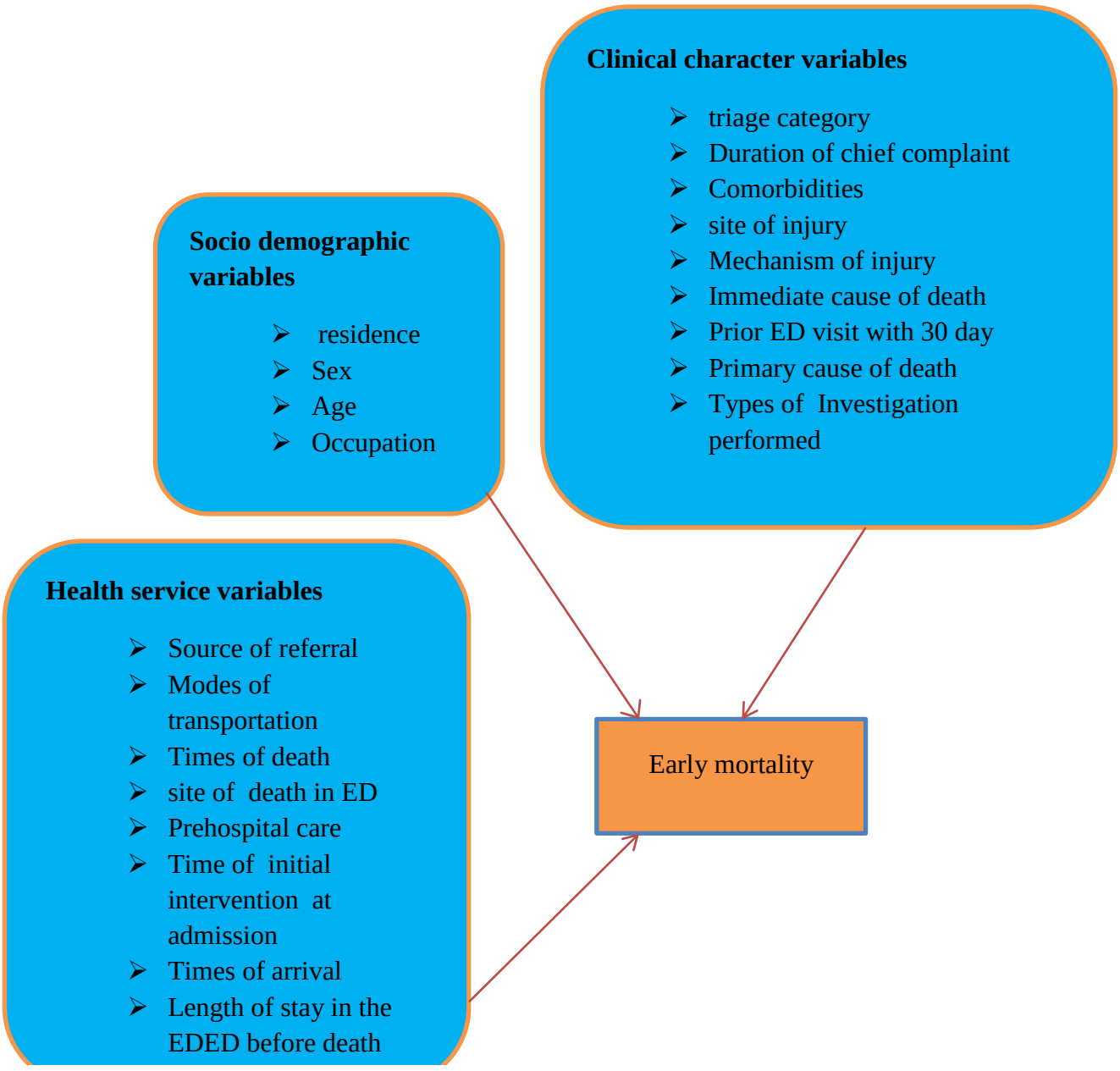

Figure 1.Concetual framework for magnitude and associated factors of early mortality among deaths in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023

CHAPTER FOUR; MATERALS AND METHOD

4.1 Study design

An institutional-based cross-sectional study design was used.

4.2 Study period

The study was conducted from May 5, to June 6, 2023.

4.3 Study Area

Study was conducted in Hawassa city public hospitals at Hawassa University's comprehensive specialty hospital, Adare General Hospital and Tula Primary hospital. Hawassa is a city in Ethiopia's Sidama region, about 275 kilometers from Addis Ababa. It is situated north of the Arsi zone (Shashemene), east of the wondognet woreda, south of the melga woreda, and south of the shebedino woreda. There are twelve hospitals in the city, eight of which are private and four of which are public. This study was conducted at three public hospitals selected by the lottery method: Hawassa University Comprehensive Specialty Hospital, Adare General Hospital, and Tula Primary Hospital. Hawassa University's comprehensive specialty hospital served as a tertiary referral hospital for the federal ministries of health as well as a teaching hospital for Hawassa University's College of Medicine and Health Sciences. The hospital serves 20 million people in its catchment region. It has 400 beds and receives around 5,000 outpatient and emergency visits every month. The HUCSH emergency department is organized by one emergency laboratory, one pharmacy, a trauma zone, a red zone, a triage and resuscitation area, an orange zone, a yellow zone, a green area, and a keeping area comprise the HUCSH emergency department. It employs 62 staff. The second selected Hawassa City public hospital was Adare General Hospital, which has a total capacity of 110 beds and receives more than 10,000 outpatient and emergency visits per month. It receives referral patients from Hawassa town and nearby zones. The hospital provides services such as outpatient, emergency, and inpatient. In addition to providing basic health services, the hospital is also serving as a training center for medical and health students who come from governmental and private teaching centers. The AGH emergency department is organized by one emergency laboratory, one pharmacy, a red zone, a triage area, a resuscitation area, an orange zone, a yellow zone, a green area, and a keeping area. It is occupied by 34 staff. The third selected hospital was Tula Primary hospital, which has the capacity to serve more than 750,000 populations, has 91 total beds, and receives 7,000 outpatient and

emergency visits per month. The TPH emergency department is organized into a red zone, a triage and resuscitation area, a yellow zone, and a green area. It is occupied by 23 staff.

4.4 Population

4.4.1 Source population

All charts of patients who were admitted and died in the adult emergency department of selected public hospitals in Hawassa city from January 2021 to December 2022.

4 .4 .2 Study population

Selected charts of patients who died in the adult emergency department of selected public hospitals in Hawassa City from January 2021 to December 2022.

4.4.3 Study subjects

Sampled and reviewed charts of patients who died in the adult emergency department of selected public hospitals in Hawassa City from January 2021 to December 2022.

4.5 Eligibility criteria

4.5.1 Inclusion criteria

Registered charts of patients who died in the adult emergency department were included in the study.

4.5.2 Exclusion criteria

Deaths on arrival were excluded

Incomplete and missed patients' charts were excluded and replaced by next chart.

4.6 Sample size determination

Sample size was calculated by using a single population proportional formula for the magnitude of early mortality with a p-value of 0.598 (Yosha, Tadele et al. 2021). The total sample size was

n = ((z 〖a/2) 〗^2 p (1-p))/d^2 = ((〖1.96) 〗^2 (0.598) (0.41))/ 〖0.05〗^2) =

(3.8416 x .24) / .0025

.9235 / .0025

369

Table 1. Sample size calculation by objective for associated factors of early mortality among deaths in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023 (Abebe, Habtamu et al. 2023).

Variable	CI	Power	Unexposed: exposed ratio	%unexposed with outcome	AOR	Sample size
Cardiovascular disease	95%	80%	1	37.9	4.79	**66**
Residency	95%	80%	5	83	6.57	**334**

By using proportional allocation

$n_a = N \times n_{a/N_t}$ =369 × 245 / 786) = 115 patients' charts were reviewed at Adare General Hospital.

$n_t = N \times n_t/N_t$= 369 x 59/786 = 28 patients' charts were reviewed at Tula Primary Hospital.

$n_{r=N \times n_{r/N_t}}$ = 369 × (482/786) = 226 patients' charts were reviewed at Hawassa University's comprehensive specialized hospital.

$N_{T=n_{a+n_{r+nt}}}$ = **28+115+226 = 369**

When **N** = 786, the total number of patients who died at Hawassa University Comprehensive Specialized Hospital, Adare General Hospital, and Tula Primary Hospital in the emergency department for the past two years.

$\boldsymbol{n_r}$ = (482) total number of patients who died in the adult emergency department at Hawassa University Comprehensive Specialized Hospital for the past two years

n_a = (245) total number of patients who died in the adult emergency department at Adare General Hospital for the past two years.

n_t = (59) total number of patients who died in the adult emergency at Tula primary Hospital

N_T= (369) total sample size

4.7 Sampling Technique

By using lottery method three public hospitals were selected from four public hospitals in Hawassa, and a systematic random sampling technique was performed for each hospital with K values of 482/226 = 2 for HUCSH, 245/115= 2 for AGH and 59/28=2 for TPH to select patients who died at ED and fulfill the inclusion criteria.

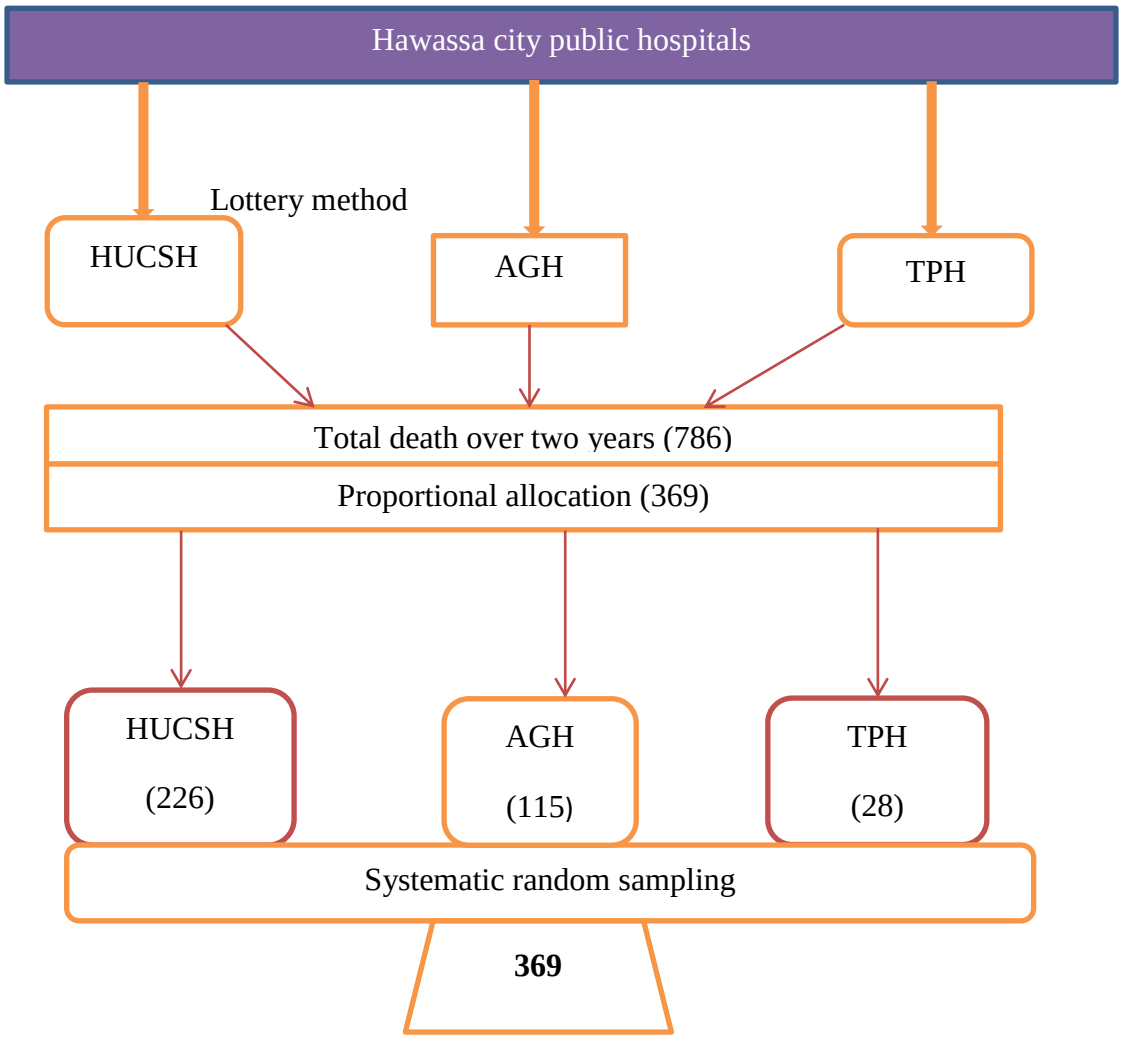

Figure2. Schematic representation of selected public hospitals in Hawassa for magnitude and associated factors of early mortality among deaths in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023

4.8 Study variables

4.8.1 Dependent variable

- ✓ Early mortality

4.8.2. Independent variable

Socio-demographic variables

- ✓ Age
- ✓ sex
- ✓ Occupation
- ✓ Address

Health services variables

- ✓ prehospital care
- ✓ time of initial intervention at admission
- ✓ Mode of transport to the ED
- ✓ Source of referral
- ✓ Times of death
- ✓ site of death in the ED
- ✓ times of arrival
- ✓ Length of stay in the ED before death

Clinical characters variables

- ✓ Duration of chief compliant
- ✓ Triage category
- ✓ mechanism of injury in traumatic patients
- ✓ site of injury in traumatic patients
- ✓ immediate cause of death
- ✓ comorbidities
- ✓ Types of investigation performed
- ✓ Prior ED visit with 30 days
- ✓ major cause of death

4.9 Operational definition

Early mortality: death occurred within 72 hours of the emergency department presentation (Hunchak, Teklu et al. 2015).

Late mortality: death occurred after 72 hours of the emergency department presentation (Abebe, Habtamu et al. 2023).

Incomplete chart: A patient's charts were not included if more than 20% and/or a single major variable of the data requested on the data abstraction tool were missing (Yosha, Tadele et al. 2021).

Standard initial intervention: first treatment, which was within the standard time of each triage category (Galvagno, Nahmias et al. 2019).

4.10 Data collection and analysis

4.10.1 Data collection instrument

Data was collected from the emergency department triage record, clinical care notes, and hospital death certificate by using a pretested data extraction tool entered into the Kobo Toolbox software. It includes socio-demographic characteristics (sex, age, occupation, and residence), clinical characteristics (like traumatic and medical causes of death, ED visits, triage category, duration of chief compliant, immediate cause of death, site of injury, and comorbidities), and health services variables such as mode of transportation, source of referral, prehospital care, time of initial intervention at admission, Length of stay in the ED before death, arrival time, site of death, and time of death.

4.10.2 Data collection process

The data extraction tool was organized by adapting questions from literature and considering the local situation (Yosha, Tadele et al. 2021). The tools were prepared in the English language based on the study objective. During the data collection period, data collectors first collect all medical card numbers from health management information systems registration books of patients who died in the adult emergency department from January 2021 to December 2022. Then 369 patients' charts were selected systematically from the frame. Three trained data collectors who have BSc nurses with emergency experience had collected data. One supervisor, who has data collection experience, was involved.

4.10.3 Data quality control measures

Supervisor received orientation prior to data collection, while data collectors received training on the data gathering methodology. One week before the start of data collection, a pretest on 5% of the sample size was carried out at the Hawassa University comprehensive specialized hospital. After the pretest, the data abstraction tool was adjusted as appropriate. The actual data gathering was conducted using a Kobo toolbox the following day. The supervisor double-checked the obtained data for consistency, completeness, and redundancy. The lead investigator was tasked with gathering data from subordinates and monitoring its accuracy through daily reviews. Finally, the data had been entered and meticulously cleaned before analysis by the lead investigator.

4.10.4 Data analysis

After being checked for completeness, the data was entered into EpiData version 4.6.0 and exported to SPSS version 27 for analysis. The data was described in terms of frequencies and percentages. Binary logistic regression was used to determine association of each independent variable with the outcome variable (early mortality). Using bivariate analysis variables with a p-value of < 0.25 were candidates for a multivariate analysis. Following a model fitness test with the Hosmer-Lemeshow test, multivariable analysis is performed for confounder adjustment. Then, with a 95% confidence interval, an adjusted odds ratio is used to determine association and strength, and statistical significance is declared at a p-value of <0.05. Finally, the data were presented in the form of a sentence, table, and figure.

4.11 Ethical considerations

An ethical clearance was obtained from Hawassa University College of Medicine and Health Sciences and the Research Ethical Review Committee. Then permission letters were obtained from the medical directors of HUCSH, AGH, and TPH. The advantages and purposes of the study were explained to the staff members of the record office and health management information system team. Then, for the retrieval of individual records and the confidentiality of information, a permission letter is given to the record office manager of the hospital and the health management information system manager. After the completion of data collection, patients' charts were properly returned to their original place.

4.12 Result dissemination

The findings of the study will be presented to the school of nursing at Hawassa University. Besides, it will be disseminated through a document to the Sidama regional health bureau, Hawassa University Comprehensive Specialized Hospital, Adare General Hospital, and Tula Primary Hospital, and through presentations at different professional association meetings. The paper will be submitted to national or international peer-reviewed scientific journals for possible publication.

CHAPTER FIVE; RESULTS

A total of 37145 admissions and 786 (2.1%) registered deaths in the adult emergency department during the course of twenty-four (24) months at selected public hospitals in Hawassa city resulted in the enrollment of 369 participants, with a 100% completion rate.

5.1 Socio-demographic characteristics

This study result shows that 185(50.2%) of the participants were between the ages of 25 and 54. Within the first 72 hours of admission to the ED, 146 (39.6%) of those patients had passed away. The range of ages was 15 to 82. The age of the participants was 40.68 ±17.53 on average. The majority of the participants 253 (68.6%) were from rural areas, and 193 (52.3%) of them died within the first 72 hours of being admitted to the ED (see Table 2 below).

Table 2. Socio-demographic characteristics of study participants in the adult emergency at selected public hospitals in Hawassa, Sidama, Ethiopia (n = 369), 2023.

Variable	Categories	Frequency	Percentage
Sex	Male	250	67.7
	Female	119	32.3
Age	15-24	77	20.9
	25-54	185	50.2
	55-64	48	12.9
	≥65	59	16
Residences	Rural	253	68.6
	Urban	116	31.5
Occupation	Employed	74	20.1
	Student	41	11.1
	Merchant	53	14.4
	Farmer	129	34.9
	Housewife	72	19.5

5.2 Health Facility-related descriptive analysis

More than half (55.8%) of the study participants utilized any car for transportation, followed by ambulances (33.6%). Most of the study participants (66.1%) received delayed intervention at admission, and 54.2% died within three days. Almost two-thirds of study participants (83.5%) arrived day times (see table 3 below).

Table 3. Facility-related description by time of death in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

Variable	categories	Time of death in the ED			
		Early death<72hrs		Late death >72hrs	
		Frequency	Percent	Frequency	Percent
Source of referral	Governmental hospital	122	33	50	13.6
	Private hospital	23	6.2	5	1.4
	Health center	24	6.5	8	2.1
	Private clinic	23	6.2	4	1.1
	Self-referral	87	23.6	13	3.6
	Police	9	2.4	1	0.27
Modes of arrival	Ambulance	91	24.7	33	8.9
	Any car	167	45.3	39	10.5
	Carried	25	6.8	3	0.8
	Walking	3	0.8	6	1.6
Times of intervention at admission	With-standard	88	23.8	37	10
	Delayed	200	54.2	44	11.9
Times of arrival	Weakened	19	5.1	7	1.9
	Night	26	7	9	2.4
	Day	243	65.9	65	17.7
site of death	Triage area	44	11.9	2	0.6
	Red zone	139	37.7	41	11.1
	orange zone	48	13	6	1.6
	Yellow zone	47	12.7	18	4.9
	Green or keeping area	10	2.7	14	3.8
Time of death	Day times	192	52	45	12.2
	Night times	96	26	36	9.8

Motor cycle was other modes of arrival.

Out of the 50.4% of patients who had not received prehospital care, 43.9% died within 72 hours (see figure 3 below).

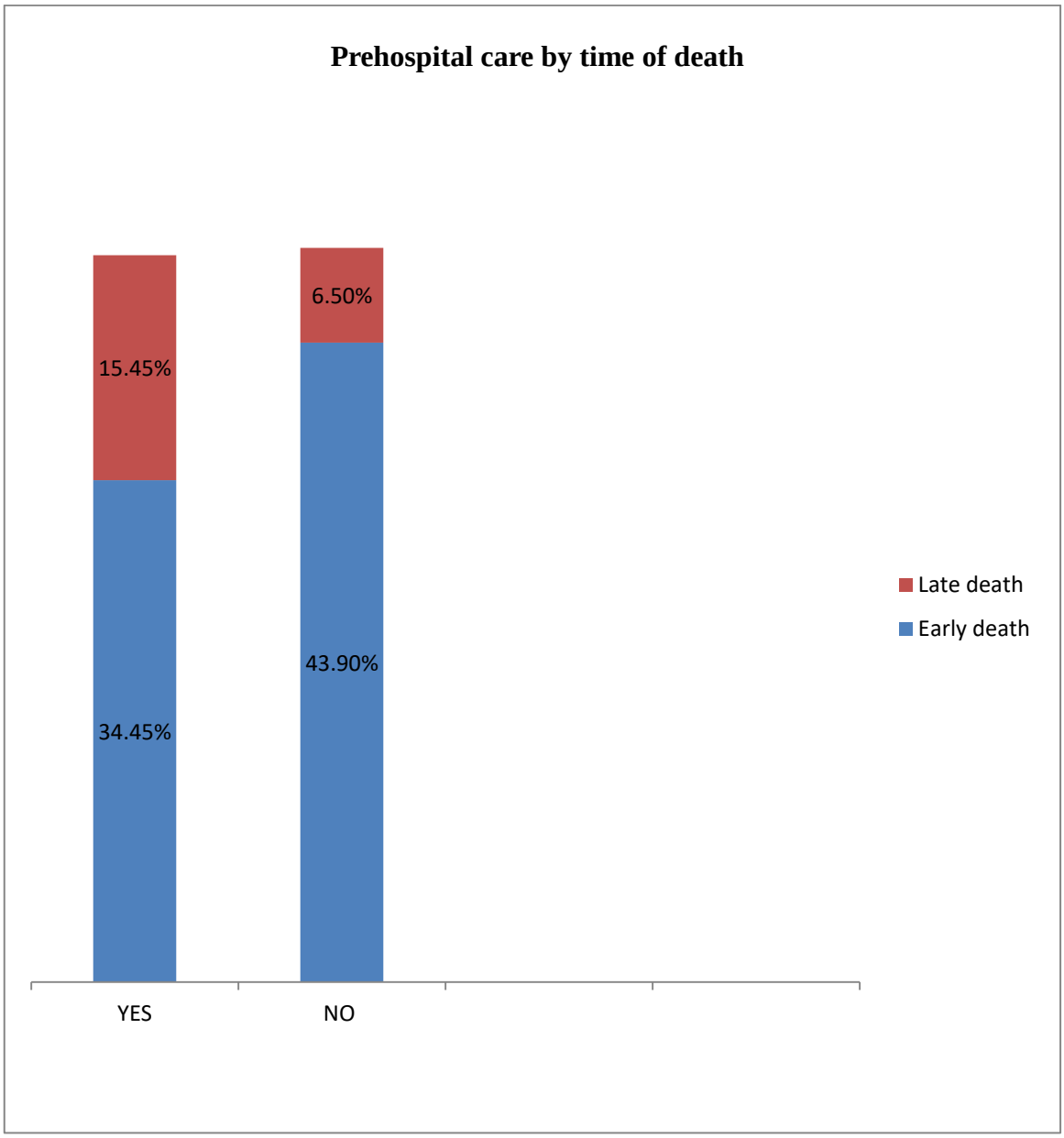

Figure 3. Prehospital care of mortality in the adult emergency department at selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

5.3 Clinical characters

Early death accounted for 42.3% of the 49.59% of patients who were triaged as red (see Figure 4 below).

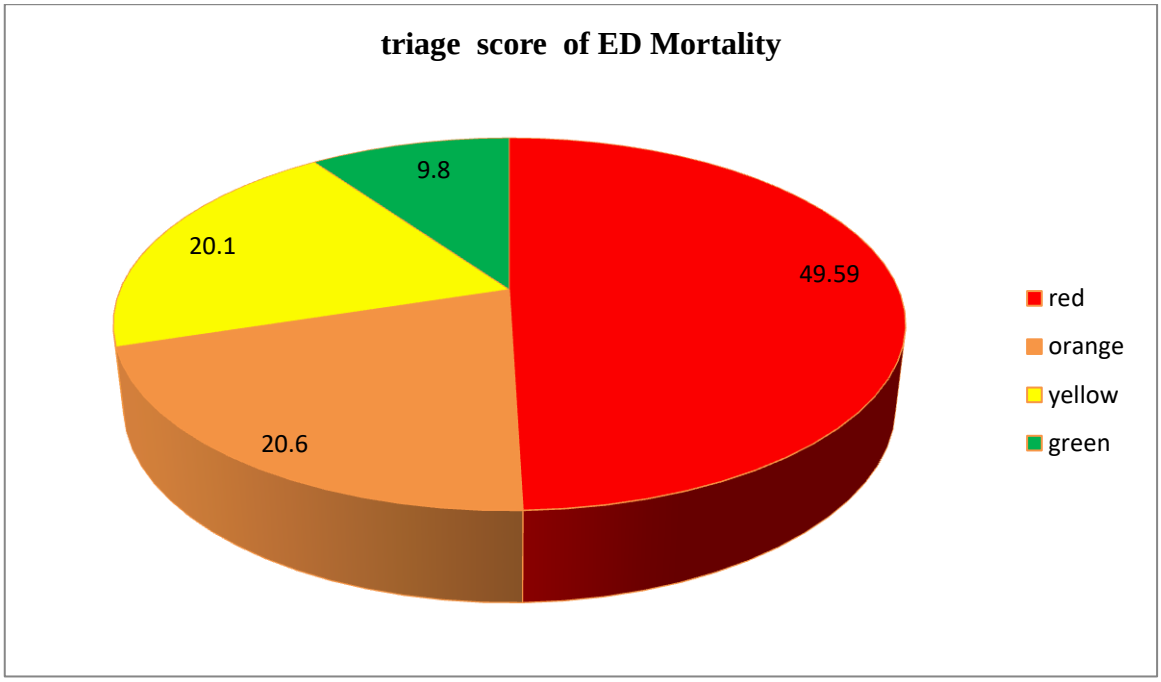

Figure 4.Triage category of mortality in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

The findings of the study showed that 273 (74%) of the study participants died from non-traumatic causes. There were intentional and unintentional accidents during the study period. 31% had a single comorbidity. Patients without comorbid illnesses had a considerably higher proportion of early mortality. The majority of patients 257 (69.6%) had no prior ED visits within the previous 30 days. About 94 (25.5%) of the study individuals were not investigated, of which 86 (23.3%) experienced early mortality (see table 4 below).

Table 4.Clinical character by times of death in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

Variable	Categories	Early<72hours		Late>72hours	
		Frequency	percent	Frequency	Percent
Prior ED visit with 30 day	No	209	56.6	48	13
	Once	31	8.4	16	4.4
	≥two	48	13	17	4.6
Duration of C/C	<4hours	41	11.1	5	1.4
	4-24hours	107	29	21	5.7
	25-48hours	20	5.4	9	2.4
	48h-1week	48	13	19	5.1
	>1week	72	19.5	27	7.4
Immediate cause of death	Respiratory failure	77	21	13	3.5
	Cardiac failure	26	7	14	3.8
	Cardiorespiratory failure	90	24.4	23	6.2
	MOF	92	24.9	30	8.1
	Others	3	0.8	1	0.3
Types of investigation	None	86	23.3	8	2.2
	Lab	116	31.4	40	10.8
	Image	34	9.2	14	3.9
	Both	52	14.1	19	5.1
Hypertension	Yes	54	14.6	10	2.7
	No	134	63.3	71	19.2
DM	Yes	29	7.9	7	1.9
	No	259	70.2	74	20.1
Known cardiac patient	Yes	24	6.2	2	0.5
	No	264	71.5	79	21.4
Known cancer patient	Yes	16	4.3	3	0.8
	No	272	73.7	78	21.1
HIV/ADIS	Yes	11	3	2	0.5
	No	277	75.1	79	21.4
Asthma/COPD	Yes	13	3.3	1	0.3
	No	275	74.5	80	21.7
CKD	Yes	18	4.9	4	1.1
	No	270	73.2	77	20.9
Number of comorbidity	None	170	46.1	60	16.1
	One	99	26.9	15	4.1
	≥ Two	19	5.1	6	1.7

Other immediate causes of death included brain death, brain hernia, and end-stage renal illness. CKD; chronic kidney disease, MOF; multiple organ failure,

The results of this study showed that the common non-trauma diagnoses of early ED mortalities were cardiovascular disorders (16.8%), respiratory diseases (12.7%), and sepsis/septic shock (7.3%). On the other hand, RTA was identified as a common traumatic cause of early death; it affected 13.6% of all early-dead participants (see Table 5 below).

Table 5. Traumatic and non-traumatic causes of death in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

Variable	Categories	Early <72hours		Late >72hours	
		Frequency	Percent	Frequency	Percent
Non traumatic Primary diagnosis	CVD	62	16.8	22	6
	Renal disease	10	2.7	5	1.4
	Liver disease	16	4.3	5	1.4
	Sepsis/septic shock	27	7.3	2	0.5
	Endocrine disease	18	4.9	4	1.1
	Severe anemia	6	1.6	3	0.8
	Hematologic disease	8	2.2	2	0.5
	GI loss	12	3.3	5	1.4
	Respiratory disease	47	12.7	10	2.7
	Neurologic disease	7	1.8	16	7
	Malignancy	6	1.6	3	0.8
	RTA	50	13.6	5	1.4
Mechanisms of injury	Assaults	8	2.2	2	0.5
	Gunshot	4	1.1	1	0.3
	Fall	13	3.5	1	0.3
	Poison	6	1.6	4	1.1
Sites of injury	Head injury	53	14.4	8	2.2
	Chest injury	10	2.7	1	0.3
	Spinal injury	5	1.4	1	0.3
	Poly trauma	12	3.3	3	0.8

Fighting and suicide were other mechanisms of injury. On the other hand, acute febrile disease, small bowel obstruction, and tetanus were other non- traumatic causes of death.

5.4. Magnitude and associated factors of early mortality at adult emergency department.

5.4.1 Magnitude of early mortality

From the total 369 study participants, early mortality accounts for 288 (78%), 95% CI (73.8, 81.8) which was 46.07% at Hawassa University Comprehensive specialized hospital (see figure 5 below).

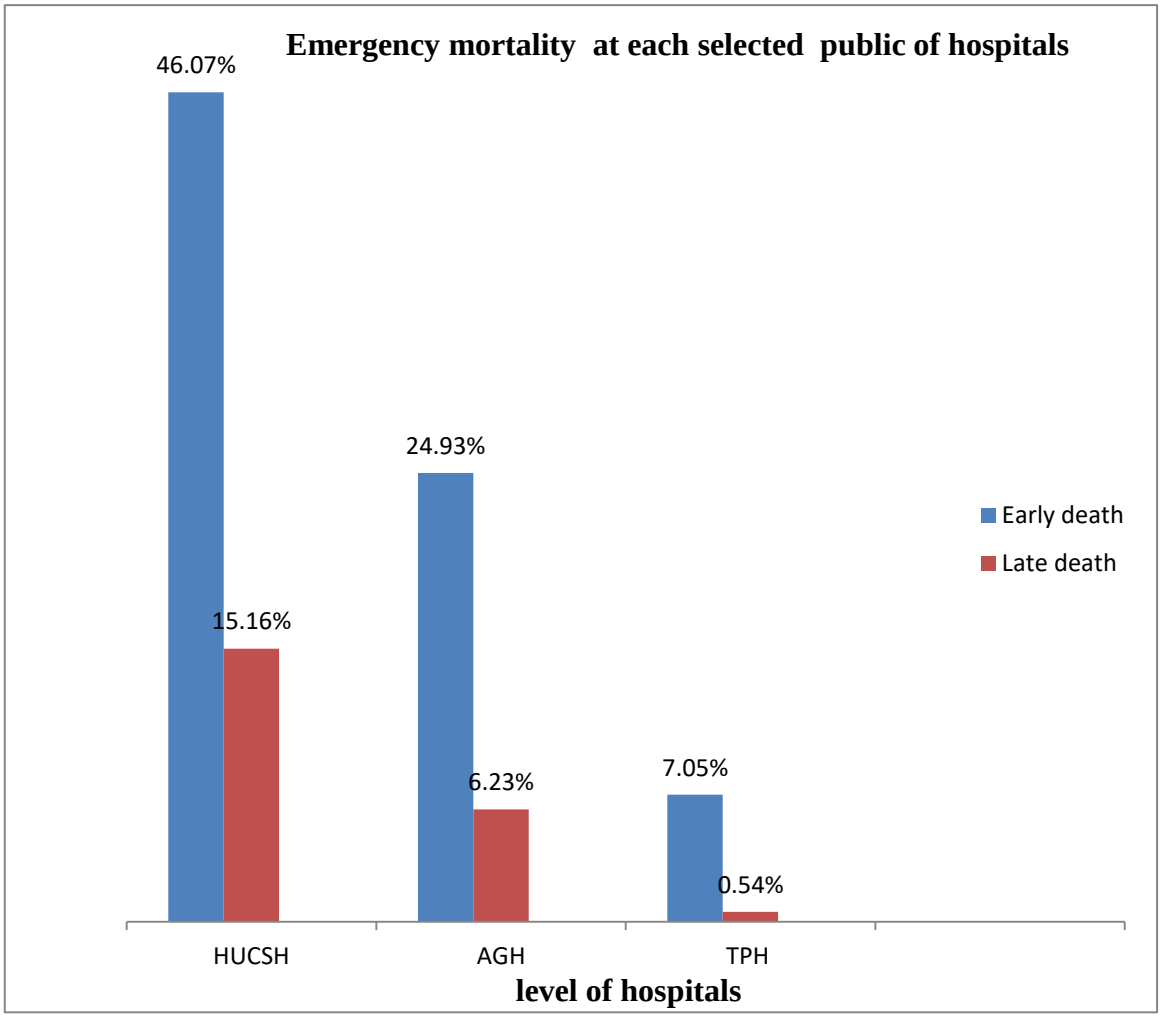

Figure 5. Magnitude of early mortality in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

5.4.2 Associated factors of early mortality

Following the data description, the binary logistic regression model was used to perform bivariate and multivariable analysis. The 17 variables were chosen as candidate variables in the bivariate analysis since each had a p-value < 0.25.

In the multivariate analysis: The odd of early mortality among patient who had not received prehospital care were 4.2 times higher compared to those who had received prehospital care (p-value <0.001, AOR = 4.2, 95% CI: 2.2–7.9). The odd of early mortality among patients engage road traffic accidents were 4.1 fold higher than those who did not engaged road traffic accidents (AOR = 4.1; 95% CI: 1.4-12.1), P = 0.013). The odd of early mortality among Patients having higher early warning scores or categorized in the red zone under the triage category were 3.9 times higher compare to green triage category [(AOR=3.9; 95% CI 1.6- 9.4), P=0.003)].

The odd of early mortality among un an investigation patients were 3.4 times higher compare to those who had [(AOR = 3.4; 95% CI: 1.2-9.4), P = 0.022]. the odd of early mortality among Patients with one comorbid illness rather than a primary disease were 3.2 times higher compare to patients with no comorbidity [(AOR = 3.2; 95% CI: 1.6-6.5), P = 0.001]. the odd of early mortality among patient who had delayed initial intervention were 2.3 times higher compare to those who received immediate intervention [AOR = 2.3; 95% CI: 1.3- 4.3; p = 0.007].

Table 6. Multivariate analysis of associated factors of early mortality among deaths in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, 2023.

Variables	categories	Mortality		COR (95%CI)	AOR (95%CI)	p-value
		Early	Late			
prehospital care	Yes	126	57	1	1	1
	No	162	24	3.1(1.79, 5.19)	4.2(2.2, 7.9)	<001
Road traffic accident	Yes	50	5	3.2(1.23, 8.3)	4.1(1.4, 12.1)	.013
	No	238	76	1	1	1
Triage category	Red	156	27	6.5(2.66, 13.67)	3.9(1.6, 9.4)	.003
	Orange	61	15	4.5(1.9, 10.8)	2.2(.8, 6.1)	.112
	Yellow	54	20	3.0(1.3, 6.9)	2.1(.8, 6)	.128
	Green	17	19	1	1	1
Any investigation performed	None	86	8	3.9(1.6, 9.6)	3.4(1.2, 9.4)	.022
	Laboratory	116	40	1.1(0.56, 2)	.9(.4, 1.9)	.705
	Imaging	34	14	0.9(0.39, 2)	.6(.2, 1.6)	.274
	Both lab and imaging	52	19	1	1	1
Number of comorbidity	None	170	60	1	1	1
	One	99	15	2.3(1.23, 4.25)	3.2(1.6, 6.5)	.001
	≥ Two	19	6	.9(.37, 2.35)	1.9(.6, 6.0)	.289
Times of initial intervention at admission	With standard time	88	37	1	1	1
	delayed	200	44	1.9(1.15, 3.16)	2. 3(1.3, 4.3)	.007

CHAPTER SIX; DISCUSSION

The results indicate that the magnitude of early mortality in adult emergency departments was 78 % (95% CI: 73.8, 81.8) in two years. This study was higher than a study conducted at Tikur Anbesa specialized tertiary hospital (59.8%) (Yosha, Tadele et al. 2021), and Saint Pauls Hospital and Millennium Medical College (45%) (Dode, Alemayehu et al. 2022). This variation might be attributed to the fact that the study results were multisector and addressed several levels of hospitals with different emergency department setups. It may be due to the difference in dichotomization of emergency department mortality (early mortality was death within 24 hours for study at Paul's).

Furthermore, this result indicated a higher early mortality rate than a study at Lumbini Medical College Teaching Hospitals from January 2014 to June 2017 that revealed 110 deaths with mortality rates of 47.3% (Shakya, Adhikari et al. 2017), and a study conducted in Nairobi from January to June 2014 showed injury-related deaths (10.6%) (Botchey Jr, Hung et al. 2017). This difference may be related to the study population difference for the Nairobi study, which only included trauma-related emergency department deaths, and to the fact that there is variation in emergency department settings.

Patients who did not receive prehospital care were 4.2 times more likely to pass away early than those who received prehospital care [(AOR = 4.2; 95% CI: 2.2, 7.9), P < 0.001]. This study finding was in line with the study conducted in Peru, which revealed that a lack of a pre-hospital emergency medical system significantly increased early mortality after admission to the emergency room (adjusted AOR 2.31; 95% CI [1.95-2.73]) (LA MORTALIDAD 2020).Therefore, timely provision of care by the prehospital care providers halts the cascade of events that quickly leads to death (Abdulahi 2021). The strong association in this study might be related to a lack of knowledge of pre-hospital service and/or it might be connected an inadequate pre-hospital care system.

Patients who were engaged in road traffic accidents were 4.1 times more likely to die within 72 hours than those who were not engaged in road traffic accidents [(AOR = 4.1; 95% CI: 1.4, 12.1), P = 0.013]. This finding was consistent with the study on "Cause of emergency department mortality: a case-control study revealed that severe trauma (AOR = 4.6; 95% CI: 2.0-13.2; p 0.001) (Alimohammadi, Bidarizerehpoosh et al. 2014). Possible reasons were that patients engaged in automobile accidents may have had many injuries and extensive bleeding, resulting in early death.

Patients with a red early warning score under the triage category were 3.9 times more likely to die early than those who were assigned to green triage categories [(AOR=3.9; 95% CI1.6, 9.4), P=0.003)]. This finding was in line with a study conducted at Jimma on the risk of early mortality and associated factors at the adult emergency department, which showed that patients categorized as red were at a 2.3 risk of dying early [(AOR=2.3; 95% CI: 1.10, 5.55) P=0.001 (Abebe, Habtamu et al. 2023)]. The probable explanation was that those patients identified as red were severely injured or impaired by chronic sickness, leading them to die prematurely if they did not receive quick treatment. But inconsistent to the unanticipated finding at the adult emergency department of the Tikur Anbessa specialized tertiary hospital revealed that triage category red was protective for early emergency department mortality (AOR 0.23; 95% CI: 0.1-0.55)(Yosha, Tadele et al. 2021).The discrepancy might be attributable to variations in the early intervention of patients with life-threatening conditions. As a result, several instances in the triage category red were readily reversible and treatable problems, and/or those groups of clients admitted to the adult emergency department at Tikur Anbessa specialized hospital had gotten immediate intervention as required.

Patients who did not have any investigation were 3.4 times more likely to die early than those who had diagnostic tests [(AOR = 3.4; 95% CI: 1.2, 9.4), P = 0.022]. A possible reason may be a delayed decision, which decreases the quality of care for patients who have not had any diagnostic tests (Ataman, Sariyer et al. 2023).

Patients with one comorbid illness rather than a primary disease were 3.2 times more likely to die within 72 hours than patients with no comorbidity [(AOR = 3.2; 95% CI: 1.6, 6.5), P = 0.001]. This result was nearly similar with the study at Tikur Anbessa specialized tertiary hospital, Ethiopia, which found co-morbid HIV/AIDS (p-value 0.05, AOR = 2.72, 95% CI: 1.01–7.30) (Yosha, Tadele et al. 2021). This was related to the weakening of immunity caused by chronic disease.

Patients who got delayed initial intervention at admission were 2.3 times more likely to die early than those who got immediate intervention based on their triage categories [(AOR = 2.3; 95% CI: 1.3, 4.3), P = 0.007]. It is in line with an Egypt study on the impact of implementing a five-level triage system on patients' outcomes and resource utilization in the emergency department, which stated that patients who received initial intervention after one hour were 2.27 times more likely to die early compared to those who received immediate intervention [AOR = 2.3; 95% CI: 1.96, 4.6; p = 0.007] (Sabry, Abdel Salam et al. 2023). Therefore, early detection and rapid life-saving intervention, according to the emergency severity index, were effective preventative strategies against early mortality (Hinson, Martinez et al. 2018).

Conclusion

This study identified that a significant proportion of patients died early in the adult emergency department of Hawassa public hospitals. The quality of care in the emergency department system of Hawassa city public hospitals should have been improved to lower the number of preventable early deaths in the adult emergency department. A red warning score, lack of prehospital care, delayed initial intervention, road traffic accidents, comorbidity, and lack of an investigation were all significantly associated with early mortality in the adult emergency department. Promotion of sufficient and qualified ED personnel, effective pre-hospital care, and well-organized ambulance service should have been done to reduce early mortality at Hawassa city public hospitals.

Strengths and Limitations of the study

Strength of the Study

The study was conducted in a multicenter setting, involving different levels of hospitals. As a result, the findings have been applied to all hospital levels**.**

Limitations

The findings of this study should be interpreted in light of the inherent limitations of the study. In the current study, due to the retrospective data collection process, variable such as detailed facility-related variable, income, and educational status were not included.
There was Limited number of literature.

Recommendations

For Hawassa University and Hawassa City Public Hospitals

The public hospitals in Hawassa should strengthen their record-keeping systems. It should be stored in a secure computerized format. Individuals with a lack of prehospital care, RTA, red triage categories, comorbidity, delayed initial intervention, and a lack of investigation should have been given extra attention. Furthermore, emergency patients should be prioritized and get interventions depending on the severity of their condition, as determined by the early warning score mentioned in the triage categories. Emergency patients should have to investigate timely.

Sidama regional health bureau and Hawassa city

The findings of this study imply that urgent and priority efforts should be implemented to reduce the preventable loss of life caused by delayed patient care. As a result, the Ministry of Health and Sidama regional health bureau should build and expand advanced pre-hospital treatment as quickly as feasible, as well as an effective ambulance system for transporting patients to neighboring health institutions. Awareness creation for ambulance utilization and prehospital care should have been done by using different communication media to increase community ambulance utilization.

Further research

A prospective multicenter study should have been conducted to strengthen the findings.

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ANNEX I

Informed consent

Title: magnitude and associated factors of early mortality among death in adult emergency, at selected public hospitals, Hawassa, Sidama, Ethiopia, 2023.

Principal investigator: Gelane Geleto Gobena

Name of the institution: school of nursing, college of health science, Hawassa University.

Payment: there was payment per charts for card officers but there will be no payment for the family members of studied charts.

Contact for additional information

If you need more clarification about this study, you can call or contact the researcher;

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Table 7. Data abstraction tool for magnitude and associated factors of early mortality among death in the adult emergency department of selected public hospitals in Hawassa, Sidama, Ethiopia, from January 1, 2021, to December 31, 2022

I socio demographic characteristics	
1.sex	1. Male 2.Female
2.adress	1. rural 2. Urban
3. age	1. A15-25 2.26-50 3. 51-64 4. >64
4 occupation	1.Employment 2.Farmer 3.Student 4.Merchant 5.Housewife
II. baseline information	
5. Referring institutions	1.Private hospital 2.Public hospital 3. Health center 4.Private clinic 5.Self-referral 6.Unknown
6. Mode of arrival	1. Ambulance 2.Taxi 3.public transport 4.others specify
7.Prehospital care	1. Yes 2. No
8. time of intervention at admission	1. with standard time 2. delayed
9. prior ED visit in past 30 day	No visit One visit 3. ≥ two visit

10. Duration chief compliant	1.<4 hour 2.4-24 hours 3.24-48 hours 4. 48hour to week 5. more than week
11. triage categories	1.red 2.orange 3.yellow 4.green
12. Time of death	1.Day time 2.Night time
13.Length of stay in ED before death	1.0-24 hours 2.24-48 hours 3.48-72 hours 4. >72 hours
14. Death categories	1. early 2. late
15. Major diagnosis	1.Traumatic if go to question no 12 2.non traumatic
16. co-morbidities	1.hypertension 2.diabetic mellitus 3.known cardiac patient 4.known cancer patient 5.HIV/ADIS 6. bronchial Asthma 7.CKD 8. others specific
17.Mechanism of injury	1.RTA 2.Assault 3.Gunshot 4.Stab 5.Fall 6.Suicide 7.others (specify)
18.site of injury	1.head injury 2.Chest injury 3.Spinal cord injury 4.polytrauma 5. others specify)

19. medical cause of death	1.Cardiovascular disease 2.Renal disease 3.Liver disease 4.Infection /sepsis 5.DM and complication 6.Oncologic 7.neurologic disease 8. hematologic malignancy 9.bleeding disorder 10.Others(specify)
20. types investigation if performed	1.No investigation 2.Lab investigation 3.Imaging 4. Both lab and imaging
21. Immediate cause of death	1.Respiratory failure 2.Cardiac failure 3.Cardiorespiratory arrest 4.MOF 5.Others(specify
22. site of death	1.Traige area 2.Red zone 3.Orange zone 4.Yellow and green zone