ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE

Risk Factors and Outcomes of Non Traumatic Chest Pain Patients in A Tertiary Hospital in Addis Ababa, Ethiopia : A Retrospective Cohort Study in ED

Primary Investigator:
Dr. Elias Amsalu, MD, Third year EMCC Resident

Advisors:
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Demmelash Gezahegn, MD, EMCC

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCE, DEPARTMENT OF EMERGENCY MEDICINE AND CRITICAL CARE FOR THE PARTIAL FULFILLMENT OF THE REQUIREMENT IN SPECIALITY PROGRAM.

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Acronyms and Abbreviations

ACS: Acute Coronary Syndrome

AMI: Acute Myocardial Infarction

BP: Blood Pressure

CAD: Coronary Artery Disease

CCU: Coronary Care Unit

CCP: Cardiac causes chest pain

CI: Confidence Interval

CT: Computed Tomography

CXR: Chest X-Ray

CVD: Cardiovascular Disease

DM: Diabetes Mellitus

ECG: Electrocardiography

Echo: Echocardiography

ED: Emergency Department

HHD: Hypertensive Heart Disease

ICU: Intensive Care Unit

IHD: Ischemic Heart Disease

LBBB: Left Bundle Branch Block

OR: Odds Ratio

PAD: Peripheral Arterial Disease

PCI: Percutaneous Coronary Intervention

PUD: Peptic Ulcer Disease

NCCP: Non-cardiac caused chest pain

NSTEMI: Non-ST-Elevation MI

NTCP: Non-trauma-related chest pain

STEMI: ST-Elevation Myocardial Infarction

TASH: Tikur Anbessa Specialized Hospital

UA: Unstable Angina

ABSTRACT

Background

Chest pain is of the most common presenting complaints globally, including in low and middle-income countries like Ethiopia, and is associated with challenging diagnostic problems in emergency rooms with increased mortality and morbidity. However, there is limited research focusing on understanding the risk factors and clinical outcomes of patients presenting with non-traumatic chest pain in the emergency departments of Tikur Anbessa Specialized Hospital in Addis Ababa, Ethiopia.

Objectives

The aim of the study was to identify risk factors and clinical outcomes including admission and mortality of patients with non traumatic chest pain at emergency department in TASH.

Methods

A retrospective cohort study was conducted. Patient data were collected from medical records of individuals who visited the emergency department of TASH between April 1, 2023, and March 31, 2024, and met the inclusion criteria. Data analysis was performed using SPSS software version 27.

Result

A total of 149 patients were analyzed, with 55% male and a median age of 53 years. Cardiovascular (51%) and respiratory (18.8%) disorders were the leading causes of chest pain. Common risk factors included hypertension, diabetes mellitus, ischemic heart disease, and dyslipidemia. Sixty-two percent were admitted, with cardiovascular disorders causing 75% of admissions and ACS accounting for 49.5%. The mortality rate was 3.4%, with 60% of deaths within 24 hours. Shortness of breath and hypertension strongly predicted admission. ACS (80%) and heart failure (20%) were the primary causes of mortality, with three of five deaths occurring in patients without cardiovascular risk factors.

Conclusion

Cardiovascular related chest pain, particularly acute myocardial infarction and heart failure was significantly associated with high admission and mortality rate. These finding emphasizing the importance of early recognition and management of cardiovascular emergencies.

Keywords

Chest pain, acute coronary syndrome, emergency department, mortality.

1. Introduction

1.1 Background

Acute non-traumatic chest pain is one of the commonest complaint for emergency visits and one of the most challenging diagnostic problems in emergency medicine. Around 5.3% of all emergency department (ED) visits present with a chief complaint of chest pain (1). It is a symptom caused by various diseases from non-life-threatening to several life-threatening making it a diagnostic challenge in the ED (2).

Physicians managing chest pain in the ED focus on identifying life-threatening causes, such as ACS, acute aortic dissection, pulmonary embolism, tension pneumothorax, and pericardial tamponade. Other common causes are acute heart failure, pneumonia, GERD, musculoskeletal disorders like costochondritis, and other psychiatric disorders (2).

Cardiac and pulmonary causes are the most common underlying disorders in acute chest pain patients in the ED. A definite final diagnosis was not established in around 10 % of the cases. Other common causes were musculoskeletal disorders and somatization disorders (3).

The most common risk factors for cardiovascular disease were hypertension, diabetes, and smoking. However, half of those presenting with chest pain are without high-risk coronary heart disease (4). In the United State of America (USA), 2.1% of patients with AMI and 2.3 % of those with UA are misdiagnosed (5).

Acute chest pain was associated with a high hospital admission (20-30%) and mortality rate. Among admitted patients, less than half are diagnosed with AMI or UA yet the leading risk factors for mortality. In the USA, the mortality rate is < 1% whereas in Africa reaches 9% due to delayed recognition in the ED and other contributing factors(4)(6)(7).

1.2 Statement of the problem

Over five million patients in the USA visit the ED annually due to chest pain (2). More than half of the cases were of cardiac origin, of whom AMI and UA were the leading causes mortality (3)(8)(9).

In low- and middle-income countries, there is limited knowledge about chest pain patients presenting to ED. The prevalence of non-traumatic chest pain was 1.66%, and 1.3% in South Africa and Tanzania respectively, but more than 7% in Pakistan (6)(8)(9).

In comparison with the high-income countries, the common causes of chest pain in low- and middle-income countries were heart failure, pneumonia, and pulmonary tuberculosis followed by musculoskeletal disorders. ACS remains the primary risk factor for death (8)(9).

In Ethiopia, the prevalence of CVD was high, affecting about 5% of patients who visit health institutions. By 2017, more than 2.83 million individuals had CVD. IHD, stroke, and hypertensive heart disease were the leading causes of CVD-related deaths (10)(11).

Patients with ACS in TASH had extremely high (27.4%) in-hospital mortality (12). Further research is needed about the risk factors and associated outcomes in patients presenting to ED with NTCP since they have increased risk of mortality.

1.3 Significance of the study

Understanding the patterns and outcomes of patients presenting with chest pain to EDs, provide insight into the magnitude of the problem in the community. It is crucial for effective health care planning, resource allocation and provision of appropriate health services.

At TASH, the burden of chest pain presentations is significant. Despite the frequency of these undifferentiated chest pain encounters, there remain a notable gap in the understanding of chest pain among adult patients within this specific healthcare setting. To my best knowledge, no research has been conducted on the profile of chest pain in our ED.

This study will therefore provide valuable insight into risk factors and associated clinical outcomes of patients presenting with NTCP to the TASH ED. It will be the basis for the improvement of patient management and further research in this area.

2. Literature Review

2.1 Globally

In the USA, chest pain is the second most common reason for ED visits, accounting 4.7% of all ED visits (13). Over half of those presenting with chest pain do not have high-risk coronary heart disease. Chest pain also accounts for 20-30% of emergency medical admissions. AMI or UA was the final diagnosis in less than half of the admitted patients (4).

A cross-sectional analysis used during 2011–2015 data from the National Hospital Ambulatory Medical Care Survey (NHAMCS), there were almost 676 million ED visits in the US. Over 14 million patients presenting with symptoms of ACS were hospitalized (14).

A 2001 prospective observational study conducted in western Switzerland in primary care practice, the prevalence of chest pain among patients was 2.7%. Of these patients, mean age was 55 years and 52% were female. The causes of chest pain were musculoskeletal (49%), cardiovascular (16%), psychogenic (11%), respiratory (10%), digestive (8%) and miscellaneous (2%). The most common diagnosis was chest wall syndrome (43%). UA, myocardial infarction, and pulmonary embolism were uncommon. In addition, 5% of the patients were hospitalized (15).

A 2003 multicenter study in north-eastern Italy found that chest pain accounted for 4% of ED admission. Among these patients, 67% were aged over 55 and 50% were females. Patients reported experiencing typical chest pain in 35% of cases. ECG (97%), cardiac injury markers (40%), chest radiography (17%), and echocardiography (15%) were performed. ECG findings were normal in 57% of cases, atypical in 33%, ischemic with ST elevation in 4%, and non-ST elevation in 3%. Although the ECG at presentation was non-diagnostic, 58% of patients still reported chest pain. Additionally, 25% had at least two cardiovascular risk factors, predominantly hypertension and smoking. ACS was confirmed in 29% of all patients and 79% of those hospitalized (16).

A Spanish study from 2008 NTCP accounted for 6.1% of medical emergencies. Among these patients, 45.3% were female, and 39.8% were over 65 years. Chest pain causes were nonischemic (59.9%), undefined (24.4%), and ischemic (15.7%). Respiratory cause (11.7%), Gastrointestinal condition(2.7%). AMI was diagnosed in 6.5% of patients. Diagnostic tests included ECG (88.4%), troponin measurement (43.2%), chest radiography (54.7%) were performed. Atypical chest pain (59%) and respiratory infections (12%) were the most common

diagnoses. Among patients with NTCP, 15.2% were admitted to hospital. The mortality rate was 0.5% (17).

A 2015 multicenter cross-sectional study conducted in Tunisia included 1,173 adults presenting with acute chest pain to 14 EDs (EDs). The study revealed that cardiac cause of chest were in 51.7% cases. ACS was the cause of 49.7% of non-traumatic chest pain cases, with the majority (74.2%) being UA or NSTEMI. Age, sex, smoking, and diabetes were identified as significant contributors and cardiovascular risk factors to ACS. Males accounted for 67.4% of ACS patients, with a median age of 60 year (18).

A 2024 North Indian study found cardiac causes pain (CCP) in 53.7% of ED chest pain cases, with 39.7% female. Predictors of cardiac cause included age, smoking, diabetes, hypertension, and family history of ischemic heart disease, central/left-sided pain, and dyspnea. Elevated troponin I and high blood sugar levels, low HDL, abnormal ECGs were common in CCP compared to stabbing, and epigastric pain, normal ECG common in non-cardiac cause of chest pain. Musculoskeletal (40%) and gastritis (24%.) were common non cardiac causes. Diabetes and hypertension were strong predictors of cardiac complication (19).

An analytical cross-sectional study in Pakistan among emergency patients with acute chest pain (mean age 54.05 years ± 13.5, 61% were male), 45.94% had ACS. Risk factors were present in 86%, primarily diabetes (72%), hypertension (52%), ischemic heart disease (22.3%), smoking (22.3%) and family history of premature CAD (13.4%) was the risk factors. ECG showed NSTEMI in 46.5% and STEMI in 21.9% of the ACS cases. Non-cardiac cause of chest pain accounted for 34.5%, with 27.6% reporting muscular pain (20).

2.2 Africa

A retrospective descriptive study was done in South Africa at the ED of a regional hospital from 1 December 2011 through 10 April 2012. The prevalence of NTCP was 1.66% with mean age of 42.41 years, and 53.6% were males. Respiratory disease (36.19%) was leading causes of chest pain, primarily pneumonia. Musculoskeletal (21.90%), cardiovascular (21.43%), psychological/psychiatric (3.33%), and gastrointestinal (6.67%) disease were other causes of chest pain. Ischemic heart disease (13.81%) was prominent component of CV-related chest pain. Among all patients with chest pain, 33% were admitted (9).

From a prospective observational cohort study done in Dar es Salaam, Tanzania from September 2017 to April 2018, the prevalence was of non-traumatic chest pain 1.3% with a median age of 45 years and 50.7% were females. ECG (69.1%) and troponin (34.1%) were done. Pulmonary tuberculosis (12.6%), heart failure (12.6%), CKD (10%) and ACS (9.6%) were common causes of chest pain. 48% of the patients were admitted. The 24-hour and 7-day mortality was 3% and 9.6% respectively. ACS was the leading risk factor for death (6).

A retrospective study done at Orotta National Referral Hospital, Asmara, Eritrea, ED, in 2018 reported that 855 patients visited the ED with chest pain annually. Respiratory disease (51.6%), mainly pneumonia (94.1%), followed by cardiac causes (27.4%) were the common cause. STEMI was the most common cardiovascular cause of chest pain. Diabetes associated with cardiovascular complications, while smoking and advanced age with high mortality. Mortality rate was 9.1%, primarily due to pulmonary embolism and STEMI (21).

2.3 Ethiopia

In Ethiopia, cardiovascular diseases are common with significant challenges. A hospital-based prospective cross-sectional study done in Western Ethiopia showed the leading types of emergencies were medical emergencies (45.4%). Respiratory distress (12.43%), and hypertensive disorders (8.6%) were among the primary causes of adult ED admissions (22)(23).

As previously discussed, despite the significant burden of chest pain in TASH, in Addis Ababa, Ethiopia, there appears to be a lack of published studies specifically examining chest pain among adult patients in this context.

3. Conceptual framework

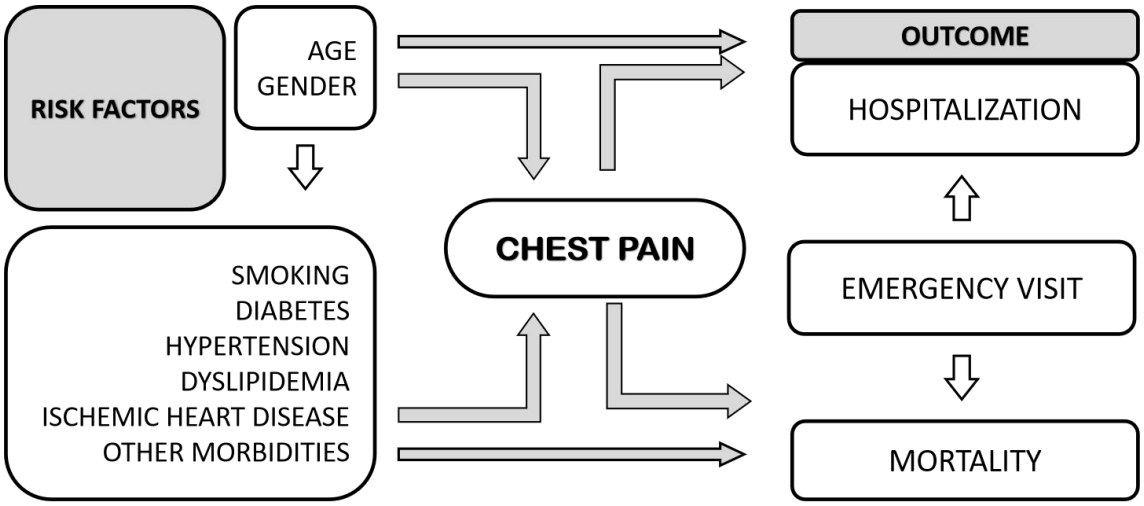

Figure 1: Conceptual Framework: Risk factors and associated outcomes of Chest Pain, Source: Adapted from different literature(24)

4. Objective

4.1 General Objective

To assess risk factors and clinical outcomes in patients presented with NTCP to the ED in TASH, in Addis Ababa, Ethiopia

4.2 Specific Objective

-To identify risk factors in patients presented with NTCP to the ED in TASH

-To evaluate clinical outcome in patients presented with NTCP to the ED in TASH including disposition and mortality

5. Methodology

5.1 Study Setting

TASH is situated in Addis Ababa, a specialized healthcare facility. It is a teaching hospital for medical students and the largest referral center in Ethiopia (24). TASH established its ED in 2010, staffed by dedicated emergency physicians. They provide medical care, guidance, and training to residents, interns, and visiting professionals from various departments. is equipped with both a Cardiac ICU and a Catheterization Laboratory (Cath Lab). The hospital has

undergone significant renovations to enhance its cardiac care facilities(25)(26). The hospital admits patients from all over the country.

5.2 Study Design

A retrospective cohort study was used for the study. This research used data from the past to examine risks and outcome of adult patients who have non traumatic chest pain as their primary complaint in TASH. The data was collected and analyzed from patient medical charts. The study took place between June 01, 2024 and October 30, 2024.

5.3 Source and Study Population

Target Population: All patients presenting with NTCP to the EDs in similar tertiary care hospitals in Ethiopia

Source population: All patients who presented to adult ED at TASH

Study Population: Patients who presented with the main complaint of NTCP to the ED at TASH from April 01, 2023, to March 31, 2024.

Study Unit: Patients who presented with the main complaint of NTCP to the ED at TASH from April 01, 2023, to March 31, 2024, and met the inclusion criteria, resulting in a final sample size of 149 patients.

5.4 Eligibility

Inclusion criteria:

- Patients, > 13 year of age, presented with main complaint of non-traumatic chest pain to TASH
- Patients with documented medical records during their visit to the ED
- Patients who presented to ED within the specified study period: April 01, 2023, to March 31, 2024.

Exclusion criteria:

- Patient presented with trauma-related chest pain
- Patients discharged against medical advice or leaving without being seen by a physician.

- Patients with incomplete or missing medical records that lack essential data required for the study.

5.5 Study Sample Determination

To determine the sample size single population formula was be used. For the sample size for this study, we use the expected prevalence to be 1.3% from a study done in Tanzania (8).

$$n = \frac{(z\ \alpha/2)^2 * p\ (1-p)}{d^2}$$

n = required sample size

Zα/2 = Z-score corresponding to the desired level of confidence (1.96)

p = the expected prevalence (1.3%)

d = margin of error (1%)

$$n = \frac{(1.96)^2 * 0.013*(1-0.013)}{(0.01)\ 2} = 493$$

The total required sample size for this study was 493 participants. However, during the study time-frame, the total patient presented with main compliant of chest pain in was a total of 231 patients. Therefore, convenience sampling method was used, enrolling all patients who met inclusion criteria.

5.6 Sampling Procedure

The study took at TASH in Addis Ababa, Ethiopia. TASH is a tertiary care hospital with a dedicated adult ED. A consecutive sampling method was employed. All patients aged >13 years who presented with the main complaint of non-traumatic chest pain to the ED at TASH during the specified timeframe (April 01, 2023, to March 31, 2024) were assessed for eligibility. All eligible patient was included in the study.

5.7 Data Collection Methods

Data was gathered from patient's medical records using a standardized data collection form for documentation of patient demographics, presenting complaints and duration, comorbidities, risk factors and physical findings. ECG reports, cardiac biomarkers results, final diagnosis, disposition and mortality were also recorded. Data collectors reviewed medical records of all eligible patients presenting to TASH ED from April 01, 2023, to March 31, 2024, ensuring data quality through regular supervision and cross-checking. To enhance consistency and minimize errors, a pre-tested data collection form was used.

5.8 Variables and Measures

5.8.1 Independent Variables

- Demographic variables: age, gender, region and co-morbidity
- Cardiovascular risk factors
- Clinical presentation
- Investigative modalities: ECG, Troponin, echocardiography

5.8.2 Dependent Variables

- Disposition
- Death

5.9 Operational definition

Non-traumatic chest pain: The presence of chest discomfort or pain, non-trauma origin but that occurs spontaneously or due to associated medical conditions, without a history of trauma to the torso or direct physical injury chest area

Adult: person age > 14 years

Length of Stay: Short= <24 hr., Prolonged > 24hr

Mortality: Early if within 24hr, and late if after 24hr of presentation

5.10 Data collection tool and procedure

Data was collected by the primary investigator and data collector. The standardized data collection form was used for documentation of patient demographics, presenting complaints and duration, comorbidities, risk factors, and clinical outcomes.

5.11 Data Quality Control

The collected data was checked by the principal investigator for completeness and validity.

5.12 Data Analysis

The collected data was checked for completeness and inconsistency, and it was then processed and analyzed using SPSS software version 27. Descriptive data was described using mean with standard deviation, median, and mode. Comparisons of categorical data were performed using the chi-squared test. The Kolmogorov-Smirnov test was used to assess the normality of continuous variables.

Variables with a p-value <0.2 in bi-variable analysis were included in multivariable analysis. Multivariable logistic regression analysis was carried out to identify factors associated with patient outcomes. The Hosmer-Lemeshow test was performed to assess the goodness-of-fit of the logistic regression model. P-value <0.05 was considered statistically significant for all analyses.

5.13 Ethical Considerations

The study protocol will be reviewed and approved by the Institutional Review Board (IRB) before commencement. All measures will be taken to protect patient confidentiality and privacy. This study holds no feasible risk for the participant. Participants will get no financial benefit. All participants' rights, privacy, and autonomy will be respected.

6. Result

A total of 13,239 patients were seen between April 01, 2023, to March 31, 2024, in TASH. Among these, 231 patients were triaged with chest pain as their chief complaint. During reassessment, 35 patients did not meet inclusion criteria and were excluded from further analysis. In addition, 47 of the patients' medical records couldn't be retrieved. Consequently, the total number of patients included in the study and analyzed was 149 patients.

6.1 Demographic Overview

Out of 149 participants, 55.0% (82) were males and 45.0% (67) were females. The mean age of the participants was 51.63 years (±16.18), with a median age of 53 years. Most participants fell within the age range of 61 to 70 years, accounting for 38 (25.5%), followed by the age range of 51 to 60 years with 32 (21.5%).

The majority of participants resided in Addis Ababa (71.1%) and Oromia (18.8%) regions. The remaining participants were from different regions of Ethiopia.

Table 6.1: Demographic overview of participants presented with chest pain

Demographics		Frequency(%)
Sex	Female	67(45)
	Male	82(55)
Age	<21	5(3.4)
	21-35	22(14.8)
	36-55	53(35.6)
	56-65	43(28.9)
	66-75	17(11.4)
	>75	9(6)
Region	Addis Ababa	106(71.1)
	Amhara	5(3.4)
	Harar	2(1.3)
	Oromia	28(18.8)
	SNNPR	8(5.4)

6.2 Characterization of Chest Pain among Participants

Among the participants, 107 patients reported onset of chest pain lasting less than 7 days, while 37 patients reported symptoms lasting more than 1 week. 55% of those with acute chest pain developed symptoms within the first 3 days, and 34.2% within 1 day.

The most common pain locations in the analysis were left-sided (36.2%) and central (44.3%). Left-sided pain was significantly associated with cardiovascular diagnoses [OR, 2.750; 95% CI (1.399–5.578); $p = 0.004$], suggesting that patients with left-sided pain were over twice as likely to have a cardiovascular cause. Right-sided pain (16.1%), however, was significantly associated with non-cardiovascular causes, with only 3 cardiac cases out of 24 [OR, 0.102; 95% CI (0.026–0.292); $p < 0.001$].

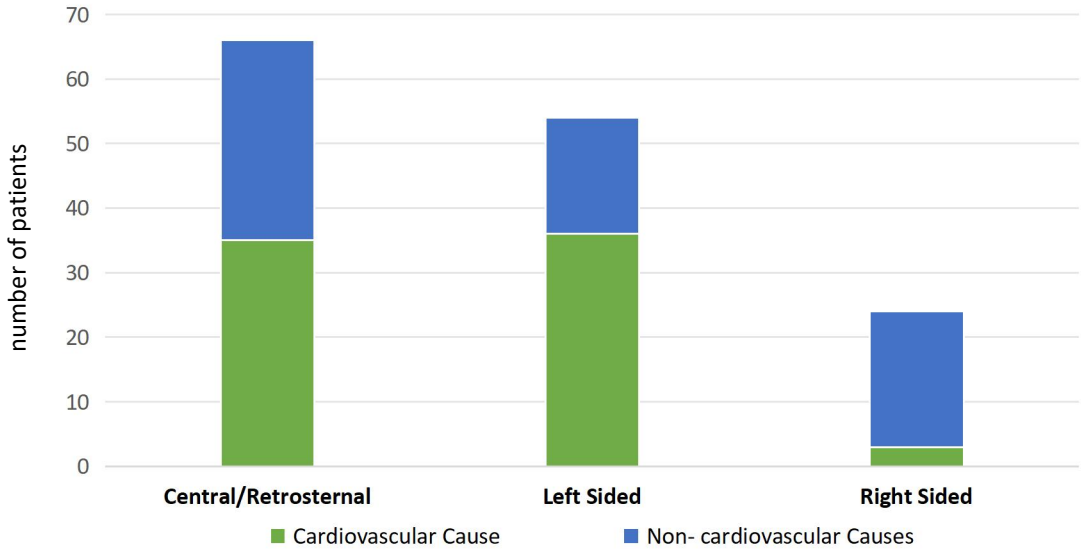

Figure 2: Distribution of chest pain by anatomic location

In the analysis of chest pain types among participants, the most prevalent type was squeezing or crushing pain, reported by 39.6% of participants. This type of pain was significantly associated with the cardiovascular origin of chest pain [OR,16.575; 95% CI (7.451–51.158); p < 0.001]. In contrast, sharp or stabbing pain was reported by 28.2% of participants and was primarily associated with non-CV causes [OR,0.088; 95% CI (0.023–0.203); p < 0.001].

Table 6.1 Distribution of Chest Pain Locations and Types Among Participant

Variable	Frequency(%)	Cardiac	Non cardiac	p-Value	OR (CI)
Location of Pain					
Right Sided	24 (16.1%)	3	21	<0.001	0.102 (0.026 - 0.292)
Left Sided	54(36.2)	36	18	0.004	2.750 (1.399 - 5.578)
Retrosternal	66 (44.3%)	35	31	0.659	1.157 (0.618- 2.187
Not Specified	5(3.4%)	2	3	-	-
Type of Pain					
Sharp/Stabbing	42(28.2)	6(14.3)	36(85.7)	<0.001	0.088 (0.023- 0.203)
Squeezing/crushing	59(39.6)	51(86.4)	8(13.6)	<0.001	16.575 (7.451-51.158)
Burning	15 (10.1)	5(33.3)	10(66.7)	0.149	0.444(0.101-1.545)
Dull	25(16.8)	9(36)	16(64)	0.100	0.479(0.175-1.119)
Heaviness/ Tightness	8(5.4)	5(62.5)	3(37.5)	0.504	1.643(0.337-7.921)

In the assessment of chest pain, the most common associated symptoms were shortness of breath (38.9%), fatigue (26.8%) and cough or sputum (19.5%). Associated gastrointestinal symptoms such as nausea, vomiting, and epigastric discomfort/pain were noted in 43.6% of the patients. In 22.1% of the participants, no associated symptoms were reported.

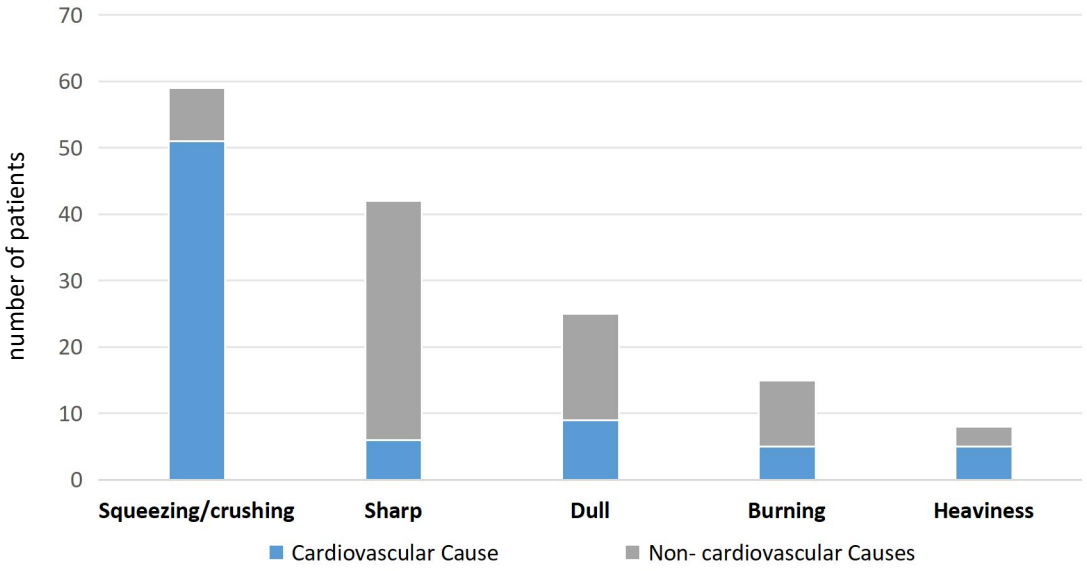

Figure 3: Distribution of chest pain by quality

6.3 Risk Factors Associated with Chest Pain

Among participants presented with chest pain in emergency majority (85.2%) of the patients had associated risk factors and comorbidities. The common risk factors identified were hypertension (44.3%), diabetes Mellitus (36.9%), ischemic heart disease (15.4%) and dyslipidemia (11.4%). Other risk factor identified were heart failure (8.7%), peptic ulcer disease (9.4%), smoking (8.1%), and CRVHD (9%).

Of patients with risk factors, 73.2% had a combination of multiple factors. Patients with cardiovascular risk factor (61.1%) had 2.93 times higher odds of developing ACS [OR, 2.928; 95% CI (1.344–6.376); p=0.006]. Heart failure was identified risk factor that was strongly associated with cardiovascular cause of chest pain, increasing the likelihood by 6.27 times [OR,6.273; 95% CI (1.308- 30.084); p=0.022]. IHD and DM had also increased the likelihood

of cardiovascular disease (DM:[OR 2.005; 95% CI(1.016-4.438); p= 0.043], IHD: [OR 2.717; 95% CI(1.113-9.827); p=0.034]). For non-cardiovascular cause of chest pain, peptic ulcer disease was the risk factor with strong association [OR, 4.227; 95% CI (1.10–18.22); p=0.043].

Among the patients, 38.9 % (n=58) had no cardiovascular risk factors. Despite this, 15.5% of these patients were diagnosed with ACS. In addition, three out of the five deaths occurred in patients without cardiovascular risk factor.

Table 6.2: Prevalence of Associated Risk Factors in Patients with Chest Pain

Associated Risk Factors	**Frequency (%)**
Hypertension	65 (43.6)
Diabetes Mellitus	55 (36.9)
Ischemic Heart Disease	24 (16.1)
Dyslipidemia	17 (11.4)
Heart Failure	13 (8.7)
CRVHD	9 (6)
Atrial Fibrillation	6 (4)
Valvular Heart Disease	4 (2.7)
Peptic Ulcer Diseases	14 (9.4)
Smoking	12 (8.1)
Asthma/COPD	7 (4.7)
HIV	4 (2.7)
Musculoskeletal Disease	4 (2.7)
Psychiatric Diseases	1 (0.7)
Chronic Kidney Diseases	6 (4)
Other	21 (14.1)
None	22 (14.8)

COPD: Chronic Obstructive Pulmonary Disease

CRVHD: Chronic Rheumatic Heart Disease

6.4 Investigation Modalities

Of the patient presented with chest pain ECG, troponin, and echocardiography were done in 55.7 %, 68.5 % and 21.5% of cases respectively. In around 30% of the patients, normal ECG was reported. ST-segment elevation and new LBBB findings account for around 45% of the patients. In 68.6% of patients, troponin was normal

Table 6.3: Prevalence of Associated Symptom/sign in Patients with Chest Pain

Associated Symptoms	Frequency (%)
Shortness of Breath	58(38.9)
Nausea or Vomiting	42 (28.2)
Fatigue	40 (26.8)
Cough/Sputum	29 (19.5)
Sweating	28(18.8)
Epigastric discomfort/ pain	23 (15.4)
Palpitation	18 (12.1)
Orthopnea	10 (6.7)
PND	8 (5.4)
Loss of Consciousness	5 (3.4)
None	33 (22.1)

PND: Paroxysmal nocturnal dyspnea

6.5 Clinical Outcome

6.5.1 Diagnosis

Among 149 patients studied, cardiovascular disease was the primary cause of chest pain, representing 51 percent of cases. Respiratory and gastrointestinal disease followed, accounting for 18.8 percent and 17.4 percent of cases respectively. Within the cardiovascular category, ACS was the most common diagnosis (32.2%). Other common causes were angina, arrhythmia and heart failure.

Pneumonia was a primary cause of respiratory disorder in 64 percent of cases. Bronchial asthma and Pulmonary tuberculosis each account for 11 percent of the patients. Other causes included pleural effusion and pulmonary embolism.

Gastrointestinal symptoms were the primary reason for admission in 17.4 percent of cases, dyspepsia accounted for 92% of all gastrointestinal causes. Other less common cause of chest pain was musculoskeletal (9.4%) and psychiatric (1.3%) disorders. 2% of the patients had nonspecific causes of chest pain.

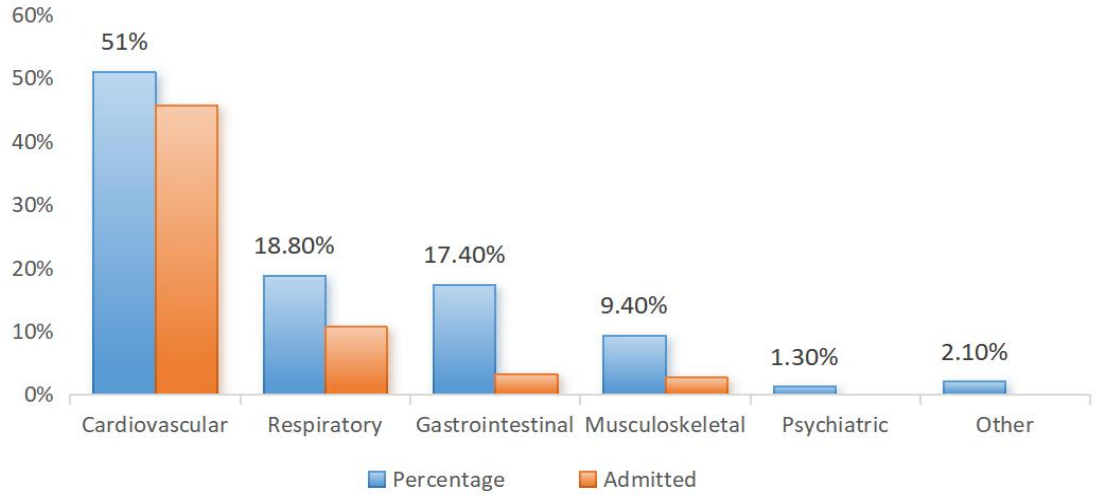

Figure 4: Distribution of Chest pain according to underlying Causes

6.5.2 Disposition

Out of 149 patients, 62.4 percent was admitted to ED and 72 percent (n=67) of those patients stayed more than 24 hours. Three-fourths of ED admission were due to cardiovascular disorders. 90 percent of cardiovascular disorder were admitted, increasing the likelihood of admission by 16.3 times [OR,16.3; 95% CI (6.79-39.26); p<0.001]. Acute myocardial infarction led to 40% of emergency admission and responsible for 71 percent of mortality cases.

Respiratory cause of chest pain led to 17 percent of admission. Pneumonia accounts for admission of 10% of the patients. Although 42 percent of these patients were discharged, there was no significant association with disposition [OR = 0.762; 95% CI (0.331–1.756); p = 0.523].

Patients with gastrointestinal disease accounted for 6% of admission; however gastrointestinal conditions strongly associated with a lower likelihood of admission [OR,0.095; 95% CI (0.025-0.253); p<0.001]. Patients with gastrointestinal conditions were 4.2 time more likely to be discharged and 80 percent of these patients were discharged.

Patients with musculoskeletal disease were also strongly associated with a lower likelihood of admission [OR, 0.207 95% CI (0.041-0.637); p=0.006]. 4 percent of admission were due to musculoskeletal conditions; however, these patients were approximately 4.84 times more likely to be discharged and 71.4 % of these patients were discharged.

6.5.3 Mortality

Among the 149 patients, mortality occurred in 3.4 percent. 60 percent of the death were within the first 24 hours. Mortality was higher among males, having approximately 3.4 times higher odds compared to females [OR, 3.385; 95% CI (0.424-6.428); p=0.254]. The rate of mortality rise with age, with 80 percent of all deaths occurring in patients over 55 years. The age greater than 65 years experienced the highest mortality rate at 11.8 percent, though the association was not statistically significant. Additionally, in those under 21years, there was one out of five deaths. While this finding is notable, the limited sample size may impact the conclusion.

All mortality cases were attributed to cardiovascular disease, with 80 percent of the patients presenting with STEMI and 20 percent with heart failure. Among these patients, 40 percent (n=2) had multiple risk factors, including diabetes mellitus, hypertension, and heart failure, while 60% (n=3) of the patients had no cardiovascular risk factors. The leading causes of death were refractory cardiogenic shock and arrhythmia secondary to acute myocardial infarction.

6.5.4 Predictor of clinical outcomes

For Mortality

Binary logistic regression analysis was conducted to identify independent predictors of mortality among chest pain patients. Though, mortality was significantly associated with cardiovascular disease presence, specifically among those diagnosed with STEMI and heart failure, no single variable emerged as an independent predictor of mortality.

For Disposition

Binary logistic regression was also conducted to identify independent predictors of patient disposition among individuals presenting with chest pain. The analysis revealed that shortness of breath was a significant predictor of disposition, with an [OR, 15.581; 95% CI (1.869, 128.107); P=0.016]. Additionally, hypertension was also identified as a significant predictor of disposition, with an [OR, 8.683; 95% CI (1.221, 60.866); P = 0.030].

Table 6.4: Causes of Chest Pain and Patient Disposition

Cause	Frequency (%)	Admitted	Discharged	COR 95% CI	P-value
Cardiovascular	76(51.0%)	68	8	16.320 [6.79-39.26]	<0.001
ACS	48(32.2%)	46	2		
AMI	37(24.8%)	37	0		
Unstable Angina	11(7.4)	9	2		
Stable Angina	7	2	5		
Arrhythmia	8	8	0		
Heart Failure	10	9	1		
Acute Pericarditis	1	1	0		
OTHER	2	2	0		
Respiratory	28(18.8%)	17.2(16)	21.4(12)	0.762 (0.308-1.877)	0.523
Pneumonia	18(12%)	9	9		
PTB	3	2	1		
PE	2	2	0		
Pleural Effusion	2	2	0		
Asthma	3	2	1		
Gastrointestinal	26(17.4%)	5.4(5)	37.5(21)	0.095 (0.025-0.253)	<0.001
Dyspepsia	24(16.1 %)	5	19		
Other GI	2 (1.3%)	0	2		
Musculoskeletal	14 (9.4%)	4.3% (4)	17.9% (10)	0.207(0.041-0.637)	0.006
Costochondritis	4(2.7%)	1	3		
Others	10(6.7%)	3	7		
Psychiatric	2(1.3%)	0	3.6% (2%)		
Non-Specific	3(2%)	0	5.4 (3%)		
Total	149 (100%)	93 (62.4%)	56 (37.6%)		

AMI: Acute Myocardial Infarction CI: Confidence Interval GI: Gastrointestinal OR: Odds Ratio PTB: Pulmonary Tuberculosis

For Acute Coronary syndrome

Binary logistic regression analysis indicated that retrosternal pain and the crushing quality of pain are significant independent predictors of ACS in patients presenting with chest pain. Additionally, radiation of pain to the jaws and to the left arm was identified as a critical predictor.

Furthermore, shortness of breath (SOB) was also identified as significant factor, , hypertension was associated with an OR of 4.030 [95% CI: 1.311–12.382; P = 0.015], and smoking showed a trend towards significance with an OR of 6.036 [95% CI: 0.971–37.528; P = 0.054].

Table 6.5: Binary Regression to determine the independent predictor of Acute Coronary Syndrome in patients presenting with Chest Pain in ED

Variable	COR(95% CI)	P-value	AOR (95% CI)	P-Value
Retrosternal pain	0.555 (0.257 - 1.201)	0.094	**14.690(3.577, 60.330)**	< 0.001
Crushing type of pain	0.135 (0.070 - 0.261)	0.01	**28.608(7.557, 108.293)**	< 0.001
Radiation to the jaws	3.380(1.430-9.210)	0.07	**8.785(2.319, 33.279)**	0.001
Radiation to left arm	13.451(4.594-51.012	0.001	**40.133(4.261, 377.994)**	0.001
Shortness of breath	0.344 (0.178 - 0.672)	0.003	**8.049(2.435, 26.608)**	0.001
Hypertension	0.532 (0.190 - 1.497)	0.074	**4.030(1.311, 12.382)**	0.015
Smoking	4.850(1.277-22.970)	0.008	6.036(0.971, 37.528)	0.054
IHD	2.102(0.787-5.245)	0.119	2.330(0.519-10.468)	0.270
Diabetes	1.984(1.005-4.125)	0.055	0.877(0.217-3.545)	0.854
Dyslipidemia	2.683(0.920-9.614)	0.052	3.041(0.638-14.485)	0.163

IHD: Ischemic Heart Disease

7. Discussion

The study analyzed 149 patients presenting with non-traumatic chest pain at TASH. Cardiovascular causes, particularly AMI (32.2%), were the leading diagnoses (51%), followed by respiratory (18.8%) and gastrointestinal causes (17.4%). Most patients (85.2%) had associated risk factors, with hypertension (44.3%) and diabetes (36.9%) being the most common. Shortness of breath and hypertension were significant predictors of admission, while clinical features like retrosternal, crushing pain and pain radiating to the left arm or jaw were strong predictors of ACS. Mortality was 3.4%, with all deaths due to cardiovascular causes, primarily within 24 hours of presentation.

This study may have selection bias because it only included patients from a single tertiary hospital and 82 patients were excluded due to ineligibility or inaccessible information. Convenience sampling limits the representativeness of the findings, and the small sample size

reduces statistical power to detect less common outcomes. Relying on retrospective chart reviews adds documentation bias, as insufficient or inconsistent records may result in data misclassification and compromising data quality.

The demographic profile of the patients revealed a predominantly middle-aged population, almost half the patients greater than 65 years, with a significant proportion residing in Addis Ababa and Oromia. Only 34% of the patients sought medical attention within 24 hours of chest pain onset, and significant portion, 25% of the patients, sought care after one week onset of chest pain.

Unlike the other studies, the majority of patients presented with cardiovascular causes of chest pain, followed by respiratory, gastrointestinal, musculoskeletal, and psychiatric disorders.

In this study, ACS was identified as the most common cause of chest pain, consistent with findings from other countries like Pakistan and Tunisia, where AMI was also identified as the leading cause of chest pain in EDs (18)(20). Hypertension, diabetes mellitus, and ischemic heart disease were similarly recognized as common risk factors across various studies, including those from Tunisia and Italy, where these conditions were strongly associated with cardiovascular causes of chest pain(16)(18). Heart failure emerged as a particularly strong predictor of cardiovascular-related chest pain in this study. Pneumonia and gastrointestinal conditions, mainly dyspepsia, were also common causes, similar to the study done in Spain and South Africa. Musculoskeletal and psychiatric-related causes of chest pain were the least common (9)(17).

The clinical characteristic of chest pain was found to differentiate cardiovascular from non-cardiovascular related causes of chest pain. Left-sided and central chest pain, along with the squeezing or crushing type of chest pain, were significant predictors of cardiovascular causes. These could help in early identification of high-risk patients, such as those with ACS. Conversely, sharp pain and right-sided pain may prompt further investigation into respiratory, gastrointestinal or musculoskeletal disorders.

Regarding patient disposition, 62.4% of patients were admitted for further evaluation and management, with the majority (72%) staying longer than 24 hours. Three-fourths of ED admissions were due to cardiovascular disorders, with nearly all patients suffering from

cardiovascular conditions being admitted. Patients with a cardiovascular cause were 16.3 times more likely to be admitted than those without a cardiovascular cause. AMI was the most prevalent cardiovascular issue, accounting for 40% of total admissions, highlighting the need for timely diagnosis and intervention in this population.

The mortality rate among chest pain patients was relatively low, at 3.4%, compared to a similar study done in Tanzania (6). Mortality was more prevalent among males and aged over 55 years. Most of these deaths occurred within the first 24 hours, emphasizing the importance of the early phase of critical care in patients with chest pain. AMI was the leading cause of mortality among chest pain patients, with a 10.8% mortality rate, which is higher than the 0.5% mortality rate reported in a similar study done in Spain (17).

8. Conclusion

This research highlights the significant burden of cardiovascular-related chest pain in the ED at TASH, Addis Ababa, Ethiopia, with a high proportion of patients requiring admission, and long hospital stays. Clinical characteristics such as left-sided and central chest pain, along with squeezing pain, serve as key indicators for identifying high-risk cardiovascular cases. AMI was the primary cause of hospitalization and mortality among chest pain patients. However, a significant portion of patients lack identifiable cardiovascular risk factor. These finding emphasizing the importance of early recognition and management of cardiovascular emergencies. In addition, delayed medical presentation, particularly beyond 24 hours, highlights the need to improve awareness.

9. Limitations

This study has several limitations. It was conducted single-centered study, so the results may be difficult to apply to other areas or healthcare settings. The study used existing patient records, which may have affected the quality of data and some patient medical records could not be retrieved. The relatively small sample size may have limited the ability to comprehensively analyze risk factors and predictors of outcomes.

10. Recommendation

To improve outcomes for chest pain patients, it is recommended to enhance early recognition and diagnosis of cardiovascular conditions, particularly acute myocardial infarction, through better training and awareness in EDs, along with public health campaigns to promote timely medical presentation, is crucial. Enhancing implementation of evidence-based interventions such as primary percutaneous coronary intervention (PCI) and fibrinolysis for acute myocardial infarction is essential for improved outcome.

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Annex I: Data Collecting Tool

DEMOGRAPHICS

MRN: …… Age: …… Sex: …… Region: ……..

PRESENTATION

Chest Pain characterization

Onset:	☐ <3 days	☐ 3- 7 days	☐ > 7 days
Location:	☐ Central	☐ Left-sided	
	☐ Right-sided	☐ Retrosternal	
Quality:	☐ Sharp/Stabbing	☐ Burning	
	☐ Crushing	☐ Dull	
Duration:	☐ Continuous	☐ Intermittent	
Radiation:	☐ YES	☐ NO	
If yes,	☐ to the neck	☐ jaw	☐ shoulders
	☐ arms	☐ back	
Exacerbating Factors:		☐ YES	☐ No
If yes:-	☐ Exertion	☐ Deep breathing	
	☐ Coughing	☐ Lying down	
Alleviating Factors:		☐ YES	☐ NO
If yes:-	☐ Rest	☐ Medication	☐ Changing position
Associated Symptoms:		☐ YES	☐ NO
If yes:	☐ Shortness of breath	☐ Sweating	☐ Nausea
	☐ Vomiting	☐ Palpitations	

ASSOCIATED FACTORS

Comorbidities	☐ YES	☐ NO	
If yes:	☐ Diabetes Mellitus	☐ Hypertension	☐ Dyslipidemia
	☐ Arrhythmia	☐ IHD/ACS	☐ Heart Failure
	☐ VHD	☐ Asthma	☐ COPD

☐ Peptic Ulcer Disease ☐ Psychiatric Condition

☐ Chronic Kidney Disease ☐ Musculoskeletal Condition

PHYSICAL FINDING

Vital Sign

Pulse Rate: ☐ Tachycardia(>100) ☐ Normal ☐ Bradycardia(<60)

Respiratory Rate ☐ Normal ☐ Tachypnea (>14)

Blood Pressure: ☐ Hypertension ☐ Normal ☐ Hypotension

Oxygen Saturation ☐ Normal ☐ Hypoxia (<90%)

DIAGNOSTIC TESTS ORDERED

ECG ☐ Normal ☐ STEMI ☐ OTHERS……..

Troponin ☐ Normal ☐ Elevated ☐ Not Done

DIAGNOSIS:

Origin ☐ Cardiac ☐ Non Cardiac

If Cardiac Cause ☐ STEMI ☐ NSTEMI ☐ Other(Specify)……

If non-cardiac Cause

☐ Respiratory ☐ Gastrointestinal

☐ Musculoskeletal ☐ Other

Final Diagnosis:……

CLINICAL OUTCOMES

☐ Discharged ☐ Admitted

Length of stay if admitted ☐ <24 hr ☐ >24hr

Mortality ☐ YES ☐ NO

If yes: ☐ within 24 hr ☐ > 24hr

Annex II: Assurance of investigator

I, the undersigned candidate agrees to accept responsibility for the scientific and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the research and publications office of the Addis Ababa university

Name of investigator: Elias Amsalu
MD, Emergency and critical care resident
Signature_____
Date_____

Approval of the advisors
Advisors Name:

Dr. Merhai Kefyalew Signature: _____ Date: _____
(Assistant professor of Emergency and critical care, MPH)

Dr. Demmelash Gezahegn : Signature: _____ Date: _____
(Assistant professor of Emergency and critical care, MPH)