

2022-03-24

ELECTROCARDIOGRAM AND ECHOCARDIOGRAPHY FINDINGS OF MYOCARDIAL INFARCTION PATIENTS AT TIBEBE GHION SPECIALIZED HOSPITAL AND FELEGE HIWOT COMMPRHENSEIVE SPECIALIZED HOSPITAL

Dr. WONDALE, TSEGA

<http://ir.bdu.edu.et/handle/123456789/13264>

Downloaded from DSpace Repository, DSpace Institution's institutional repository



BAHIR BAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCE
SCHOOL OF MEDICINE
DEPARTMENT OF INTERNAL MEDICINE

**ELECTROCARDIOGRAM AND ECHOCARDIOGRAPHY FINDINGS OF
MYOCARDIAL INFARCTION PATIENTS AT TIBEBE GHION SPECIALIZED
HOSPITAL AND FELEGE HIWOT COMMPRHENSEIVE SPECIALIZED
HOSPITAL**

By: Dr. WONDALE TSEGA (MEDICAL RESIDENT)

**A THESIS REPORT SUBMITTED TO, BAHIRDAR UNIVERSITY COLLEGE
OF HEALTH SCIENCES, DEPARTMENT OF INTERNAL MEDICINE AS
PARTIAL FULFILMENT FOR REQUIREMENTS OF THE INTERNAL
MEDICINE SPECIALITY PROGRAM.**

NOVEMBER, 2021

BAHIRDAR, ETHIOPIA

BAHIR BAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCE
SCHOOL OF MEDICINE
DEPARTMENT OF INTERNAL MEDICINE

**ELECTROCARDIOGRAM AND ECHOCARDIOGRAPHY FINDINGS OF DIED
MYOCARDIAL INFARCTION PATIENTS AT TIBEBE GHION SPECIALIZED
HOSPITAL AND FELEGE HIWOT COMPREHENSIVE SPECIALIZED
HOSPITAL**

BY: DR. WONDALE TSEGA (MEDICAL RESIDENT)

**A THESIS REPORT SUBMITTED TO, BAHIRDAR UNIVERSITY COLLEGE OF
HEALTH SCIENCES, DEPARTMENT OF INTERNAL MEDICINE AS PARTIAL
FULFILMENT FOR REQUIREMENTS OF THE INTERNAL MEDICINE
SPECIALITY PROGRAM**

ADVISOR'S

WORKU AWOKE (ASSOCIATE PROFESSOR OF EPIDEMIOLOGY)

DR. HABTAMU BAYIH (MD, INTERNIST AND CARDIOLOGIST)

NOVEMBER, 2021

BAHIR DAR

Bahir Dar University
College of Medicine and Health Sciences
School of Medicine
Department of Internal Medicine

Principal Investigator	Wondale Tsega (MD, Year III Medical Resident) Department of Internal Medicine College of Medicine and Health Sciences Bahir Dar University Email: wongotse@gmail.com Cell phone: +251-920851629
Advisors	Worku Awoke (Associate professor of Epidemiology) School of Public Health College of Medicine and Health Sciences Bahir Dar University Email: workuawo@yahoo.com Cell phone: +251-963827845
	Dr. Habtamu Bayih (MD, internist and cardiologist at BDU) Department of Internal Medicine College of Medicine and Health Sciences Bahir Dar University Email: habtamu95@gmail.com Cell phone: +251-922535229
Full Title of Research	ELECTROCARDIOGRAM AND ECHOCARDIOGRAPHY FINDINGS OF DIED MYOCARDIAL INFARCTION PATIENTS AT TIBEBE GHION SPECIALIZED HOSPITAL AND FELEGE HIWOT COMPREHENSIVE SPECIALIZED HOSPITAL
Study Period	July 30 to August 30, 2021
Project Area	Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital, Bahir Dar, Ethiopia

DECLARATION

This is to certify that the thesis entitled “identify electrocardiography and echocardiography findings of died Myocardial infarction patients admitted at Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital”, submitted in partial fulfillment of the requirements for internal medicine specialty program, Bahir Dar University, is a record of original work carried out by me and has never been submitted to this or any other institution to get any other degree or certificates. The assistance and help I received during the course of this investigation have been duly acknowledged.

Dr. Wondale Tsega (Year III medical resident)

Name:

Date

Place

BAHIR BAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCE
SCHOOL OF MEDICINE
DEPARTMENT OF INTERNAL MEDICINE

Approval of Dissertation/Thesis for Defense

I hereby certify that I have supervised, read, and evaluated this thesis/dissertation titled “identify electrocardiography and echocardiography findings of died Myocardial infarction patients admitted at Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital” by Dr. Wondale Tsega (Year III medical resident) prepared under my guidance. I recommend the thesis/dissertation be submitted for oral defense.

<u>Worku Awoke (Associate professor of Epidemiology)</u>	_____	_____
Advisor's name	Signature	Date

<u>Dr. Habtamu Bayih (MD, internist and cardiologist)</u>	_____	_____
Advisor' name	Signature	Date

<u>Dr. Tilahun (MD, Internist)</u>	_____	_____
Department Head	Signature	Date

BAHIR BAR UNIVERSITY
COLLEGE OF MEDICINE AND HEALTH SCIENCE
SCHOOL OF MEDICINE
DEPARTMENT OF INTERNAL MEDICINE

Approval of Dissertation/thesis for defense result

As members of the the board of examiners, we examined this dissertation/thesis entitled
“identify electrocardiography and echocardiography findings of died Myocardial
infarction patients admitted at Tibebe Ghion Specialized Hospital and Felege Hiwot
Comprehensive Specialized Hospital” by We hereby certify that the thesis/dissertation is
accepted for fulfilling the requirements for internal medicine specialty program.

Board of Examiners

External examiner name	Signature	Date
_____	_____	_____
_____	_____	_____
Internal examiner name	Signature	Date
_____	_____	_____
_____	_____	_____
Chair person’s name	Signature	Date
_____	_____	_____

ACKNOWLEDGMENTS

I would like to express my deepest gratitude to my advisors Dr. Habtamu Bayih and Mr. Worku Aowke for their necessary guidance, encouragement, constructive comments, and support for the development of this research paper.

I would also like to extend my special thanks to the Bahirdar University for the financial support to conduct this research and for giving this golden opportunity to practice research. I would like to say thanks to those who work in TGSH and FHRH for availing of medical records and charts.

ABSTRACT

Background: Myocardial infarction is diagnosed when cardiac biomarkers rise, together with supporting evidence such as usual symptoms, suggestive electrocardiographic changes, or imaging evidence of new loss of viable myocardium or new regional wall motion abnormality. While an electrocardiogram is normal, echocardiography is not used in the emergency room. In Ethiopia, data on electrocardiogram and echocardiogram findings, as well as their impact on mortality, is still scarce. This research can be a reference for next researches.

Objective: To identify electrocardiography and echocardiography findings of died Myocardial infarction patients admitted at Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital from January 2010 E.C to July 2013 E.C.

Method: A cross-sectional study was conducted on patients with myocardial infarction admitted in adult ICU of the two hospitals from January 30/2018 to July 30/2021 by using the pre-developed data collection format. Data entered to SPSS 25 version software database for analysis. The estimated sample size was 215 by using EPI-info and population proportion 50%. A simple random sampling method was conducted to identify medical registration numbers.

Result: Among 203 participants 67.5 % were male, the mean age of participants was 59(59±13.8), 66.5% of patients had ST-elevation myocardial infarction, and regional all motion abnormality 54.1% of the cases were in the anterio-apical region. Hypertension found in 47.3% of them & 25.1% had type II diabetes. There was a 23.2% inconsistency between electrocardiogram and echocardiography findings for MI and 22.7% of patients died. Findings associated with in-hospital death were pulmonary hypertension [AOR=2.65, 95% CI (1.53-4.60)], infero-basal regional wall motion abnormality [AOR = 4.36, 95% CI (1.13-16.83)], Killip's class (AOR= 4.54, 95% CI (2.81-7.31)), and Infections (AOR=3.15, 95% CI (1.21-8.19)).

Conclusions and Recommendation: In around half of the cases there are consistencies between ECG and ECHO in locating the site of an infarction. Mortality of myocardial infarction at those hospitals was higher than in other parts of the world reports. This region needs to have a cardiac center at Bahir Dar.

Keywords: Myocardial infarction, Electrocardiography, Echocardiography, Assessment, Mortality.

Table of Figures

<i>Figure 1 Comparison of ECG and ECHO MI findings, MI risk factors (18, 25)</i>	9
<i>Figure 2: Age distribution of myocardial infarction patients at TGSH and FHRH August 2021</i>	15
<i>Figure 3 common ECG findings of patients Myocardial infarction patients at TGSH and FHRH August 2021</i>	18
<i>Figure 4: ECG location of infract * Regional wall motion abnormality of Myocardial infarction patients at TGSH and FHRH August 2021</i>	20
<i>Figure 5: In-hospital outcome of Myocardial infarction patients at TGSH and FHRH August 2021</i>	21

List of Tables

<i>Table 1: Sex and clinical parameters of myocardial infarction patients at TGSH and FHRH August 2021</i>	16
<i>Table 2: Comorbidities and risk factors of Myocardial infarction patients at TGSH and FHRH August 2021</i>	17
<i>Table 3: location infract by electrocardiogram of patients Myocardial infarction patients at TGSH and FHRH August 2021</i>	18
<i>Table 4: Echocardiographic localization of segmental wall motion abnormalities of Myocardial infarction patients at TGSH and FHRH August 2021</i>	19
<i>Table 5: Multivariate logistic regression analyses (Binary logistics) of factors affecting in-hospital mortality of Myocardial infarction patients at TGSH and FHRH August 2021</i>	22

TABLE OF CONTENTS

Contents

DECLARATION.....	ii
ACKNOWLEDGMENTS	v
ABSTRACT	vi
Table of Figures.....	vii
List of Tables	vii
TABLE OF CONTENTS.....	viii
ACRONYMS.....	x
1. INTRODUCTION.....	1
1.1. BACKGROUND	1
1.2. Statement of the problem	2
1.3. Significance of the study	3
2. LITERATURE REVIEW	4
2.1. Electrocardiography and Myocardial infarction	4
2.2. Echocardiography and Myocardial infarction findings	5
2.3. Electrocardiography and Echocardiography	5
2.4. Electrocardiography / Echocardiography findings and Outcomes	7
3. Conceptual framework.....	9
.....	9
4. OBJECTIVES	10
4.1. GENERAL OBJECTIVE	10
4.2. SPECIFIC OBJECTIVE	10
5. METHODS AND MATERIALS	11
5.1. Study area:	11
5.2. Study period:	11
5.3. Study design:	11
5.4. Population.....	11
5.4.1. Source population.....	11
5.4.2. Study population.....	11
5.5. Sample size determination and Sampling Technique.....	11

5.5.1.	Sample size	11
5.5.2.	Sampling technique	12
5.6.	Inclusion Criteria/ Exclusion Criteria.....	12
5.6.1.	Inclusion Criteria	12
5.7.	Study Variables	12
5.7.1.	Independent Variables:.....	12
5.7.2.	Dependent variables	12
5.8.	Operational Definition	13
5.9.	Data Collection Procedure	13
5.10.	Data Quality Assurance.....	14
5.11.	Data Processing and Analysis.....	14
5.12.	Pretest	14
5.13.	Ethical Considerations	14
5.14.	Dissemination.....	14
6.	RESULTS	15
6.1.	Clinical parameters and comorbidities	15
i.	Age, Sex and clinical presentation of Patients	15
ii.	Comorbidities and Risk factors.....	16
6.2.	Electrocardiogram and Echocardiography findings.....	17
6.2.1)	Electrocardiograph findings.....	17
6.2.2)	Echocardiography findings	18
6.3.	Electrocardiography and Echocardiography predictors of in-hospital outcomes.....	20
6.3.1)	Outcomes.....	20
6.3.2)	Predictors of in-hospital outcomes	21
7.	Discussion	23
8.	Limitations	26
9.	Conclusion	26
10.	Recommendation	26
	REFERENCES	28
	Annex II: Data checklists format	30

ACRONYMS

AMI - Acute myocardial infarction

AWMI –Anterior Wall Myocardial Infarction

CAD- Coronary Artery Disease

ECG- Electrocardiogram

ECHO- Echocardiography

EF- Ejection fraction

IWMI – Inferior Wall Myocardial Infarction

LAD - left anterior descending

LBBB- Left bundle branch block

MI – Myocardial Infarction

NSTEMI - Non-ST-elevation myocardial infarction

RBBB- Right bundle branch block

RCA - right coronary artery

RV- Right ventricle

RVI- Retroviral infection

RWMA- Regional wall motion abnormality

STD – ST depression

STEMI - ST-elevation myocardial infarction

TWI- T-wave inversion

1. INTRODUCTION

1.1. BACKGROUND

Pathologically, myocardial infarction is defined as the death of myocardial cells as a result of prolonged ischemia. When cardiac biomarkers rise and there is supportive evidence in the form of typical symptoms, suggestive ECG changes, or imaging evidence of new loss of viable myocardium or new regional wall motion abnormality, the criteria are met(1). Acute chest discomfort is the most common symptom of myocardial ischemia. Coronary angiography is the gold standard for diagnosing coronary artery disease, but cardiac biomarkers, ECG, and echocardiogram all play a role in patients with MI. For establishing the diagnosis of infarction, serial serum biomarkers (troponin T and I) are required. For patients with suspected or confirmed myocardial ischemia or infarction, an electrocardiogram (ECG) is an important diagnostic tool. The ST-segment, T wave, and QRS complex display abnormalities. In these cases, however, the ECG may be normal or nonspecific. In the management of patients with acute myocardial infarction, echocardiography is a standard tool (MI). The value of echocardiography in establishing the diagnosis, location, and extent of myocardial infarction, as well as detecting mechanical complications and providing prognostic information for risk stratification(1). It also assesses systolic function, diastolic dysfunction, and pulmonary hypertension.

An electrocardiogram (ECG or EKG) is a graphic representation of the heart's electrical activity. The electrocardiograph amplifies and records the signals detected by metal electrodes attached to the extremities and chest wall(2). Since Einthoven's creation of the string galvanometer in 1901, the technology and clinical usefulness of the ECG have continued to evolve. By 1910, the ECG had made its way from the research lab to the clinic, and it had quickly become the most widely used cardiac diagnostic tool. The *P* wave is generated by activation of the atria, the *PR interval* corresponds to the duration of atrioventricular conduction, the *QRS complex* is produced by the activation of the two ventricles, and the *ST-T* wave reflects ventricular recovery(3). When acute ischemia

occurs trans-mural, ST elevations and, in the early stages of ischemia, tall, positive so-called hyperacute T waves over the ischemic zone can be seen. Ischemia confined primarily to the *sub-endocardium* leads shows ST-segment depression(2).

High-frequency sound waves (ultrasound) penetrate the body, reflect important structures, and form an image in echocardiography. The idea of using "sound" to "see" structures dates back to the 1920s. Harvey Feigenbaum standardized the clinical use of M-mode echocardiography for quantifying left ventricular dimensions in the 1960s(4). Standard transthoracic echocardiogram (TTE) is supplemented in most echocardiography labs by trans-esophageal echocardiography (TEE), which provides better resolution, and stress echocardiography, which is used to monitor myocardial ischemia and valve function during exercise(3). Multiple imaging views, including the parasternal long-axis and short-axis views, as well as the apical four-chamber, two-chamber, and three-chamber views should be used to determine regional wall motion(5).

1.2.Statement of the problem

STEMI is still a major public health issue in developed countries, and it is on the rise in developing nations. MI rates climb rapidly with age in both men and women, and there are racial disparities, with MI occurring more frequently in blacks. Death rates in low-income areas have risen from 340 per 100,000 in 1990 to 390 per 100,000 in 2013(3).

Although acute STEMI cannot be distinguished from an old myocardial scar or acute severe ischemia by echocardiography, the ease and safety of the procedure make its use appealing as a screening tool in the Emergency Department setting, bedside echocardiography use is not practiced.

When the ECG is not diagnostic of STEMI, early detection of the presence or absence of wall motion abnormalities by echocardiography can aid in management decisions, such as whether the patient should receive reperfusion therapy but it is also not practiced in the emergency setup. The risk stratification of MI at the time of admission and discharge

from the hospital by clinical, E.C.G and Echocardiographic parameters accurately determine the outcome of patients with MI and helps in determining the Optimal Therapeutic Interventions and secondary preventive measures we are using those two at the time of discharge but those therapeutic interventions are not available in Bahirdar. Search for literature review shows there are limited studies on the comparison of echocardiography and electrocardiography findings and their impact on the outcome of patients with myocardial infarction.

Coronary artery disease is a severe problem in Ethiopia, as demonstrated by its onset early in life and more widespread involvement of the coronary vasculature. It has been demonstrated that coronary intervention without on-site cardiac surgery is safe(6). The data regarding the electrocardiogram and echocardiography comparison and their use is still lacking in Ethiopia.

1.3. Significance of the study

Acute myocardial infarction (AMI) continues to be a significant public health problem in industrialized countries and an increasingly significant problem in developing countries. There are limited studies on the assessment of ECG and echo findings and their impact on the outcome of patients with MI and this study will help to show the association especially the anatomic location of the infraction. The use of echo in the acute myocardial infarction is less even in the occasions of normal ECG finding this will give direction to use bedside echocardiography as routine in acute coronary syndrome. It is therefore anticipated that the Study findings will contribute to the development of knowledge about ECG and ECHO findings, their effect on the outcome and will use as a reference for those who want to study related research topics. The findings of this study may also help in influencing the development of appropriate investigation and intervention programs for the management of MI.

2. LITERATURE REVIEW

2.1. Electrocardiography and Myocardial infarction

ST-elevation myocardial infarctions account for 40% of all AMIs, 670,000 cases diagnosed each year in the US. Those who survive an AMI face a significant risk of additional cardiac complications like re-infarction, sudden death, and heart failure(7). In research conducted at Sir Sunderlal Hospital in Varanasi, India, 63% of patients had anterior wall MI, and 37% had inferior wall MI. Diabetes afflicted 49%, hypertension afflicted 44%, and obesity afflicted 30%. 24% were smokers and 42% had a family history of similar illness. 88% presented with chest pain and 41% with breathlessness(8).

The ECG's sensitivity and specificity in diagnosing the culprit coronary artery were 70.0 % and 79.1 %, respectively, in a study involving 179 individuals. They were able to identify the right coronary artery as the culprit artery in 88.9% of the instances using ECG analysis(9). Males made up 68.6% of the total, with 77.9% being between the ages of 51 and 70. In the diagnosis of the proximal left anterior descending (LAD), proximal right coronary artery, and mid and distal RCA, ECG and CAG showed complete agreement(10). Sanaani et al identified 131 consecutive individuals with AMI and 1-vessel CAD in their investigation. There were 97 men (74%) and 34 women (26%), with an average age of 64.13 years. According to a blinded ECG examination, 29 (22%) of the patients had STEMI, while 102 (78%) had NSTEMI(11).

In a study on the prevalence of ECG unrecognized myocardial infarction and its association with mortality conducted in the Netherlands, MI was found in 1881 (1.2%) of participants and was unrecognized in 431 (22.9%). Men and women under the age of 50 had 34 percent and 55 percent of unrecognized MI, respectively, when compared to the total quantity of MI(12).

The National Heart Attack Alert Program's (NHAAP) working group conducted a systematic review to determine the accuracy of "out of hospital" ECG in the identification of ACI and MI. The random-effects pooled sensitivity for acute MI was 68 percent, the

specificity was 97 percent, and the diagnostic odds ratio was 104 (95 percent CI, 48–224) based on the 8 trials for which data were available(13).

181 ACS patients were involved in a study conducted at Jimma University specialized hospital and Saint Paul Millennium hospital, and roughly (61 percent) were diagnosed with ST-elevation myocardial infarction (STEMI). The average age of the study participants was 55.8 ± 11.9 years, with men accounting for 62.4 percent of the total (14).

2.2.Echocardiography and Myocardial infarction findings

The diagnostic role of echocardiography was investigated in patients brought to the emergency room with a suspected no-ST-segment elevation acute myocardial infarction. 52.5 percent of the 101 individuals in the research had obstructive CAD, while 47.5 percent had no CAD. Regional wall motion abnormalities were detected in 52.8 percent of CAD patients and 43.7 percent of NOCAD patients on echocardiographic evaluation. In the two groups, the left ventricle ejection fraction was $56.4 \pm 6.7\%$ vs. $54.7 \pm 9.8\%$, and the wall motion score index was 1.160.26 vs. 1.210.32 ($p=0.39$), respectively. Age, male gender, typical angina, diabetes, and hypertension were all independent predictors of obstructive CAD in a multivariable logistic regression(15).

2.3. Electrocardiography and Echocardiography

A study of 59 hypertensives and 59 normotensive patients undergoing coronary angiography for chest discomfort compared exercise echocardiography to exercise electrocardiography in the identification of coronary artery disease in hypertension. The sensitivity, specificity, and diagnostic accuracy of exercise echocardiography done before therapy did not differ significantly between the two groups (95 percent, 94 percent, 94 percent in hypertensive and 82 percent, 77 percent, 83 percent in normotensives, respectively), but they were much greater than those found in the activity ECG test (68 percent, 70 percent, and 69 percent, respectively). As a result of these findings, exercise

echocardiography appears to be a more accurate and reliable test than exercise ECG for detecting CAD in both normotensives and hypertensive(16).

Males made up 77.97 percent of the 236 patients admitted with Acute STEMI symptoms, while females made up 22.03 percent. The age group most typically afflicted was 40-60 years old. The most common modifiable risk factor was type 2 diabetes mellitus (36.01 percent). For males, smoking (9.75 percent) and drunkenness (7.63 percent) were significant risk factors. The most common presenting symptom was chest discomfort (72.88 percent). AWMi was more prevalent than IWMi (51.27 percent) (46.19 percent). In 33 percent of patients with Acute IWMi, an RV infarction occurred. In the AWMi group (64.46 percent) and non-thrombolized patients, there were more patients with LVEF 40%. (66.67 percent)(17).

Nine (45%) of the twenty individuals had an STD, whereas 16 (85%) had TWI. STD was found to be associated with a decreased global early diastolic strain rate ($\beta=-5.061$, $p=0.033$) in multivariable analysis. TWI was related with decreased circumferential strain ($\beta=0.132$, $p=0.032$) on its own (18)

A multicenter study included 650 patients with an average age of 55.0 years, 553 men and 97 women. In 408 patients (62.8 percent) of the cohort, both techniques yielded consistent results. The diagnosis of MI by ECG and Echo-2D was unclear in 61 individuals (9.4%). In 181 patients (27.8%), contradictions between ECG and Echo-2D evaluations were observed; in 106 patients, ECG changes were undefined, but clear Echo-2D changes were found; on the other hand, MI was diagnosed by ECG was not verified by Echo-2D in 51 patients. The results were completely inconsistent in 24 patients. 209 patients (32%), identified with myocardial contractility abnormalities in the apical area of the heart by Echo-2D, had distinct MI localization established by ECG: 147 patients had an anterior or anterolateral MI, 28 patients who had a posteroinferior MI, 12 patients who had an apical MI, and 22 patients who had another MI. These findings demonstrate that ECG and Echo-2D are compatible but not interchangeable procedures. (19).

The diagnostic information obtained by M-mode Echo and ECG in chronic trans-mural infarctions was compared in a study of 121 consecutive patients who had coronary angiography for coronary heart disease. ECG and echocardiography findings were identical to those obtained by angiography in 53% of patients. False-positive results were seen in 10% of electrocardiograms and 14% of echocardiograms. False-negative ECG results occurred in 13% of cases, while false-positive echocardiography findings occurred in 25% of cases. With relation to the diagnosis of posterior-wall and anterior-wall infarction, both approaches combined had a specificity of about 100 percent (20).

2.4. Electrocardiography / Echocardiography findings and Outcomes

In a study done in the US on mortality of myocardial infarction by sex, age, and obstructive coronary artery disease status in the ACTION Registry–GWTG age of the participants were age less than 50 years (18%), 50–59 (27%), 60–69 (26%), 70–79 (18%) and 80–89 years (12%). There was a stronger relationship between older age and mortality in patients with MI-CAD Women had a greater risk of post-MI death in comparison to men, a finding that was restricted to patients with MI-CAD and was most pronounced at younger ages (21). In another study from ACTION (Acute Coronary Treatment and Intervention Outcomes Network) Registry–GWTG (Get with the Guidelines) database the in-hospital mortality rate was 4.6% (22).

There were 32 deaths in prospective research by S.B. Prasad et al. with a median follow-up of two years. Significant clinical variables (age, chronic kidney disease, and the extent of coronary artery disease) were the only independent echocardiographic predictors of all-cause mortality in multivariate analysis. Significant DD and left ventricular end-diastolic volume index were the only independent echocardiographic predictors of all-cause mortality in multivariate analysis. Significant DD was the sole independent echocardiographic predictor for individuals with LVEF >35 percent (23).

After an ST-segment elevation myocardial infarction (STEMI), high systolic pulmonary artery pressure (SPAP) has been linked to a poor prognosis. Age, hypertension, baseline LVEF, and baseline left atrial volume were all independent correlates of incident high

SPAP during 12-month follow-up. Spikes in SPAP were shown to be linked with all-cause mortality (hazard ratio 3.84, 95 percent confidence interval 1.76 to 8.39, and p 0.001). Although raised SPAP is uncommon following STEMI, its presence is related to an increased risk of all-cause mortality at follow-up (24).

181 ACS patients were included in a study conducted at Jimma University specialized hospital and Saint Paul Millennium hospital, with an all-cause in-hospital death rate of 20.4 percent and a non-fatal MACE rate of 25 percent. Rural residence (AHR: 3.64, 95 percent CI: 1.81–7.29), symptom onset to hospital arrival > 12 h (AHR: 4.23, 95 percent CI: 1.28–13.81), and Cardiogenic shock (AHR: 7.20, 95 percent CI: 3.55–14.55) were independent predictors of time to in-hospital death among ACS patients (14).

3. Conceptual framework

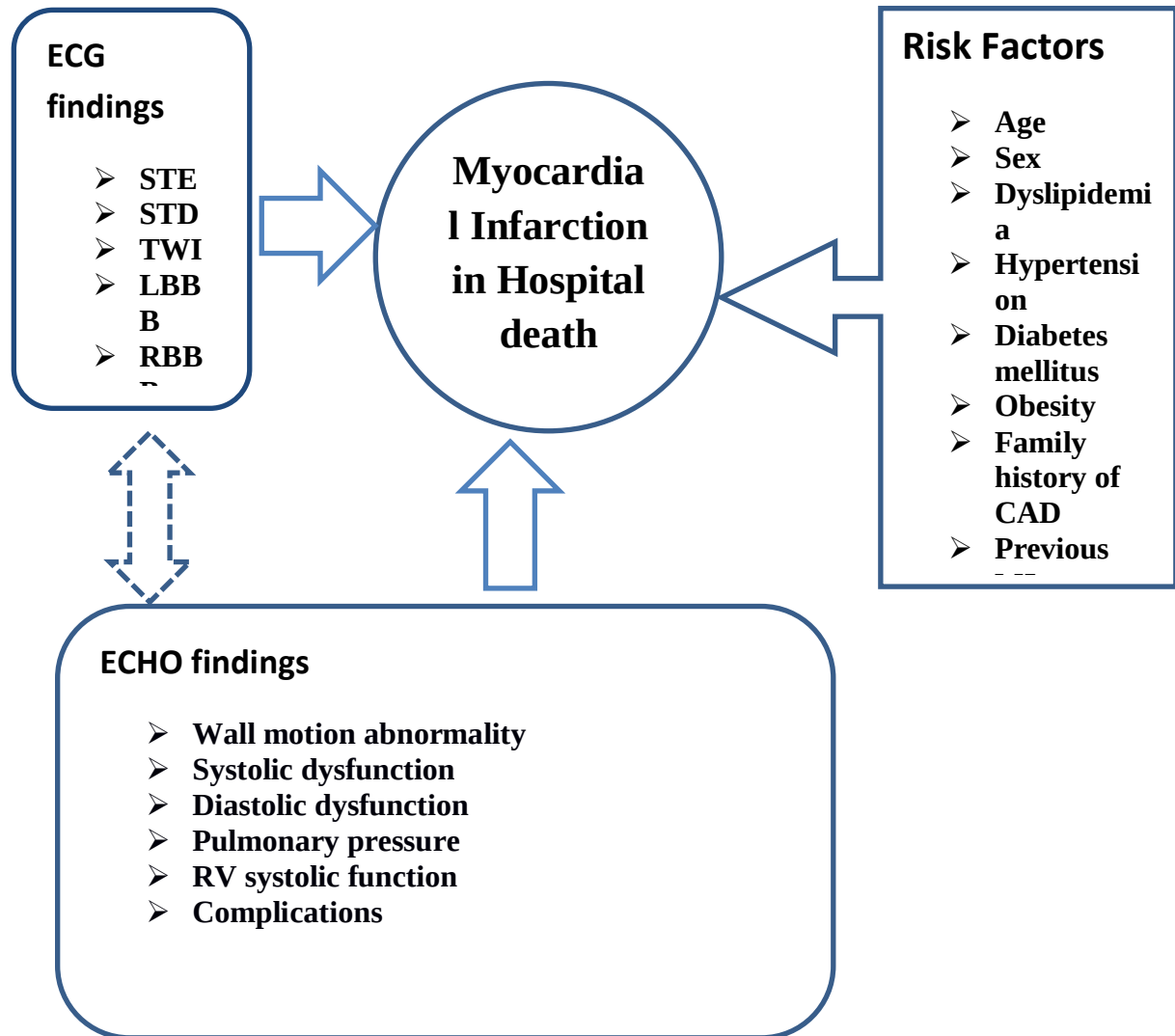


Figure 1 Comparison of ECG and ECHO MI findings, MI risk factors (18, 25)

4. OBJECTIVES

4.1.GENERAL OBJECTIVE

- To identify electrocardiography and echocardiography findings of died Myocardial infarction patients admitted at Tibebe Ghion Specialized Hospital and Felege Hiwot Comprehensive Specialized Hospital from January 2010 E.C to July 2013 E.C.

4.2.SPECIFIC OBJECTIVE

- To determine Electrocardiograph findings among with myocardial infarction patients admitted at TGSH and FHCSH from January 2010 E.C to July 2013 E.C.
- To determine Echocardiography findings among with myocardial infarction patients admitted at TGSH and FHCSH from January 2010 E.C to July 2013 E.C.
- To identify the similarities in locating site of infarction between ECG with Echocardiography findings of myocardial infarction patients admitted at TGSH and FHCSH from January 2010 E.C to July 2013 E.C
- To identify ECG and Echo findings which affect myocardial infarction death in the hospital admitted at TGSH and FHCSH from January 2010 E.C to July 2013 E.C.

5. METHODS AND MATERIALS

5.1. Study area:

The study was conducted at Tibebe Ghion specialized Hospital, and Felege Hiwot Comprehensive Specialized Hospital both are known Hospitals in Ethiopia, found in Bahirdar, Northwest of Addis Ababa (491KM). Both TGSH and FHCSH have in-patient and outpatient department which gives service to patients from the Northwest part of Ethiopia. The study will be conducted in Tibebe Ghion specialized Hospital Felege Hiwot Comprehensive Specialized Hospital to assess Electrocardiography and echocardiography findings and their impact on outcomes of patients with myocardial infarction from July 30 - August 30, 2021.

5.2. Study period:

The study was conducted from July 30 – August 30, 2021

5.3. Study design:

Hospital-based cross-sectional study design employed

5.4. Population

5.4.1. Source population

The source population was all myocardial infarction patients who were admitted at Tibebe Ghion specialized Hospital ICU and Felege Hiwot Hospital ICU.

5.4.2. Study population

Patients with myocardial infarction who were hospitalized to TGSH and FHRH adult ICUs between January 2010 and July 2013 E.C.

5.5. Sample size determination and Sampling Technique

5.5.1. Sample size

The sample size was determined by using the following assumptions. Since there was no study in our country using population proportion of 50%, 95% confidence level (1.96), 5% acceptable margin of error (~400 patients were admitted at ICU of two hospitals from

Jan 2010 to July 2013 E.C with the diagnosis of MI) using EPI info version 7 was 196 giving final sample size 215.

5.5.2. Sampling technique

Simple random sampling was used. The study was conducted on myocardial infarction patients who were admitted in TGSH and FHRH adult ICU from Jan 2010 E.C to July 2013 E.C. The required numbers of samples 215 were fulfilled by selecting their medical registration number from the ICU logbook record.

5.6. Inclusion Criteria/ Exclusion Criteria

5.6.1. Inclusion Criteria

- Patients with troponin, ECG, and Echocardiography fulfilled the fourth universal definition of myocardial infarction.

5.7. Study Variables

5.7.1. Independent Variables:

- Age
- Sex
- Diabetes mellitus
- Smoking
- Hypertension
- Dyslipidemia
- Alcoholism
- Infection
- Drug history
- RVI
- ST-elevation and LBBB on ECG
- Ejection fraction
- Pulmonary hypertension
- Diastolic dysfunction
- Region of the wall motion abnormality

5.7.2. Dependent variables

- In-hospital outcome of myocardial infarction

5.8. Operational Definition

Myocardial infarction - is defined as a clinical (or pathologic) event caused by myocardial ischemia in which there is evidence of myocardial injury or necrosis. Criteria are met when there is a rise and/or fall of cardiac biomarkers, along with supportive evidence in the form of typical symptoms, suggestive electrocardiographic (ECG) changes, or imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

Typical Chest pain- in acute MI has the following characteristics. It's intense and unrelenting, lasting 30-60 minutes. Sub-sternal, and often radiates up to the neck, shoulder, and jaw, and down the left arm. Usually, patients described it as a sub-sternal pressure sensation that also may be characterized as squeezing, aching, burning, or even sharp.

Global LV systolic function -in this study left ventricular ejection fraction (LVEF) is from echocardiography assessment. The grading is mildly depressed (41 to 51 for men and 41 to 53 for women), moderately depressed (30 to 40), and severely depressed (<30).

Pulmonary hypertension- in this study, pulmonary hypertension was defined as a pulmonary artery systolic pressure (PASP) of more than 36 mmHg as determined by echocardiography. Normal PASP (PASP 35mmHg), mild (PASP 36-45mmHg), moderate (PASP 46-60mmHg), and severe PH (PASP >60mmHg) are the four levels of PASP.

Diastolic dysfunction- the finding and grade of diastolic dysfunction in this study are based on the echocardiographer's report, which is rated from mild (grade I) to severe (grade III).

Infections – any site and type of infection other than retroviral infection (RVI) included in this group.

5.9. Data Collection Procedure

Pre-developed data collection format was used to collect data on the patient's socio-demographic characteristics, associated factors, ECG findings, and Echo findings. ECG Manifestations Suggestive of Acute MI(In the Absence of LVH and BBB) ST-elevation (New ST-elevation at the J-point in 2 contiguous leads with the cut-point: ≥ 1 mm in all leads other than leads V 2–V3 where the following cut points apply: ≥ 2 mm in men ≥ 40 years; ≥ 2.5 mm in men <40 years, or ≥ 1.5 mm in women regardless of age) & ST-depression and T wave changes (New horizontal or downsloping ST-depression ≥ 0.5 mm in 2 contiguous leads and/or T inversion > 1 mm in 2 contiguous leads with prominent R wave or R/S ratio > 1).ECG Changes Associated With Prior MI (In the Absence of

LVH& BBB) Any Q wave in leads V2–V3 >0.02 s or QS complex in leads V2–V3. Q wave ≥ 0.03 s and ≥ 1 mm deep or QS complex in leads I, II, aVL, aVF, or V4–V6 in any 2 leads of a contiguous lead grouping (I, aVL; V1–V6; II, III, aVF). * R wave >0.04 s in V1–V2 and R/S >1 with a concordant positive T wave in absence of conduction defect(1).

5.10. Data Quality Assurance

The data was collected by year three internal medicine residents. The training was given on how to collect the data. Data collection was supervised by the principal investigator internal medicine resident.

5.11. Data Processing and Analysis

The principal investigator checked the collected data and incomplete checklists were cleaned, checked for quality before data entry. Data were collected and analyzed using SPSS software program version 25. Characteristics of the study population were described by descriptive statistics. Multicollinearity checked for continuous variables; ROC curve and Holmes and Lemeshow test checked for model fitness. Binary logistic regression is used to see ECG/Echo findings or other factors that impact the outcome of patients (in-hospital death). First each variable entered in simple binary logistic regression analysis those with p-value <0.25 re-entered to multivariate binary logistic regression. Finally, the result is presented by tables, graphs, and percentages according to the type of data.

5.12. Pretest

One week before the actual survey pretest was carried out in similar socio-demographic characteristics, ECG and Echo findings, on 5% of sample size and necessary modification of the checklist was made.

5.13. Ethical Considerations

Ethical clearance was obtained from Bahir Dar University Ethics Review Committee. A support letter was sent to Tibebe Ghion Specialized Hospital and Felege Hiwot Compressive Specialized Hospital. Names were not used in collecting the data. Confidentiality was maintained by keeping the data collection forms locked in a secure cabinet and the electronic data file was kept securely in a password-protected computer. Data obtained in the course of the study was only handled by the research team.

5.14. Dissemination

The finding of this study will be disseminated through publications, presentations at scientific meetings, and conferences. The finding of the study will be forwarded to Bahirdar University, Tibebe Ghion specialized hospital, Felege Hiwot Referral Hospital, and Amhara National Health Bureau.

6. RESULTS

6.1. Clinical parameters and comorbidities

i. Age, Sex and clinical presentation of Patients

Out of 215 patients admitted with the diagnosis of MI 203 (94.4%) patients who fulfill the fourth definition of myocardial infarction were involved in this study. From those 203 patients; 137(67.5 %) are males and 66(32.5%) are females. The mean age with SD of the participant is 59 ± 13.8 years (*Figure 1*). 80.3% of patients presented with typical chest pain for myocardial infarction. Shortness of breath (27.1%), diaphoresis (25.6%), and epigastric burning pain (16.7%) are symptoms of patients in addition to chest pain. In terms of Killip's class of the patients, 47.8% were Killip's class I and 20.2 % were Killip's class III.

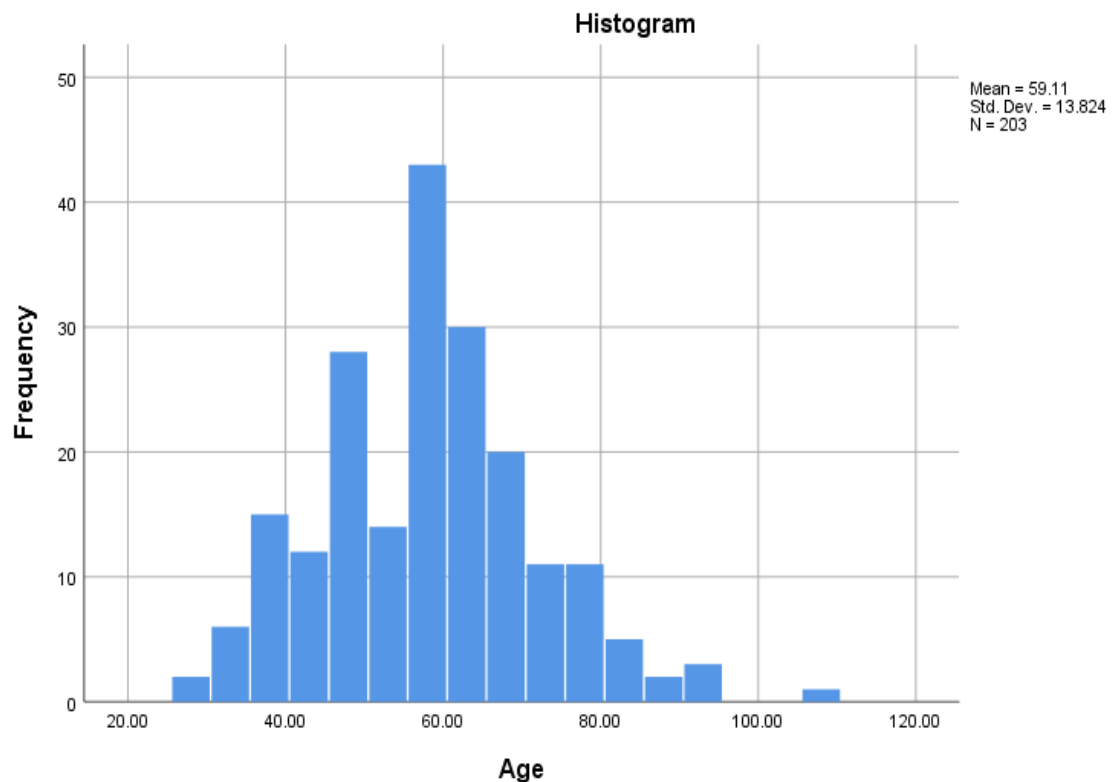


Figure 2: Age distribution of myocardial infarction patients at TGS and FHRH August 2021

Table 1: Sex and clinical parameters of myocardial infarction patients at TGSH and FHRH August 2021

Variables	Categories	Frequency	Percent (%)
Age categories	< 50 years	63	31
	50-59 years	28	13.8
	60-69 years	64	31.5
	70-79 years	32	15.8
	80 years and above	16	7.9
	Total	203	100
SEX	Male	137	67.5
	Female	66	32.5
	Total	203	100
Chest Pain	Typical	163	80.3
	Atypical	23	11.3
	No chest pain	17	8.4
	Total	203	100
Killip's Class	Class I	97	47.8
	Class II	29	14.3
	Class III	41	20.2
	Class IV	31	15.3
	Not documented	2	1
	Total	200	98.5

ii. Comorbidities and Risk factors

Out of 203 patients admitted with the diagnosis of myocardial infarction 47.3% of patients had hypertension, 25.1% had diabetes mellitus (type II), 7.4% had RVI and 7.4% had dyslipidemia (*Table 2*). 18.7% of patients who had infections other than RVI from these community-acquired pneumonia accounts for the most (76.9%). From myocardial infarction patients having hypertension only 39 (40.6%) were on treatment, 21 (21.8%) were not on treatment and the rest 26% were having newly diagnosed hypertension. From diabetic patients having MI 75% were on treatment and 7.6% were not on treatment. All of RVI patients were on HAART.

Table 2: Comorbidities and risk factors of Myocardial infarction patients at TGSB and FHRH August 2021

Variables	Categories	Frequency	Percent (%)
Diabetes mellitus	Yes	51	25.1
	No	152	74.9
Hypertension	Yes	96	47.3
	No	107	52.7
Smoking	Current Smoker	8	3.9
	Previous Smoker	2	1
	No Smoking	193	95.1
Alcoholism	Yes	10	4.9
	No	193	95.1
Dyslipidemia	Yes	15	7.4
	No	114	56.2
	Lipid profile not done	74	36.5
RVI status	Yes	15	7.4
	No	188	92.6
Infection	Yes	38	18.7
	No	165	81.3
Ischemic stroke	Yes	9	4.4
	No	194	95.4
Total		203	100

6.2. Electrocardiogram and Echocardiography findings

6.2.1) Electrocardiograph findings

In this study 66.5% (135) of patients had STEMI, 20.7% (42) had NSTEMI and 12.8 % (26) had no ECG changes. 66.5% of the patients had ST-elevation, 10.8% T-wave inversion, 8.9% ST-depression and 6.4% had LBBB (Figure 3). ECG anatomic location of infarct anterior wall accounts for 32% (65) and anterio-septal accounts for 25.1% (51 patients).

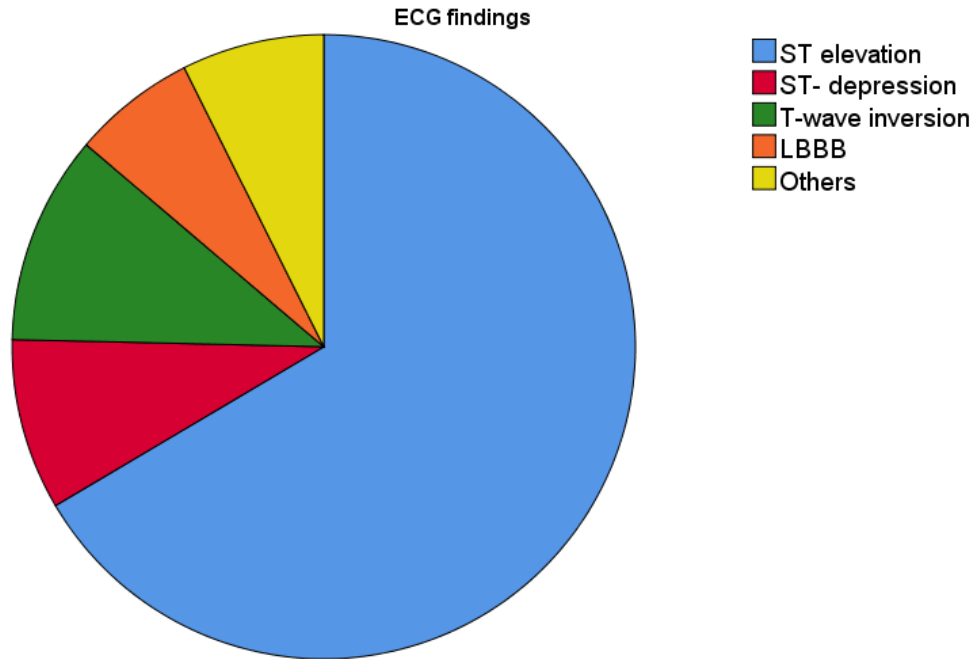


Figure 3 common ECG findings of patients Myocardial infarction patients at TGSH and FHRH August 2021

Table 3: location infract by electrocardiogram of patients Myocardial infarction patients at TGSH and FHRH August 2021

ECG location infract	Frequency	Percent
Anterior wall	65	32
Antero-septal	51	25.1
Antero-lateral	26	12.8
Inferior wall	23	11.3
Multiple	8	3.9
No specific location	30	14.8
Total	203	100

6.2.2) Echocardiography findings

Regarding the echocardiography results of the study 146(71.9%) patients had echocardiography from those 122 (83.5%) had findings for ischemic heart disease and 24 (11.8%) of the patients had no findings suggestive for ischemic heart disease. For 57(28.1%) of patients, echocardiography was not done. Systolic functions of those participants 60(41.1%) had mildly reduced ejection fraction and 46(31.5%) had normal ejection fraction. 112 (76.7%) of patients had no diastolic dysfunction and 31 (21.2%) of

them had grade I diastolic dysfunction. 82.9% (121) of patients had normal pulmonary arterial pressure, 97.3% (142) had normal TAPSE and 78.8% (145) had hypo-kinesis wall motion score index. Regarding regions of infarct anteroapical accounts for 54.1% (79) of patients and infero-basal accounts for 14.4% (21).

Table 4: Echocardiographic localization of segmental wall motion abnormalities of Myocardial infarction patients at TGSH and FHRH August 2021

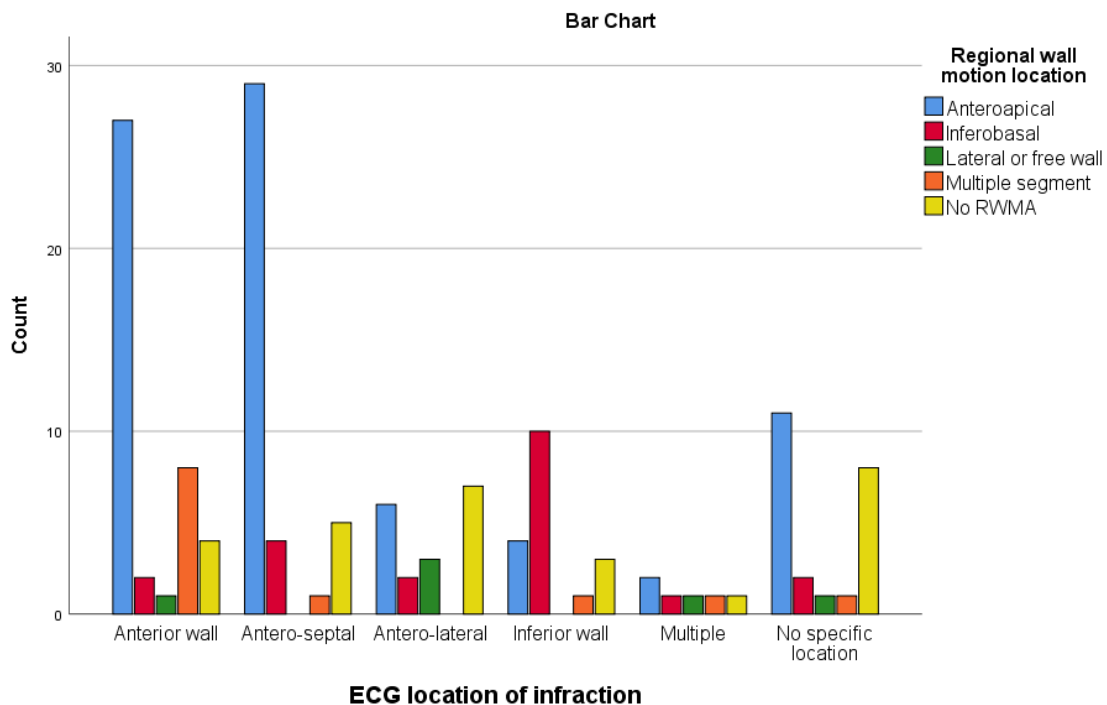
	Segment/Region	Frequency	Percent
Wall motion segmental location	Anterior wall(Base/Mid)	7	3.4
	Anterio-septal(Base/Mid)	25	12.3
	Anterio-lateral(Base/Mid)	6	3
	Septal only (Base/Mid)	9	4.4
	Inferior wall(Base/Mid)	5	2.5
	Apex(Anterior/Septal/Lateral/Inferior)	25	12.3
	Inferio-lateral(Base/Mid) or Posteriolateral	10	4.9
	Multiple segments	31	15.3
	No RWMA	28	13.8
Regional wall motion abnormality location	Anteroapical	79	38.9
	Inferobasal	21	10.3
	Lateral or free wall	6	3
	Multiple segments	12	5.9
	No RWMA	28	13.8
	Total	146	71.9

Regarding myocardial infarction complications detected by echocardiography 9 patients (6.2%) had LV thrombus, 18 patients (12.3%) mild mitral regurgitation and 115 patients (78.8%) had no complications detected.

6.2.3) Association between Electrocardiography and Echocardiography findings

Of those patients who had both ECG and Echo 13 %(19 patients) had ECG suggestive of MI but no RWMA on Echo and 10.2 %(15 patients) had no suggestive ECG finding for MI but had Echo finding suggestive of MI (there was RWMA). Allover there was a 23.2% inconsistency between electrocardiogram and echocardiography findings in suggesting myocardial infarction. In 78 (53.4%) of patients having both ECG and Echo, there was a consistency to show the regional location of the infarction (*Figure 4*). We

analyzed the association of the electrocardiogram location of infarct and echocardiography regional wall motion abnormality with chi-square (2-sided) the p-value ($p < 0.001$) so there is an association. Out of 17.1% of patients had apical hypokinesis detected by Echo; from those 25 patients with apical hypokinesis 32 % had antero-septal MI on ECG, 24% had anterior wall MI (56% of apical hypo-kinesis has antero-septal and anterior wall MI on ECG).



*Figure 4: ECG location of infarct * Regional wall motion abnormality of Myocardial infarction patients at TGS and FHRH August 2021*

6.3. Electrocardiography and Echocardiography predictors of in-hospital outcomes

6.3.1) Outcomes

Out of 203 patients admitted from Jan 2010 E.C to Jun 2013 E.C, 46 (22.7%) of patients died and 144 (70.9%) of them discharged improved (*Figure 5*).

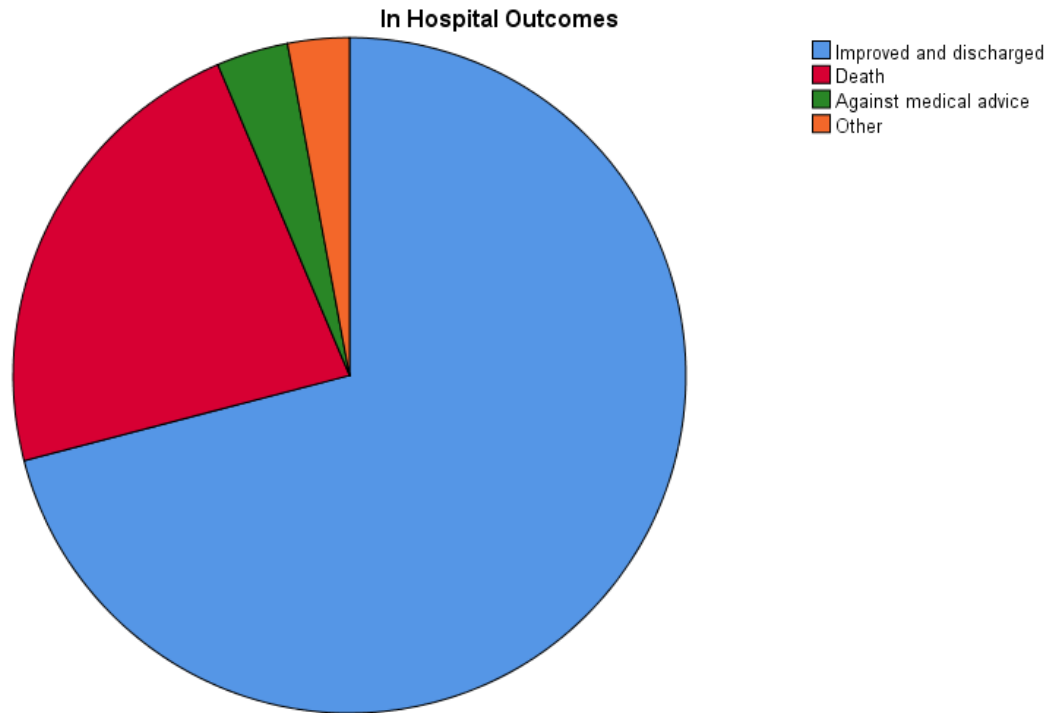


Figure 5: In-hospital outcome of Myocardial infarction patients at TGS and FHRH August 2021

6.3.2) Predictors of in-hospital outcomes

When we see the in hospital all-cause mortality 46 (24.2%) patients died out of 190 patients and the other 13 patients were unknown whether they died or not. When the death compared to each ECG findings of MI in this study out of 12 patients with LBBB 6 died (50%) while STEMI (22.2%); based on ECG location of infarct higher in patients with anterior wall MI 32.2 % (20/62) patients died. When the death compared in each Echo findings; ejection fraction higher in those EF<30% 4 died out of 11 patients (36.3%), based on the location of regional wall motion abnormality higher in those with inferobasal MI 28.5% and location of segmental wall motion abnormality higher in those with inferolateral/posterior-lateral 40% of them died; 5 died out of 7 patients with severe pulmonary hypertension (71.4%) and 4 died out of 10 patients with moderate pulmonary hypertension (40%). When the mortality compared by risk factors and comorbidities categories higher in the age above 80 years (38.46%), 32.2% in those from 70 to 79 years, higher in females (30.6%), higher in those having infections (44.4%), and higher in those having an ischemic stroke (55.5%).

Using multivariate logistic regression analysis findings that had statistical significant association with in-hospital death were pulmonary hypertension ($p < 0.001$, AOR: 2.65, 95% CI: 1.53-4.60), inferobasal regional wall motion abnormality ($p = 0.032$, AOR: 4.36, 95% CI: 1.133-16.833); killip's class ($P < 0.001$, AOR: 4.54, 95% CI: 2.81-7.31), and Infections ($p = 0.019$, AOR: 3.15, 95% CI: 1.21-8.19)(Table 5).

Table 5: Multivariate logistic regression analyses (Binary logistics) of factors in died Myocardial infarction patients at TGSH and FHRH August 2021

Variable	Categories	In-Hospital Death		P-Value	AOR	95% Confidence interval for AOR	
		Yes	No			Lower	Upper
Age (in years)	50-59	6	19	0.270	2.495	0.492	12.655
	60-69	17	45	0.508	1.521	0.439	5.269
	70-79	10	21	0.739	1.283	0.296	5.569
	≥ 80	5	19	0.54	1.716	0.305	9.652
	<50 years	8	51		1		
Sex	Female	19	43	0.093	2.321	0.868	6.202
	Male	27	101		1		
Hypertension	Yes	18	71	0.35	0.645	0.257	1.618
	No				1		
Killip's class	II, III, IV	38	28	<0.001	4.54	2.819	7.312
	I	8	111		1		
Infection	Yes	16	20	0.028	3.152	1.212	8.197
	No	30	124		1		
STEMI	Yes	28	98	0.776	1.121	0.51	2.465
	No	18	46		1		
LBBB	Yes	6	6	0.098	3.013	0.816	11.127
	No	40	138		1		
Pulmonary Hypertension	Mild-Severe	10	13	<0.001	2.659	1.535	4.607
	No	10	104		1		
Infero-basal WMA	Yes	6	15	0.032	4.367	1.133	16.833
	No	14	102		1		
Ejection fraction	Mild-Severe	9	27	0.523	1.696	0.336	8.561
	Normal	11	90		1		

7. Discussion

In this study, there was a 23.2% inconsistency between electrocardiogram and echocardiography findings for MI and 22.7% of patients died. The all-cause mortality 22.7% (95% CI 18.4-30.5%) was closer to the study done at Saint pitter hospital and Jimma university hospital, Ethiopia, all-cause in-hospital mortality rate was 20.4% (14); this may be because the two study areas had closer socio-demography and the sample size of both studies was comparable. The in-hospital mortality in our setup is 5 times higher than the report from the ACTION (Acute Coronary Treatment and Intervention Outcomes Network) Registry–GWTG (Get With the Guidelines) in-hospital mortality rate was 4.6% (22); This could be because most hospitals have a cardiac center with revascularization procedures such as percutaneous coronary intervention (PCI), but our hospital does not.

Of those patients who had both ECG and Echo, 13% had ECG suggestive of MI but no RWMA on Echo, and 10.2% had no suggestive ECG finding for MI but had Echo finding suggestive of MI (had RWMA). Allover there was a 23.2% inconsistency between electrocardiogram and echocardiography findings; this result is closer to the multi-center study done by Kuch, J. et al 27.8% the inconsistencies of ECG and Echo-2D evaluations were demonstrated(19); this may be because of comparable sample size between the two studies. In another way from those who had evidence of MI on both ECG and Echo 30 patients (20.5%) had inconsistent infract location on ECG infarct location and Echo regional wall motion abnormality; this result is different from the above study 3.7% of patients entirely inconsistent results were shown(19); this may be due to the use of poorly standardized electrocardiogram machine in our setup and different socio-demography of the two study areas. Out 17.1% of patients had apical hypokinesis detected by Echo; 32% had anteroseptal MI on ECG, 24% had anterior wall MI (56% of apical hypo-kinesis has anteroseptal & anterior wall MI on ECG) and it is different from the result found in the study done by Kuch, J. et al, Poland 209 patients (32%) with myocardial contractility disorders in the apical region of the heart diagnosed by Echo-2D showed different MI localization as determined by ECG(19); this may be because of the reason mentioned above.

When the death compared to each ECG findings of MI in this study out 12 patients with LBBB 6 died (50%) while STEMI (22.2%); based on ECG location of infract higher in patients with anterior wall MI 32.2 % (20/62) patients died. When the death compared in each Echo findings; ejection fraction higher in those EF<30% 4 died from 11 patients (36.3%), based on the location of regional wall motion abnormality higher in those with inferobasal MI 28.5% and location of segmental wall motion abnormality higher in those with inferolateral/posterior-lateral 40% of them died; 5 died out of 7 patients with severe

pulmonary hypertension (71.4%) and 4 died out of 10 patients with moderate pulmonary hypertension (40%). Pulmonary hypertension detected by Echo had a statistically significant association ($p < 0.001$, AOR:2.65, 95% CI: 1.53-4.60) with all-cause mortality of MI patients and it is closer to the result found in the study done by Marlieke et al incident elevated SPAP was independently associated with all-cause mortality (hazard ratio 3.84, 95% CI 1.76 to 8.39, $p < 0.001$)(24); there is the sample size difference between the two studies but the statistical significance similarity may be due to pulmonary hypertension affects the lung function of oxygen exchange and fastens mortality in already affected myocardial muscle. In our study older patients had higher mortality and higher in females than males too; this finding is similar to the study done by Smilowitz, N.R. this may be due to older patients having multiple comorbidities in any parts of the world and females presented with atypical symptoms and arrived late at the hospital as a result.

In this study, 67.5 % are males 32.5% females and the mean age was 59 (59+/-14) and it is closer to 97 men (74%) and 34 women (26%), with a mean age of 64±13 years(11); this may be due to myocardial infarction and other ischemic heart disease affects males more than females worldwide. 78.7% of patients presented with typical chest pain and it is close to the study in India 88% presented with chest pain and 41% with breathlessness(8) and closer result in other study done in India, chest pain was the most common presenting symptom (72.88%)(17); this can be explained by the nature of the disease, the physiology and anatomic location of the heart is similarity. In our study 47.3% of patients had hypertension, 25.1% had diabetes mellitus (type II), 7.4% had RVI and 7.4% had dyslipidemia only number of hypertension patients had closer to the study done in India 49% had diabetes, 44% had hypertension and 30% were obese. 24% were smokers and 42% had a family history of similar illness(8); the difference may be because this study was prospective and sensitive history parts like smoking can be easily asked but in our study, it is retrospective and difficult to find documented substance use history on the chart. But it was closer to the study done in Thanjavur, India Type II diabetes mellitus was the most common modifiable risk factor (36.01%). Smoking (9.75%) and alcoholism (7.63%) contributed as significant risk factors for males (17); this may be because of a comparable sample size.

In this study 66.5% of patients had STEMI and 20.7% had NSTEMI when compared to other studies it is different from a study done in USA STEMI constitute 40% of all AMIs(7); this may be due to socioeconomic difference, the community awareness of the disease early arrival to the hospital and early screening for ischemic heart disease for those at risk persons in the USA. In this study, 66.5% of the patients had ST-elevation, 10.8 % T-wave inversion, 8.9% ST-depression and it is different from done at Tampere University, Finland out of twenty patients nine (45%) patients had STD, and 16 (85%) patients had TWI(18); this may be because the study done at Finland was done only on

patients with NSTEMI. In this study by ECG finding AWMi accounts for 32.4 % and IWMI accounts for 11.2 % it is closer to study at India AWMi (51.27%) was more common than IWMI (46.19%)(17) since AWMi is more common than IWMI. The ejection fraction of the participants 26.6% had EF<40% and 69% had EF< 51%, based on the location of infarct AWMi by ECG 32.5% of those had EF<40%, based on ECHO patients having AWMi 42.8% of them had EF<40% and it is different from the study done in south India there were more patients with LVEF <40% in AWMi group (64.4%) (17); this may be because of the time of echocardiography difference during the hospital stay and way of ejection fraction estimation may be different by the echocardiographer at two study areas.

8. Limitations

Some limitations in this study: it is a retrospective study and incomplete documentation. Some sensitive parts of medical history like smoking, alcoholism, and chat chewing were not documented. Echocardiography was not done for most of the patients who died within a few days of admission.

9. Conclusion

To conclude, in this analysis, we explored the electrocardiogram and echocardiographic findings association and their impact on the in-hospital outcome of myocardial infarction patients. STEMI and anterior wall MI's are more common than NSTEMI and other locations of infarct detected by ECG, respectively. Anterior-apical regional wall motion abnormality is a more common finding on echocardiography; based on the segment of wall motion abnormality antero-septal hypokinesis(base and mid) is more common than other segments other than multiple segments. In around half of the cases, there are consistencies between ECG and ECHO in locating the site of the infarction. Hypertension and type II diabetes are the two identified comorbidities.

The mortality of MI is by far higher than other parts of the world mortality reports. The mortality was proportionally higher Killip's class IV, patients with age above 80 years, females, the patient having an infection, patients with ischemic stroke, patients with LBB, higher grade Diastolic dysfunction, severe pulmonary hypertension, and inferolateral segment (or inferobasal regional) wall motion abnormality. But Killip's class, pulmonary hypertension, infection, and inferobasal regional wall motion abnormalities are significantly associated with the in-hospital mortality of patients with myocardial infarction.

10. Recommendation

The hospitals especially Tibebe Ghion Specialized hospital should go forward to have a cardiac center equipped with coronary angiography and reperfusion therapy (like percutaneous coronary intervention).

The regional health bureau and government should participate in providing some drugs useful for the management of Killip's class IV patient's mainly myocardial infarction complications like cardiogenic shock.

Because pulmonary hypertension is an independent predictor of in-hospital mortality in myocardial infarction patients, intensive care unit staff should consult a cardiologist and closely monitor those patients.

For both hospitals, real-time echocardiogram, standardized electrocardiogram, and ECG monitor should be available both at emergency and intensive care units all the time.

The regional health bureau in collaboration with the hospitals or public health institutes to control the modifiable risk factors of myocardial infarction hypertension and type II diabetes mellitus; gives information for high-risk patients regarding chest pain of myocardial infarction and onetime arrival to the hospitals.

REFERENCES

1. Thygesen K, Alpert JS, Jaffe AS, Chaitman BR, Bax JJ, Morrow DA, et al. Fourth Universal Definition of Myocardial Infarction (2018). *Circulation*. 2018;138(20):e618-e51.
2. Harrison TR, editor. *Harrison's Principles of Internal Medicine*. 20th edition ed: McGraw-Hill Education; 2018.
3. Braunwald DE. *Braunwald's Heart Disease_ A Textbook of Cardiovascular Medicine*. 12 ed. Zipes DP, Libby P, Bonow RO, Mann DL, Tomaselli GF, editors 2018. 5174 p.
4. Krishnamoorthy VK, Sengupta PP, Gentile F, Khandheria BK. History of echocardiography and its future applications in medicine. *Critical care medicine*. 2007;35(8 Suppl): S309-13.
5. Maryam Esmaeilzadeh M, FACC, FCAPSC,, Mozghan Parsaee M, Majid Maleki M, FACC, FCAPSC. The Role of Echocardiography in Coronary Artery Disease and Acute Myocardial Infarction. *The Journal of Tehran University Heart Center*1. 2012;8(1):1-13.
6. Bekele Alemayehu Shashu¹, Ayele¹ MA. The pattern of coronary artery diseases as diagnosed by coronary angiography and the outcome of Percutaneous Coronary Intervention (PCI) in Ethiopia. *Ethiop J Health Dev* 2014;28(1):11-6.
7. Hayat SA, Senior R. Myocardial contrast echocardiography in ST-elevation myocardial infarction: ready for prime time? *Eur Heart J*. 2008;29(3):299-314.
8. Gautam D, Gaude R, Jain D, Singh G, Das P, Choudhury A, et al. Study of coronary angiographic correlation with electrocardiography in patients of acute coronary syndrome-ST-elevation myocardial infarction. *Heart India*. 2018;6(4):115.
9. Ferreira ARPA, Silva MVd, Maciel J. Electrocardiogram in Acute Myocardial Infarction: What to Expect? *International Journal of Cardiovascular Sciences*. 2016; 29(3):198-209.
10. Benjamin B, Dyna D, Francy L. Correlation between the diagnostic accuracy of the electrocardiogram and coronary angiography in localization of occluded artery in acute ST-elevation myocardial infarction: A single-center experience. *Heart India*. 2019;7(3):105.
11. Sanaani A, Yandrapalli S, Jolly G, Paudel R, Cooper HA, Aronow WS. Correlation between electrocardiographic changes and coronary findings in patients with acute myocardial infarction and single-vessel disease. *Ann Transl Med*. 2017;5(17):347.
12. van der Ende MY, Hartman MHT, Schurer RAJ, van der Werf HW, Lipsic E, Snieder H, et al. Prevalence of electrocardiographic unrecognized myocardial infarction and its association with mortality. *International journal of cardiology*. 2017;243:34-9.
13. Patrick H. Ginn M, MBA, Barbara Jamieson, MLS. How accurate is the use of ECGs in the diagnosis of myocardial infarct? *Family Physicians Inquiries Network* 2006.
14. Fanta K, Daba FB, Tegene E, Melaku T, Fekadu G, Chelkeba L. Management quality indicators and in-hospital mortality among acute coronary syndrome patients admitted to tertiary hospitals in Ethiopia: prospective observational study. *BMC Emerg Med*. 2021;21(1):41.
15. L. MANFREDONIA GAL, F. CRUDO, P. LAMENDOLA, F. GRAZIANI,, A. VILLANO GL, V. MELITA, E. MENCARELLI, F. PENNISTRÌ,, A. LOMBARDO ADV, S.E. RAVENNA, A. BISIGNANI, F. CREA. Diagnostic role of echocardiography in patients admitted to the emergency room with suspect no-ST-segment elevation acute myocardial infarction. *European Review for Medical and Pharmacological Sciences*. 2019;23: :826-32.
16. Anna Maltagliati MB, Manuela Muratori, Gloria Tamborini, Dennis Zavalloni,, Giovanni Berna aMP. Exercise Echocardiography Versus Exercise Electrocardiography in the Diagnosis of Coronary Artery Disease in Hypertension. *AJH*. 2000;13 (7).
17. Gopalakrishnan S, Govindharaju A. Clinical, E.C.G. And Echocardiographic Profile of Patients Presenting with Acute St Elevation Myocardial Infarction (Stemi) in a Tertiary Care

Institute at Tamilnadu, South India. *Journal of Evidence-Based Medicine and Healthcare*. 2018;5(45):3131-6.

18. Tuohinen SS, Rankinen J, Skytta T, Huhtala H, Virtanen V, Kellokumpu-Lehtinen PL, et al. Associations between ECG changes and echocardiographic findings in patients with acute non-ST elevation myocardial infarction. *J Electrocardiol*. 2018;51(2):188-94.

19. Kuch J, Braksator W, Sczaniecka O, Szwed H, Sadowski Z, Ruchalski M, et al. [Localization of myocardial infarction with the help of EKG and two-dimensional echocardiography. Controversies]. *Kardiologia Polska*. 1993;38(1):21-5.

20. Koenig W, Gehring J, Kollmann G, Schinz A, Beckmann R, Mathes P. [Electrocardiogram and M-mode echocardiography in the diagnosis of chronic transmural infarct. Correlations and determination of the accuracy of both methods based on quantitative levocardiography]. *Dtsch Med Wochenschr*. 1983;108(14):538-44.

21. Smilowitz NR, Mahajan AM, Roe MT, Hellkamp AS, Chiswell K, Gulati M, et al. Mortality of Myocardial Infarction by Sex, Age, and Obstructive Coronary Artery Disease Status in the ACTION Registry-GWTG (Acute Coronary Treatment and Intervention Outcomes Network Registry-Get With the Guidelines). *Circ Cardiovasc Qual Outcomes*. 2017;10(12):e003443.

22. McNamara RL, Kennedy KF, Cohen DJ, Diercks DB, Moscucci M, Ramee S, et al. Predicting In-Hospital Mortality in Patients With Acute Myocardial Infarction. *Journal of the American College of Cardiology*. 2016;68(6):626-35.

23. Sandhir B, Prasad a, Kristyan B, Guppy-Coles a, David Holland b, Tony Stanton b, Rathika Krishnasamy b, Gillian Whalley d JJAa, Liza Thomas. Echocardiographic predictors of all-cause mortality in patients with left ventricular ejection fraction N35%: Value of guideline-based assessment of diastolic dysfunction. *IJC Heart & Vasculature*. 24:6.

24. Haecck ML, Hoogslag GE, Boden H, Velders MA, Katsanos S, Al Amri I, et al. Prognostic Implications of Elevated Pulmonary Artery Pressure After ST-Segment Elevation Myocardial Infarction. *The American journal of cardiology*. 2016;118(3):326-31.

25. Desta DM, Nedi T, Hailu A, Atey TM, Tsadik AG, Asgedom SW, et al. Treatment outcome of acute coronary syndrome patients admitted to Ayder Comprehensive Specialized Hospital, Mekelle, Ethiopia; A retrospective cross-sectional study. *PLoS One*. 2020;15(2):e0228953.

Annex II: Data checklists format

Bahir Dar University College of Public Health and Medical Sciences, Department of Internal Medicine

Data Checklist format

This checklist will be applied to a retrospective chart of myocardial infarction patients who were admitted at TGS and FHRH adult ICU to assess the association of Electrocardiography findings and echocardiography findings and their effect on the outcome of patients with myocardial infarction at TGS and FHRH.

Direction: - The checklist should be filled by the data collector. Please encircle or fill in the blank space provided for each question appropriately.

1. Socio-demographic Characteristics

- 1.1. MRN: _____ sex: - 1. Male 2. Female
- 1.2. Age _____
- 1.3. Weight _____ Height _____ BMI _____

2. Clinical

- 2.1. Patient presentation symptoms
 - 2.1.1. Chest pain [1)typical 2: atypical 3: no chest pain]
 - 2.1.2. Others [1) Shortness of breath 2) palpitation 3) dizziness 4) nausea/vomiting 5) Abdominal pain 6) Epigastria burning pain 7) others
- 2.2. Killip's class at the time of presentation 1) class- I 2) class-II 3) class-III 4)class IV 5)not documented
- 2.3. Prior MI 1)Yes 2)No
- 2.4. Prior coronary interventions 1)Yes 2)No
- 2.5. Cardiovascular risk factors
 - 2.5.1. Family History of IHD 1)yes 2)no
 - 2.5.2. Diabetes mellitus 1)Yes 2)No
 - 2.5.3. Hypertension 1)Yes 2)No
 - 2.5.4. Smoking 1)Current 2)Previous 3)No smoking
 - 2.5.5. Alcoholism 1)Yes 2)No
 - 2.5.6. Dyslipidemia 1)Yes 2)No
 - 2.5.7. Peripheral vascular disease 1)Yes 2)No
 - 2.5.8. Connective tissue disease (RA, SLE)
 - 2.5.9. Other CV disease _____
- 2.6. Drug therapy on admission (if yes chose the ff), No
 - 1. Beta-blockers

2. Calcium channel blockers
3. ACE inhibitors /ARBs
4. Statins
5. Diuretics
6. Diabetic medications (1. Insulin 2. Metformin 3. Others)
7. Aspirin
8. Clopidogrel
- 2.7. Inflection 1. Yes, 2. No (if yes)
 1. Atypical pneumonia
 2. CAP
 3. Dental infection
 4. Others -----
- 2.8. RVI 1. Yes, 2. No -----if yes
 1. On HAART -----A. yes (____yrs) B. no
 2. Duration -----

3. Investigations

- 3.1. Troponin I 1. Elevated (____X) 2. Normal

3.2. Electrocardiogram

- 3.2.1. At the time of presentation - 1. STEMI 2. NSTEMI 3. Normal ECG
- 3.2.2. ECG changes associated with prior MI (1. Yes 2. No).....if yes
 1. Any Q wave in leads V2–V3 >0.02 s or QS complex in leads V2–V3
 2. Q wave ≥ 0.03 s and ≥ 1 mm deep or QS complex in leads I, II, aVL, aVF, or V4–V6 in any 2 leads of a contiguous lead grouping (I, aVL; V1–V6; II, III, aVF).
 3. R wave >0.04 s in V1–V2 and R/S >1 with a concordant positive T wave in absence of conduction defect.
- 3.2.3. ST elevation
 1. Anterior wall (V1-V6 and I & aVL)
 2. Anterio-septal (V1-V3)
 3. Anterio-lateral (V4-V6)
 4. Inferior wall & RV (II, III, aVF and V3R & V4R)
 5. Posterior wall (V7-V9 & dep on V1-V2)
 6. Inferior-posterior (V7-V9 and II, III & aVF)
 7. Multiple -----&----- &-----
- 3.2.4. ST depression
 1. Anterior wall (V1-V6 and I & aVL)
 2. Anterio-septal (V1-V3)
 3. Anterio-lateral (V4-V6)
 4. Inferior wall & RV (II, III, aVF and V3R & V4R)

5. Posterior wall (V7-V9 & dep on V1-V2)
 6. Inferior-posterior (V7-V9 and II, III & aVF)
 7. Multiple -----&----- &-----
- 3.2.5. T wave inversion
1. Anterior wall (V1-V6 and I & aVL)
 2. Anterio-septal (V1-V3)
 3. Anterio-lateral (V4-V6)
 4. Inferior wall & RV (II, III, aVF and V3R & V4R)
 5. Posterior wall (V7-V9 & dep on V1-V2)
 6. Inferior-posterior (V7-V9 and II, III & aVF)
 7. Multiple -----&----- &-----
- 3.2.6. Other findings
1. Hyper acute T waves 2) RV strain patterns 3) Low voltage ECG
 - 4) New onset BBB 5) LVH 6) aVR ST elevation $\geq$ V1 7)
 - Others _____

3.3. Echocardiography

- i. Any echo finding of MI 1) Yes 2) No
- ii. Systolic function
 1. Ejection fraction _____
 1. <30 2) 30-40 3) 40-55 4) >55
- iii. Diastolic dysfunction
 1. Grade I DD 2. Grade II DD 3. Grade III DD
- iv. Others
 - 1.3.3.1. RV function (TAPSE-----, RV strain (a) yes b) no
 - 1.3.3.2. PA pressure----- (a) mild b) moderate c) severe
 - 1.3.3.3. Strain 1. LV strain 2. RV strain
 - 1.3.3.4. Other specify _____
- 1.3.4. Wall motion abnormality
 - 1.3.4.1. Wall motion score index
 1. Norm kinesis 2) Hypo kinesis 3) Akinesia 4) Dyskinesia
 - 1.3.4.2. Wall motion anatomy
 1. Anterior wall
 2. Anterio-septal
 3. Anterio-lateral
 4. Inferior wall
 5. Posterior wall
 6. ASMI + Anterio-lateral
 7. Apical

8. RV wall

9. Multiple segments-----&-----&-----

1.3.5. Complications

1. LV thrombus
2. Ventricular wall rupture
3. Ischemic VSD
4. Papillary muscle rupture or displacement
5. MR or TR (circle each)
6. Pericardial effusion
7. Ventricular aneurysm

1.3.6. Volume changes

1.3.6.1.LV End diastolic diameter-----

1.3.6.2.LV End systolic diameter-----

1.3.6.3.LA enlargement-----

Outcomes

1. At hospital (a) improved and discharged b) died
c)others_____
2. At follow up (a) good condition and continues to follow up (b)
died (c) unknown -----