An-Najah National University

Faculty of Graduate Studies

COMPARING THE ACCURACY OF THROMBOLYSIS IN MYOCARDIAL INFARCTION SCORE AND THE GLOBAL REGISTRY OF ACUTE CORONARY EVENTS SCORE IN PREDICTING IN-HOSPITAL, SHORT AND LONG-TERM OUTCOMES AMONG PATIENTS WITH ACUTE CORONARY SYNDROME

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This Thesis was Defended Successfully on 20/09/2023 and approved by

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Dedication

I dedicate this work to all those who helped me and supported me during my work and studies, and I dedicate this achievement to my dear family and parent in particular, to my friends and colleagues at work, and to all those who loved me.

Acknowledgment

A successful project can never be prepared by a single effort or the person to whom the project is assigned, but it also demands the help and guardianship of some conversant person who helps in the undersigned actively or passively in the completion of a successful project.

I am grateful with a deep sense of gratitude to all those who have helped me to complete the project.

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Lastly, I thank my family, nursing colleagues at a najah national university hospital, and friends for their constant encouragement and their valuable support without which this project would not have been possible, I am grateful for their cooperation during the period of my study.

Declaration

I, the undersigned, declare that I submitted the thesis entitled:

COMPARING THE ACCURACY OF THROMBOLYSIS IN MYOCARDIAL INFARCTION SCORE AND THE GLOBAL REGISTRY OF ACUTE CORONARY EVENTS SCORE IN PREDICTING IN-HOSPITAL, SHORT AND LONG-TERM OUTCOMES AMONG PATIENTS WITH ACUTE CORONARY SYNDROME.

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: Ahmad Adnan Zamel

Signature: 

Date: 20-09-2023

List of Contents

List of Tables

List of Figures

List of Appendices

COMPARING THE ACCURACY OF THROMBOLYSIS IN MYOCARDIAL INFARCTION SCORE AND THE GLOBAL REGISTRY OF ACUTE CORONARY EVENTS SCORE IN PREDICTING IN-HOSPITAL, SHORT AND LONG-TERM OUTCOMES AMONG PATIENTS WITH ACUTE CORONARY SYNDROME

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Abstract

Background: The Thrombolysis in Myocardial Infarction (TIMI) score and the Global Registry of Acute Coronary Events (GRACE) score are frequently utilized as risk assessment instruments within the discipline of cardiology. Short-term acute coronary syndrome (ACS) outcomes are immediate treatment and survival for one months while long-term outcomes are recurrence, lifestyle-focused prevention and mortality risk for 6 months from admissions hospitals. The TIMI score is used to predict unfavorable outcomes, whilst the GRACE score to estimate death rates and significant cardiovascular events in ACS patients.

Aim: This study aimed to compare the accuracy of TIMI and GRACE scoring systems in predicting in-hospital, short-term, and long-term outcomes amongst ACS patients.

Method: A retrospective study was conducted from June to December 2022. The sample size was 250 people. This study focused on ACS patients who got admitted to An-Najah National University Hospital (NNUH). The response rate was 92.6%. Statistical Package for Social Science (SPSS) was used to analyze the data.

Results: The findings indicated that 228 patients (91.2%) survived and 22 (8.8%) died. The GRACE score exhibited remarkable accuracy of diagnosis in prediction of survival among participants. This is supported by the observation of a specificity, sensitivity, Positive Predictive Value (PPV), negative predictive value (NPV), and total accuracy of 100%. The receiver operating characteristic (ROC) curve demonstrated exceptional differentiation between survivors and those who have died, as shown by an area under the curve (AUC) value of 1.000. In contrast, TIMI score accuracy was less robust. The

study of the ROC curve yielded an AUC of 0.739 (P <0.001). The sensitivity and specificity were 68.2% and 63.6% respectively. The PPV and NPV were 15.3% and 95.4%, correspondingly. Additionally, the total accuracy for prediction and diagnosing the survival status was 64.0%.

Conclusion: The GRACE score demonstrated excellent diagnostic accuracy in predicting patient survival status, with perfect sensitivity, specificity, PPV, NPV, and overall accuracy. While, the TIMI score showed comparatively weaker accuracy, with lower sensitivity, specificity, PPV, NPV, and overall accuracy.

Keywords: Acute Coronary Events; Acute Coronary Events Score; An-Najah National University Hospital; Predicting in-Hospital; Thrombolysis in Myocardial Infarction.

Chapter One
Introduction and Theoretical Background

1.1 Introduction

1.1.1 Research Overview

Acute coronary syndromes (ACS) include a spectrum of unstable coronary artery disease (CAD) from unstable angina (UA) to myocardial infarction (MI). ACS patients consist of individuals who exhibit a variety of clinical presentations, spanning a range of diagnostic possibilities 1) UA, 2) ST elevation myocardial infarction (STEMI), and 3) non–ST elevation myocardial infarction (NSTEMI). The initial diagnosis of ACS is based on medical history, etiology, and electrocardiogram (ECG) findings (Helwani et al., 2018). The risk factors of ACS are family history, age, smoke, covid -19 viruses, increase body mass index (BMI), hypertension (HTN), hyperlipidemia, lifestyle, diagnosis based on routine physical exam and assessment, ECG, and cardiac biomarkers (Varghese, Doss et al. 2022)

ACS stands as the primary reason for illness and death in Western nations and it has quickly risen to the top cause of death worldwide (Wadhera et al., 2016). In the United States (US), approximately 1.2 million patients get admitted due to ACS each year, despite the fact that the percentage of ACS with STEMI appears to be falling. The 2016 update on cardiovascular disease (CVD) and stroke statistics by the American Heart Association revealed that over 15 million individuals in the US are afflicted by CAD (Breyre, Sloane et al. 2021)

ACS is characterized as a significant challenge for medical examinations. Risk scores are currently pivotal in guiding interventions and clinical decision-making. Among the risk assessment scores for ACS, the Global Registry in Acute Coronary Events (GRACE) and the thrombolysis in Myocardial Infarction (TIMI) scores have received extensive research attention, with GRACE demonstrating superior ACCURACY. Previously, these scores were validated based on predefined criteria from their respective validation studies. In brief, the seven dichotomous variables make up the TIMI risk score. Each one variable gives one point to the overall score, which runs from zero to seven. These variables are linked to the patients' prior features (at least three risk

factors for atherosclerotic disease, aged more than 65 years, coronary artery obstruction of 50% or more, and aspirin usage) or to the clinical manifestation of ACS including "ST-segment depression, elevation in myocardial necrosis marker, experiencing multiple episodes of angina within 24 hours"(Barbosa, Viana et al. 2012).

The GRACE score consists of eight factors, with five of them being evaluated using a semi-quantitative approach (heart rate, Killip class heart rate, plasma creatinine, and systolic blood pressure (SBP), and three of which are computed dichotomously (ST-segment depression, cardiac arrest on admission, and elevation in myocardial biomarker). The final score has a range spanning from zero up to 3723 (Barbosa, Viana et al. 2012)

As a result, the cardiothoracic critical care patients with ACS are at risk for a variety of acute consequences, such as Atrioventricular (AV) block, dysrhythmias, cardiac arrest, and heart failure, all of which can lead to hypoxia ischemic encephalopathy. In the days following a myocardial infarction, mechanical problems such as mitral valve regurgitation, free wall rupture, and ventricular septal rupture might occur, ventricular remodeling and persistent heart failure, as well as the creation of left ventricular aneurysms and pseudoaneurysms, are long-term consequences (Raffel, Tearney et al. 2007)

In other studies investigations, the risk ratings TIMI and GRACE were chosen for ratification. Both scores are simple to evaluate at the patient's bedside, rely on clinical information that is usually accessible upon hospital admission. and are obtained from comprehensive multivariable analyses conducted in a well- defined population rather than invasive data. There are two forms of the TIMI risk score: one for STEMI and a separate version for both NSTEMI and UA. In contrast, the GRACE risk score employs a single scoring system encompassing the entire range of coronary symptoms (Khan, Zarak et al. 2020)

1.1.2 Research problem

Acute coronary syndrome is still linked with a high death ratio, despite breakthroughs in treatment. The identification of high-risk individuals and, as a result, the selection of individuals who would gain from more intensive treatment holds paramount importance

in the treatment of ACS. Furthermore, practice guidelines advocate stratifying the risk of ACS using techniques such as risk scores (Chen, Huang et al. 2018)

Zhao et al., (2020) showed that likely that a significant percentage of people with ACS go undiagnosed and go on to develop problems in the future. For patients who have had the ACS, reducing risk factors through secondary preventative behavior can be difficult. These modifications may be made more difficult by ACS. However, the diagnosis and prediction of death in patients with ACS are not well understood (Zhao, Lowres et al. 2020)

1.1.3 Problem Statement

It is critical to create a tool that can reliably gauge the risk of adverse cardiovascular events in individuals with ACS. GRACE and TIMI risk scores aid in pinpointing patients with ACS at high risk for recurrent ischemic events or death, guiding treatment decisions. Accurately identify individuals who have a minimal risk of experiencing recurring events, allowing for their early discharge. Rising economic pressures amplify the necessity for suitable triage and access to clinical resources, involving determinations related to transferring patients to tertiary medical facilities. Therefore, instruments that improve the capability of physicians to assess risk quickly and precisely are highly intriguing (Mahmoud, Hassanein et al. 2010)

It is worth mentioning that the long-term prognostic usefulness of both the TIMI and GRACE risk scores is unknown (Chen, Huang et al. 2018)

There was a study confirmed the precision of the TIMI and GRACE scores in foreseeing the existence and progression of obstructive CAD. The study indicated that patients admitted successively to the ACSs Registry, who received coronary angiography without undergoing revascularization surgery, displayed TIMI and GRACE risk scores that effectively predicted the occurrence and progression of obstructive CAD. The scores were evaluated for their ability to predict the subsequent factors: the quantitative assessment of the extension of CAD, the existence of any obstructive CAD, and the existence of severe obstructive CAD. GRACE and TIMI are the highest often utilized risk scores, both of which have been substantiated through numerous clinical investigations for their prognostic value. The most appealing feature

of these risk scores is that they may be evaluated at the patient's bedside using straightforward clinical and laboratory procedures) Barbosa, Viana et al. 2012(

Another study showed that the TIMI and GRACE scores had good accuracy in stratifying risk in patients with diagnosed ACS as well as those with suspected chest discomfort, with the GRACE score slightly superior, (Boubaker, Beltaief et al. 2015). According to researcher knowledge there is no previous study in Palestine about accuracy of thrombolysis in myocardial infarction score and the global registry of ACS events score in predicting in-hospital, short and long-term outcomes among patients with ACS

In An-Najah National University Hospital (NNUH), usually, the TIMI risk score was used for prognosis of the mortality for all patients admitted due to ACS symptoms.

1.1.4 Aim and Objectives

1.1.4.1 Aim

The general objective of this study is to compare the accuracy of TIMI compared to GRACE scores in predicting in-hospital short and long-term outcomes among patients with the acute coronary syndrome.

1.1.4.2 Objectives

- To determine which of the two scores has better accuracy in patients with ACS.
- To assess and compare the accuracy of the TIMI & GRACE scores regarding Killip Class which assesses the severity of heart failure in ACS patients, as cardiogenic shock, pulmonary edema, rales and /or Jugular vein distention (JVD), congestive heart failure (CHF), cardiac arrest at admission and ST segment deviation and severity of disease among patients with ACS.
- To identify the difference in accuracy between TIMI and GRACE scores in predicting clinical data and site of death, the length of stay of patients, mortality in-hospital, and 6 months from the date of admission among patients with ACS.
- To identify TIMI and GRACE levels among medical diagnosis characteristics, the clinical features and factors that influenced mortality in-hospital and 6-month total mortality.

- To assess correlation between risk score and studied parameters and among participants.

1.1.5 Research questions

- What is the difference between TIMI and GRACE scores in predicting short- and long-term in-hospital outcomes among acute coronary syndrome patients?
- What is the utility of TIMI and GRACE scores in predicting coronary revascularization requirements?
- What is the accuracy of the TIMI & GRACE scores in predicting the severity of CAD among patients with ACS?
- What is the usefulness of TIMI and GRACE scores in predicting the cardiovascular outcomes among patients with ACS?
- What is the difference in accuracy between TIMI and GRACE scores in predicting clinical data and site of death, the length of stay of patients, mortality in-hospital, and 6 months from the date of admission among patients with ACS.
- What is TIMI and GRACE levels among medical diagnosis characteristics, the clinical features and factors that influenced mortality in-hospital and 6-month total mortality.
- What is correlation between risk score and studied parameters and among participants?

1.1.6 Research Hypothesis

H0: There is no significant difference between TIMI and GRACE scores in predicting short- and long-term in-hospital outcomes among acute coronary syndrome patients?

H0: There is no significant difference the utility of TIMI and GRACE scores in predicting coronary revascularization requirements?

H0: There is no significant difference the accuracy of the TIMI & GRACE scores in predicting the severity of CAD among patients with ACS?

H0: There is no significant difference the usefulness of TIMI and GRACE scores in predicting the cardiovascular outcomes among patients with ACS?

H0: There is no significant difference in accuracy between TIMI and GRACE scores in predicting clinical data and site of death, the length of stay of patients, mortality in-hospital, and 6 months from the date of admission among patients with ACS.

H0: There is no significant difference TIMI and GRACE levels among medical diagnosis characteristics, the clinical features and factors that influenced mortality in-hospital and 6-month total mortality.

H0: There is no significant difference correlation between risk score and studied parameters and among participants.

1.1.7 Conceptual Definitions

Acute coronary syndrome (ACS): "ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina are all examples of this condition. It's a form of coronary artery disease (CAD)" (Singh, Museedi et al. 2017) .

Unstable angina: "An inadequate supply of blood and oxygen to the heart causes chest discomfort or pain. It's a type of acute coronary syndrome that can progress to a heart attack)" (Goyal and Zeltser 2017) .

ST-Elevation Myocardial Infarction (STEMI): "Acute coronary syndromes are a form of heart attack that describes any obstruction of blood supply to the heart muscle that can cause damage to the heart tissue and create a shift in the ECG's ST segment" (Clinic 2021) .

Non-ST-elevation myocardial infarction (NSTEMI): "It is a type of heart attack that is considered acute coronary syndrome and explains the blockage of the blood supply to the heart muscle. NSTEMI can damage the heart tissue and does not show any changes in the first segment of ECG" (University of Kentucky. (2022 2022) .

The Global Registry of Acute Coronary Events (GRACE): "The risk score was developed to assess the risk of death in patients with acute coronary syndrome. There is one GRACE risk score for estimating in-hospital mortality and another GRACE risk score for mortality from discharge to 6 months" (Tang, Wong et al. 2007)

Short-term outcomes of ACS include immediate survival and extent of heart damage, and the need procedures for one month of admission hospitals.

Long-term outcomes encompass recurrence, mortality risk, quality of life, management, preventive measures and medication to decreases future CVD events for 6 months of admission hospitals.

The thrombolysis in myocardial infarction (TIMI): “Scores are considered a means of early risk stratification. According to some studies, seven factors help assess the risk of death and other adverse cardiac events” (Rao and Agasthi 2020) .

Mortality: “The number of deaths in a population during a given time or place” (Eurostat 2021) .

Cardiac catheterization: “It is a procedure using a thin, flexible tube (catheter) is directed into a blood vessel to the heart to diagnose or treat certain cardiac diseases, such as clogged arteries or irregular heartbeats” (Hospital 2023) .

An-Najah National University Hospital (NNUH): “It is a non-profit medical institution and the only teaching hospital in Palestine that provides clinical education and training to future and current health professionals” (An-Najah National University, 2022).

1.1.8 Operational Definitions

Acute Coronary Syndrome (ACS) refers to “a group of clinical symptoms and conditions that occur due to a sudden reduction or interruption of blood flow to the heart muscle. It encompasses distinct subcategories, involving unstable angina, STEMI, and NSTEMI. ACS is well recognized as a critical medical condition necessitating urgent assessment and intervention” (Singh, Museedi et al. 2017).

Unstable angina refers to “an occurrence of discomfort or pain in the chest resulting from decreased blood supply to the cardiac muscle. The condition is classified as "unstable" due to the development of symptoms while at rest, their increased severity, or their heightened frequency in comparison to stable angina. Unstable angina serves as a warning sign to an impending heart attack, necessitating urgent medical intervention” (Goyal and Zeltser 2017) .

ST-Elevation Myocardial Infarction (STEMI) refers to “a heart attack characterized by the full blockage of the coronary artery, which causes a substantial decrease in blood

supply to particular parts of the heart. The condition is distinguished by distinct alterations in the ECG, notably the presence of ST-segment elevations. It is widely recognized as an urgent medical condition, necessitating prompt restoration of blood supply to the impacted arteries in order to mitigate the damage to the heart muscle" (Clinic 2021) .

Non-ST-Elevation Myocardial Infarction (NSTEMI) refers to "a form of heart attack wherein there is a partial blockage or temporary development of a blood clot in one or more coronary arteries. In contrast to STEMI, NSTEMI may not exhibit notable ST-segment elevations on the ECG. Nevertheless, there exist other warning signs, for example heightened levels of cardiac biomarkers, which imply the presence of damage to the myocardium. The expeditious evaluation and treatment of NSTEMI is imperative in order to mitigate the risk of additional issues from occurring" (University of Kentucky, 2022).

The Global Registry of Acute Coronary Events (GRACE) is "a globally recognized and prospective registry that systematically gathers and examines records pertaining to the medical management and therapeutic outcomes of individuals diagnosed with ACS. The main aim of the GRACE is to improve comprehension of ACS and provide healthcare professionals with information on how to optimize patient treatment. The aforementioned objective is accomplished through a systematic collection of data regarding specific characteristics, therapeutic methodologies, and healthcare results" (Tang, Wong et al. 2007)

The Thrombolysis in Myocardial Infarction (TIMI) scoring system is employed to assess the likelihood of adverse cardiac events among people identified as having ACS. The TIMI score integrates various clinical parameters, such as age, heart rate, blood pressure, and biomarker levels, to evaluate the probability of death rates, myocardial infarction (MI), or the likelihood of recurrence of ischemic events. The TIMI score is an instrumental tool in providing guidance for treatment decisions and evaluating the risk profiles of persons diagnosed with ACS (Rao and Agasthi 2020) .

Mortality refers to the probability of death amongst a specific cohort or throughout a specific timeframe. In the realm of healthcare or medical research, mortality is commonly utilized as a measurement tool for evaluating outcomes, with the aim of

assessing the efficacy of interventions, medical treatments, or approaches in the management of a medical condition. This study provides valuable information regarding the overall survival rates and the impact of various medical conditions or treatments on patient outcomes (Eurostat 2021) .

Cardiac catheterization is a medical procedure conducted to both diagnose and treat certain heart conditions. The process involves the insertion of a catheter, a thin and flexible tube, into a blood vessel, typically situated in the arm or groin area, with the objective of pushing it towards the heart. This approach enables the examination and measurement of blood flow, pressures, and oxygen levels within the cardiovascular system's blood vessels and cardiac chambers. The method possesses the capacity to enhance the detection of obstructions, assess cardiac precision, and offer direction for medical interventions such as angioplasty or stent implantation (Hospital 2023) .

An-Najah National University Hospital (NNUH) is a medical setting located on the grounds of An-Najah National University in the city of Nablus, Palestine. It serves as a teaching hospital for medical students and provides a range of healthcare services to the local community. NNUH offers various departments and specialized units, including cardiology, emergency medicine, surgery, and more, to provide comprehensive medical care to patients" (An-Najah National University, 2022).

1.2 Theoretical framework

1.2.1 Acute Coronary Syndrome (ACS)

1.2.1.1 Definition

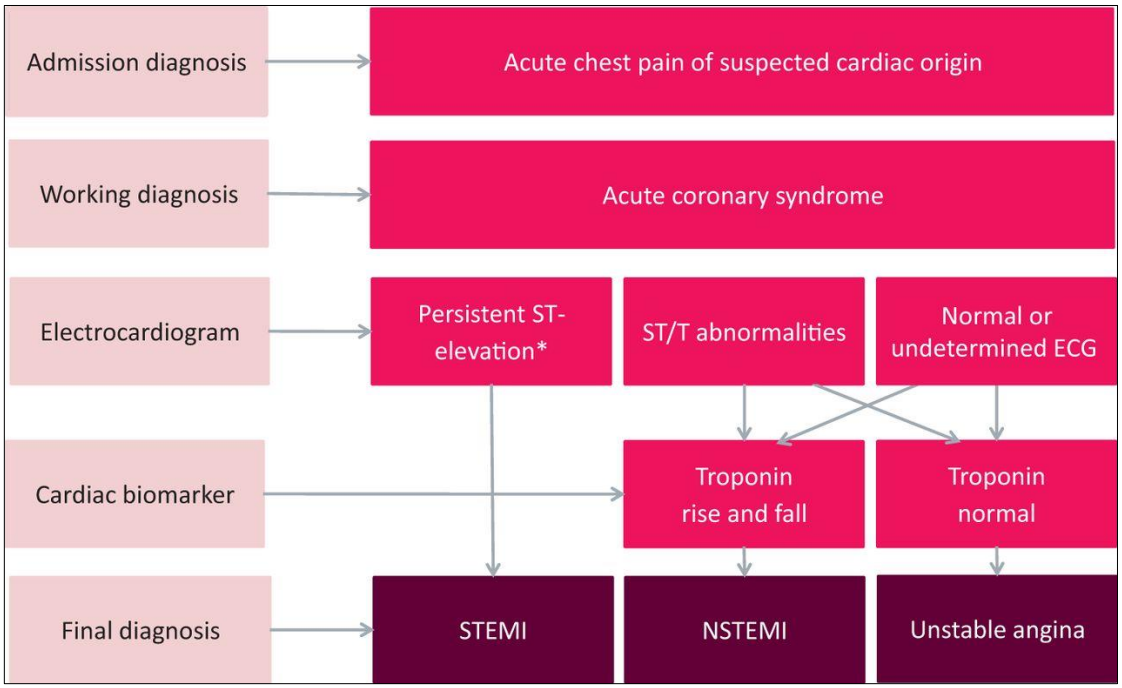
Acute coronary syndrome includes a group of signs and symptoms of myocardial cell ischemia that covers the following diagnoses: NSTEMI, UA, and STEMI (Figure 1). In the US, these symptoms indicating high-risk coronary atherosclerosis stand as primary drivers of emergency medical attention and admission to the hospitals (Kumar and Cannon 2009)

Substernal chest discomfort, reported as crushing or resembling pressure, spreading to the left arm and jaw, is a characteristic symptom of ACS. The initial report of symptoms might lack specificity and be inconspicuous, with primary grievances encompassing trouble breathing, weakness, diaphoresis, epigastric pain, feelings of nausea, left arm

discomfort or isolated jaw, and lightheadedness (Singh, Museedi et al. 2017) .ACS is classified into three subdivisions UA, NSTEMI, and STEMI (Huang, Guo et al. 2019)

Figure 1

Classification of acute coronary syndromes

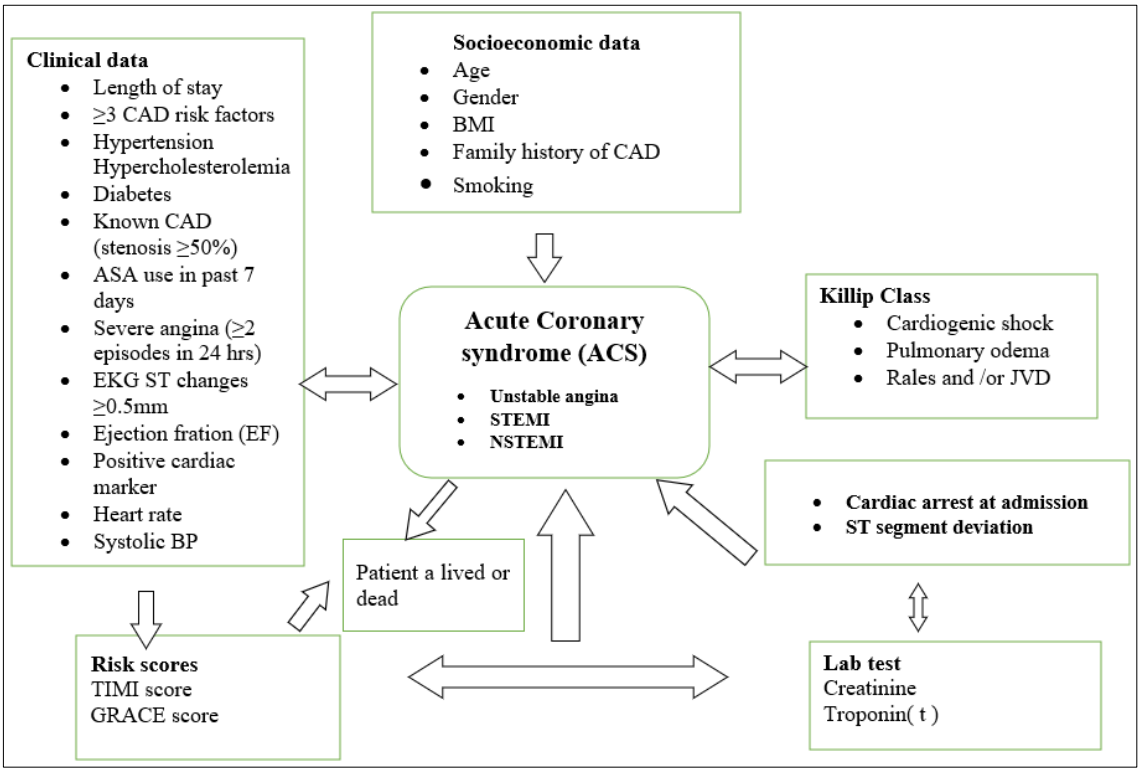


"**ECG** = electrocardiogram; **STEMI** = ST-segment elevation myocardial infarction; **NSTEMI** = non-ST-segment elevation myocardial infarction. The asterisk indicates that the patient should be immediately assessed for reperfusion therapy." Source: (Henderson 2013)

1.2.1.2 Conceptual framework

Figure 2

Conceptual framework diagram to explore the Acute Coronary syndrome



1.2.1.3 Prevalence of ACS

Approximately 15.5 million individuals are impacted by CHD within the US. As stated by the American Heart Association, a heart attack transpires roughly every 41 seconds. Notably, heart disease ranks as the leading cause of mortality in the US. Instances of angina contribute significantly to emergency room admissions. ACS is closely linked to elevated mortality and morbidity rates, and its effective management necessitates a multidisciplinary approach involving “an emergency department physician, cardiologist, internist, pharmacist, and primary care providers”. The cardiologist is in charge of the treatment, but the primary care provider and nurse practitioner are in charge of the prevention (Singh, Museedi et al. 2017) .

CHD is predicted to affect 6.4 percent of adults in the US who aged 20 years old and above, or around 15.4 million people. The incidence of MI hospitalization and death related to CHD have both declined in recent years. The reduction in mortality related to

CHD is partially attributed to a change in the way ACS clinical manifestations are observed (Smith, Negrelli et al. 2015)

1.2.1.4 Risk factors of ACS

Heavy smoking, high blood pressure, diabetes mellitus (DM), raised cholesterol levels, male gender, physical inactivity, overweight, and poor nutritional practices are all common risk factors for ACS. Vasospasm can also be caused by cocaine usage. A family history of early MI (occurring at 55 years of age) correspondingly constitutes a notable high-risk variable (Singh, Museedi et al. 2017) .

1.2.1.5 Pathophysiology of ACS

The fundamental physiological processes for ACS commence with the development and progression of atherosclerosis decades before the acute episode. Increased blood pressure, elevated level of cholesterol, extensive smoking, diabetes, and genetic predisposition collectively play a role in atherosclerosis which is a mild inflammatory condition within the intima wall of medium-sized arteries, intensified by established risk factors. In the instance of coronary atherosclerosis, this gradual thickening of the inner coronary artery layer leads to a progressive narrowing of the artery's lumen over time to varying extents. Atherosclerosis, which causes acute myocardial infarction (AMI) and sudden cardiac death (SCD), tends to target the proximal parts of the major coronary arteries. This is particularly noticeable near the junctures where the arteries divide, leading to altered blood flow. This process involves one or more cycles of swift advancement driven by either the asymptomatic disruption of plaques with the creation of a non-occlusive intraluminal clot or bleeding within the plaque which may impede this slow atherosclerotic progression (Ambrose and Singh 2015)

1.2.1.6 Complications of ACS

In CAD patients who undergo Percutaneous Coronary Intervention (PCI), major adverse cardiac events (MACE) are frequently causes of death and illness. MACE risk factors must be identified and treated to promote health and long life (Tsai, Wang et al. 2017)

Major adverse cardiovascular events (MACE) at 1 month were clearly recognized as a composed of all-cause mortality, MI, cerebrovascular accidents (CVA), and unexpected

coronaries revascularization. as well as cardiovascular arrest, and stent occlusion (Taşolar, Çetin et al. 2016)

1.2.1.7 Diagnosis of ACS

STEMI should be diagnosed and treated as soon as feasible. The disease status should be assessed according to the predetermined protocol, and therapy should begin right once. It was critical to examine vital signs, record a 12-lead ECG, monitor ECG continuously, obtains a concise and precise medical history, and conduct a physical examination, within 10 minutes of arriving at the hospital, conduct laboratory tests. When comes to STEMI reperfusion therapy, it's best to start administering a fibrinolytic agent within half an hour of arriving at the hospital if fibrinolysis is chosen. Additionally, start inflating the first balloon within ninety minutes of initial medical interaction (which includes interaction with ambulance staff) is advised if PCI is selected (Kimura, Kimura et al. 2019)

In all patients who present with ischemia symptoms, an ACS diagnosis should be investigated. Dyspnea, mandibular or epigastric discomfort, upper extremity, chest pain, sweating, nausea, exhaustion, or syncope are all clinical indications and symptoms of ischemia. An ACS event's pain and discomfort might occur during exercise or at relaxation, and it's usually distributed instead of centralized. Myocardial infarction is more likely to be linked with pain extending to the right shoulder, left arm, or two arms, as well as pain associated with diaphoresis (Smith, Negrelli et al. 2015)

“Cardiac troponins are myocardial injury biochemical indicators. Rises in cardiac biomarkers, such as the MB fraction of creatine kinase (CKMB) or cardiac troponin (I or T), indicate myocardial damage and myocardial cell necrosis. Elevated cardiac biomarkers do not distinguish between ischemia and nonischemic sources and do not reveal the underlying mechanism of harm(Smith, Negrelli et al. 2015). An invasive approach is advised for moderate- to higher-risk individuals with non-ST elevation acute coronary syndrome (NSTE-ACS), although the best time to do so is unknown. After assessing risk using the TIMI risk score and GRACE score, a timely invasive technique should be considered. Medical history is critical in diagnosing ACS and must be gathered accurately and rapidly, as protocols of treatment vary based on the confirmed diagnosis (Kimura, Kimura et al. 2019).Mitral valves prolapse, dissecting

aortic aneurysms, and pericarditis are examples of nonischemic, cardiac causes of myocardial injury that do not fit under the ACS classification. Additionally, various noncardiac diseases, such as anxiety, pulmonary embolism, esophageal discomfort, and musculoskeletal pain can present with identical symptoms to ACS(Smith, Negrelli et al. 2015) . The most often utilized scores among individuals with chest pain in the emergency room are the GRACE and TIMI, both of which have been validated to predict adverse clinical outcomes. These scores, on the other hand, aren't meant to predict the severity of CAD The seven standard categorical variables were used to construct the TIMI score. Every factor contributed single point to the total score, which ranged from 0 to 7. A TIMI score ranging from 5 to 7 was regarded as excellent. The GRACE score was computed based on eight factors and the score refinement was accomplished using the score calculator available at (http://www.grace.org). According to the main guidelines, a final score of more than 139 was judged high (Cedro, Mota et al. 2021) .

The TIMI risk score comprises seven factors: “age 65 years or more, usage of aspirin within previous 7 days, presence of more than three CAD risk factors, known coronary artery stenosis exceeding 50 percent, over two episodes of angina in the preceding 24 hours, ST-segment changes, and positive cardiac biomarkers”. Every factor contributed single to the overall score. A TIMI score ranging from 5 to 7 indicates a 14-day risk of all-cause death, new or recurrent MI, severe recurrent MI, or severe recurrent MI Ischemia that necessitates immediate revascularization (Ender, Görgülü et al. 2015) .

While the GRACE score comprises eight factors: “Heart rate, age, plasma creatinine level, Killip class, SBP, ST-segment deviation, increased myocardial necrosis biomarker, and cardiac arrest at admission”. When computing the discharge GRACE score, factors such as in-hospital PCI, coronary artery bypass grafting surgery, and history of previous MI are all taken into account. The initial plasma creatinine measurement and the troponin measurements within the initial 12 hours were utilized for score calculation, along with electrocardiographic records from the initial 6 hours. Troponin T or I level over the 99th percentile was utilized to demonstrate cardiac marker elevation. The ultimate score might be anywhere between 0 and 372(Ender, Görgülü et al. 2015). The Synergy Between PCI With Taxus and CABG (SYNTAX)

score is a technique that uses the physical features of coronary lesions as a guide to determine which patients are candidates for PCI (Bundhun, Sookharee et al. 2017).

The SYNTAX score is a lesion-based grading method that combines PCI with TAXUS and cardiac surgery. Clinical investigations have satisfactorily validated this score This grading system can not only evaluate coronary architecture complexity but also objectively identify which individuals with complex CAD are candidates for PCI(Ender, Görgülü et al. 2015).

The SYNTAX score, which assesses anatomical complexity, is as essential in determining revascularization strategy as the evaluation of clinical scores, with significant prognostic consequences (Cedro, Mota et al. 2021) .

The ability to forecast the structural extension of CAD could be important in making a clinical decision. This is because the presence of obstructive disease (or highly obstructive disease) on coronary angiography is another factor in favor of the procedure, as this finding indicates the need for myocardial revascularization. A link has been discovered in several studies between the TIMI score and the number of arteries impacted by the obstructive disease (Barbosa, Viana et al. 2012) .

The TIMI, GRACE, and Heart Score (HEART) are the very often utilized scores in emergency care settings for individuals with chest pain and they have been verified as predictors of adverse clinical consequences. However, it's important to note that these scores, aren't meant to forecast the severity of CAD (Cedro, Mota et al. 2021) .

The HEART score is a straightforward technique that can be used when a patient presents to the emergency room/unit for the initial time. It was created to categorize individuals who might potentially discharged from the emergency room after a single blood test. Individuals with a HEART score ranging from 0–3 is deemed 'low risk' and may be discharged right away (Van Den Berg and Body 2018) .

The GRACE and TIMI risk scores were used for validation in a study. Both scores are easily calculable at the patient's bedside, rely on clinical information that is typically accessible at the time of hospital admission. Moreover, these scores are obtained from a full multivariable study conducted on a well- defined sample. There are two distinct versions of TIMI risk scores: one designed for both UA and NSTEMI, and another

model is used for STEMI. As for the GRACE, it is one risk score that applicable on the entire range of coronary syndromes (Mahmoud, Hassanein et al. 2010) .

In cases where there is no obstructive coronary disease, evaluating the coronary anatomy prior to undergoing coronary angiography could alter the treatment plan. This includes decisions regarding the intensity and timing of interventions, and it might even lead to the avoidance of an invasive approach. On the contrary, if the scores can more effectively recognize individuals with substantial disease (SYNTAX score more than 32), it could potentially allow for the avoidance of aggressive antiplatelet therapy, which would elevate the risk of bleeding. Only a few research have looked into the link between coronary anatomy and prognostic risk scores; and the findings have been mixed(Hammami, Jdidi et al. 2018).

For both men and women with ACS, the GRACE core is considered a reliable predictor of in-hospital death. Because there is no interaction between sex and components of risk score, sex- specific adjustment is not necessary (Gong, Goodman et al. 2017) .

Many cardiac expert organizations have advised and promoted the usage and creation of specialized scores to distinguish individuals with a heightened risk of significant adverse outcomes from those with low risk, and to facilitate precise diagnostic and therapeutic decision making. The advantages of using more intensive and expensive treatments are highest in individuals who are at greater risk of unfavorable clinical outcomes, thus risk assessment is still important. GRACE and TIMI are the risk scores that have been studied the most up to this point, with GRACE outperforming TIMI. Additional possibly effective ACS risk scores are accessible, but they have not been rigorously validated. These other ratings, according to this study, could be valuable and should be investigated further (D'Ascenzo, Biondi-Zoccai et al. 2012) .

1.2.1.8 Prevention of ACS

Coronary artery disease-related death rates are still high – over 5 percent in the hospital and up to two-fold that after discharge and there is still more for enhancement, improving outcomes will require a multifaceted approach.

There are several major constraints to enhancing outcomes including patient teaching, the influence of the geographical land, limited adherence to guideline-based managing,

and the prevalence of cost- oriented instead than value- oriented health care systems. To overcome these constraints, approaches involve toolkits to assist in-hospital management, increased community outreach with an available individual to physician teaching and telemedicine, implementation of secondary prevention initiatives derived from high-quality real-world' data, and sustainable economic frameworks to enhance access to effective pharmacotherapies (Chan, Du et al. 2016)

1.2.1.9 Treatment of ACS

If there are no contraindications, acetylsalicylic acid (300 mg) Per oral/orally (PO) and heparin bolus and intravenous (IV) heparin pump are used as initial treatments for all ACS. Ticagrelor or clopidogrel antiplatelet treatment is also advised. Patients having thrombolysis agents are not administered ticagrelor. In the event of hypoxia, supportive measures such as morphine/fentanyl and oxygen are supplied as needed. Sublingual nitroglycerin or infusion can also serve as options for pain management. dysrhythmia monitoring should be done regularly. Either it is a STEMI/NSTEMI or UA, the next steps in treatment are determined by the type of ACS. For STEMI, the American Heart Association (AHA) advises prompt catheterization and PCI, aiming for a door-to-procedure time of under 90 minutes (Singh, Museedi et al. 2017) .

Individuals at high-risk with STEMI are managed using an early invasive approach that includes coronary angiography and rapid revascularization of viable at-risk myocardium. Revascularization combined with aggressive medical treatment, such as anti-ischemic, antiplatelet aggregation, anticoagulation, and anti-lipid, can improve clinical outcomes (Kumar and Cannon 2009)

1.2.1.10 Prognosis of ACS

Despite significant advances in treatment, CAD continues to be a prominent global reason of mortality. ACS, the most severe manifestation of CAD, is associated with a high rate of mortality, with approximately 5%–8% of cases dying within six months of diagnosis. It was critical for physicians treating patients with ACS to incorporate the newest findings from major randomized controlled trials (RCTs) into clinical practice to enhance outcomes. The guidelines of European Society of Cardiology (ESC) are designed to compile and assess current information to aid decision-making and to

recommend the optimal care of patients based on their unique circumstances and potential comorbidities (Guedeney and Collet 2020)

1.3 Related studies

"In a study conducted by Kao et al. (2020), a comparison was made between the TIMI and GRACE scores for predicting long-term CVD consequences among individuals in Taiwan with Type 2 Diabetes Mellitus (T2DM) who experienced STEMI. The discriminative capacity of the risk score systems was evaluated by analyzing the area under the ROC curve (AUC). Among the included individuals (n=455), all four risk score systems exhibited predictive accuracy for 6-, 12-, and 24-month mortality, yielding ROC values ranging from 0.67 to 0.82. Specifically, the AUC values were 0.821, 0.821, and 0.819 for 6-, 12-, and 24-month mortality, respectively (P<0.001). Additionally, it demonstrated the best diagnostic capability for bleeding and acute contrast-induced nephropathy (ACR), achieving an AUC of 0.792 and 0.977, respectively (P<0.001). Individuals with ACS with Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications (CADILLAC) exceeding 8 displayed lower 2-year survival rates compared to those with lower scores (P<0.001). Finally, the researchers concluded that the CADILLAC risk score is exhibited superior effectiveness compared to other risk scores in forecasting 0.5-, 1-, and 2- all-cause mortality in individuals with T2DM."

TIMI and GRACE risk scores for prognosis of the angiographic intensity of NSTEMI and ACS was studied in Bangladesh cross-sectional study by Bekler et al., (2015) involving 205 individuals, and showed that the vessel score and Gensini score exhibited a positive association with both the GRACE and TIMI scores (P = 0.01). Moreover, the GRACE score (R = 0.55) demonstrated a stronger correlation with the TIMI score (R = 0.51). The GRACE score's AUC (0.94; 95 percent CI = 0.89–0.99) was substantially greater than the TIMI score's AUC (0.89; 95 percent CI = 0.85–0.93), When the TIMI and GRACE risk scores were compared, the researcher concluded the GRACE score sample size (n= 2,104) patients studied. The validation group exhibited a higher occurrence of STEMI at 40.5 percent and in-hospital mortality rate of 5.5 percent surpassing the figures of the population from which the GRACE score (GS) was formed (32 percent STEMI and 4.6 percent in-hospital mortality. Because of risk underestimate in the probability ranging from 3 percent to 13 percent, model calibration was

inadequate. The calibration slope was sufficient, showing a similar overall predictive effect on in-hospital mortality to the GRACE score model. The AUC for this research was 0.85. With acceptable discrimination, the model exhibited an underestimation of risk for probabilities spanning from 5 percent to 23 percent in individuals with STE-acute coronary syndrome (STE-ACS). In individuals with NSTE-ACS, calibration and discrimination performed well, the researcher concluded The GRACE score model factors were predictors of in-hospital death in the validation group, despite their lack of statistical validity in the entire population. As a result, the GRACE score is clinically useful, but it needs to be re-calibrated in this population.

Grace and TIMI risk ratings for female individuals with NSTE-ACS: risk categorization and prognostic value of TIMI and GRACE rating scales for female individuals diagnosed with ACS and NSTEMI were studied by Zhu et al., (2015) in China This study included non-elderly (65 years) and elderly (65 years) female individuals with NSTEMI and ACS, (n= 869 participants). According to their GRACE and TIMI scores, the individuals were further split into little, middle, and high-risk categories. Patients were monitored for a year to see how many died and how often they had significant adverse cardiac events. The AUC was employed to evaluate variations in mortality and incidence between the two scoring systems. In older patients, the GRACE scoring system had a considerably higher AUC related to death and major adverse evets incidence in any period than the TIMI scoring system p less than 0.05. The rates of mortality and MACE grew in lockstep with the scores. Cox regression analysis based on GRACE and TIMI scores yielded risk ratios larger than 1 ($P<0.01$). The researcher concluded that TIMI and GRACE were both useful in clinical risk stratification and prognosis of the female with NSTE-ACS and ACS patients of various ages. GRACE scores were more accurate than TIMI scores.

In China, for patients with AMI, the GRACE and TIMI scores were employed to forecast both short and prolonged consequences, a by Chen et al., (2018), a retrospective study of sequential individuals hospitalized in a coronary care unit with MI. The sample consisted of 726 individuals with MI. the TIMI and GRACE risk scores estimated 56 percent (STEMI) and 44 percent with (NSTEMI). The researcher pointed out in both subgroups of MI, the GRACE risk score (RS) performed well in forecasting short- and long-term mortality. When compared to risk assessment using the TIMI RS,

GRACE RS tertile stratification provided more prognostic information, the researcher concluded In Asian patients with AMI, the use of risk scores indicated a fair to good discriminating precision in forecasting both short and prolonged significant adverse cardiac events. The GRACE score proved more precise in forecasting long-term death than the simpler TIMI score.

(Kumar, Saghir et al. 2021) . studied TIMI and GRACE scores to predict in-hospital consequences following NSTEMI in Pakistan. The authors enrolled individuals who were prospectively recruited and sought care at a tertiary care cardiac center. The AUC was calculated as an indicator of predictive value for both scores using ROC curves analysis. A total of 300 individuals were studied, with males comprising 76 percent of the total sample. Mean TIMI and GRACE scores were calculated. The researcher concluded that for predicting in-hospital death following NSTEMI, the GRACE score shows good discriminating strength. Also, recommended that when making clinical decisions regarding the management of NSTE-ACS, it is recommended to apply the GRACE score as a risk stratification method.

1.4 Summary

The several studies showed that the important predictive value of the GRACE and TIMI score in assessing outcomes and risk mortality among individuals with ACS. The CADILLAC risk score, based on GRACE items, outperformed other risk scores in predicting long-term CVD among individuals STEMI and T2DM. While GRACE also associated with the severity of CAD in NSTE-ACS patients and accurately predicted in-hospital mortality risk in ACS cases, particularly in Asian populations. These findings underscore the clinical important of the GRACE score as a valuable instrument for risk evolution and decision-making in ACS patients.

Chapter Two
Methods

“This chapter focuses on the methodology employed to attain the research objectives. It commences with an exploration of the study design, the study's target populations, the study's setting, duration, eligibility criteria, approaches to data collection, statistical analysis methods, piloting procedures, and ethical considerations.”

2.1 Study design

“The present study is a retrospective cross-sectional because the captured information is derived from information gathered at a specific time point. In which, the data collected from a diverse group of individuals possessing distinct characteristics and demographics. Spector (2019) demonstrated the benefits of cross-sectional studies which encompass: encompassing multiple variables during data collection, capturing a specific point in time, not costly to perform and does not require a lot of time, proof and/or disproof assumptions, the data may be utilized for a variety of studies and enabling the analysis of various results and outcomes for the generation of new studies / theories or in-depth research.” The researcher was collected data from patients file who admitted to Najah National University Hospital during the period of June to December 2022.

2.2 Population

The target population of the study was patients diagnosed with acute coronary syndrome (ACS), specifically those with unstable angina (UA), ST-elevation MI (STEMI), and non-ST-elevation MI (NSTEMI) at An Najah National University Hospital (NNUH).

2.3 Site and Setting of the Study

The research process was conducted at NNUH, which is a non-governmental hospital located in Nablus, Palestine. The settings targeted in the study was typically include the coronary care unit (CCU) within NNUH.

2.4 Period of the study

This research was conducted between the period of June 2022 to July 2023.

2.5 Sampling

Sample size became 250 participants, and the sample type was a purposive sampling that was previously screened and diagnosed according to the current diagnostic criteria for ACS enrolled in NNUH, from electronic archiving.

2.6 Eligibility criteria

2.6.1 Inclusion criteria

All patients with ACS were previously diagnosed and registered at NNUH during the study period according to the current diagnostic criteria.

2.6.2 Exclusion criteria

- Missing data files
- Pregnancy.
- Patients who are not registered in the cardiac department at NNUH.

2.7 Study instruments

The main items of this questionnaire (Appendix A) included:

- Part 1: Socioeconomic data.
- Part 2: Clinical data.
- Part 3: Diagnosis (UA, STEMI, NSTEMI).
- Part 4: Killip class which assesses the severity of heart failure in ACS patients, classified based on the presence of cardiogenic shock, pulmonary edema, rales and/or jugular venous distention (JVD), congestive heart failure (CHF), cardiac arrest at admission, and ST-segment deviation among patients with ACS.
- Part 5: Cardiac arrest at admission.
- Part 6: ST-segment deviation.
- Part 7: Lab test.
- Part 8: Risk scores (TIMI and GRACE).
- Part 9: Patient a lived or dead.

2.8 Data collection

The structured questionnaire was prepared based on study objectives, and previous related studies, then the data collection was started from the electronic archive in the Cardiology department at NNUH. Data collection process included:

- Patient selection: It involves the identification of the patient group through the establishment of specific inclusion and exclusion criteria. The aforementioned criteria define the general features of the participants who participated in the study, which includes factors like the range of age, diagnosis of ACS, and the availability of full information.
- Data sources: This section aims to determine the specific sources whereby the essential patient information was collected. Common components of this category are computerized medical records, laboratory results, clinical charts, and diagnostic imaging. The data sources utilized ought to provide extensive and accurate data about the factors necessary for the computation of the GRACE and TIMI scores.
- Data collection form: The creation of a standardized data collecting form serves the purpose of methodically documenting the necessary patient information. The form needs to have a range of characteristics, including demographic data, health history, clinical manifestation, laboratory measurements, and eventual outcomes. Additionally, it is imperative that the form includes comprehensive instructions on the method for calculating the GRACE and TIMI scores using the data that has been gathered.
- The calculation of TIMI and GRACE scores: It involves extracting the necessary data and applying the specified algorithms related to the aforementioned scoring systems to every patient being assessed. The calculated scores are documented in a spreadsheets or databases.
- Outcomes measurements: It include the collection of data pertaining to pertinent measurements, such as in-hospital outcomes, short- and long-term outcomes. This may involve reviewing medical records or contacting patients for follow-up information. Outcome measures may include mortality, major adverse cardiovascular events, MI, repeat revascularization procedures, or other relevant events.

2.9 Ethical Considerations

To conduct the study, all research ethics guidelines and general ethical values were adhered by the researcher. An institutional review board (IRB) approval (Appendix B) was obtained from An-Najah National University to allow the researcher to collect data. Researcher maintained strict confidentiality of patient information throughout the data collection process. Patient identifiers, such as names and addresses were removed or encrypted to prevent unauthorized access or disclosure.

2.10 Statistical analysis

"The researcher used the Statistical Package of Social Science (SPSS version 25) program for data entry and analysis. Frequency tables that show baseline characteristics by number (n) and percentage (%) in categorical data and plot differences between various medical histories for ACS. After testing normality by normality criteria in numerical data, normally distributed quantitative data were described by mean ± standard deviation (SD). In contrast, not normally distributed data without and with outlier values was described by the median and range. Moreover, cross-tabulation for main findings and other statistical tests such as the Chi-square test to compare categorical variables, and the T-test or way ANOVA test to compare means of numeric variables, was done when required to analyze questionnaire data. However, the screening tests for GRACE such as sensitivity, specificity, accuracy, Positive Predictive Value (PPV), and negative predictive value (NPV) were calculated based on TIMI results as standard. Finally, the agreement of the two procedures will obtain to test matched GRECE and TIMI results."

Chapter Three
Results

3.1 Introduction

This chapter discusses the outcomes of the statistical analysis conducted on the data, which includes descriptive analysis that introduces the study and provides solutions to the study's research questions. The total sample number was 270 Acute coronary syndrome (ACS) patients, but during the study, 20 files were dropped out, so the sample size became 250 participants, with a response rate of 92.6%. A cross-sectional study design was utilized, and appropriate statistical calculations, such as mean and standard deviation, were employed for numerical data. The independent t-test (Student's t-test) was utilized to assess if there was a statistically significant difference between alive and dead patients with respect to various variables, including age, height, weight, body mass index (BMI), smoking habits, length of hospital stay, ejection fraction (EF), heart rate, blood pressure, creatinine, and troponin levels. Pearson's chi-squared test was utilized to assess if a statistically significant distinction existed between the anticipated and observed frequencies within one or more classes of a contingency table, such as the comparison between alive and dead patients with respect to various factors, including age, gender, marital status, medical diagnosis, known coronary artery disease (CAD), Acetylsalicylic acid (ASA) use, hypertension, hypercholesterolemia, diabetes, and others. Chi-square (χ^2) was used to shows a statistical test used to recognize if there is a significant association between two categorical variables.

Multivariate analyses were conducted to identify factors that causes the mortality compared to alive cases among the study participants. ANOVA test was used to recognize differences between more than two means, such as obesity. ROC curves were used to identify the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under the curve (AUC) of GRACE and TIMI scores for predicting the survival status. The statistical significance of the P-value was determined to be significant when $P < 0.05$, and non-significant when $P > 0.05$.

3.2 Distribution of the respondents based on their socio-demographic factors.

The findings derived from the analysis of data obtained from a sample of 250 patients diagnosed with ACS indicate that a majority of 228 patients (91.2%) had been determined as being alive, while a minority of 22 patients (8.8%) were reported died.

Table 1 presents a comprehensive overview of a number of demographic and health-related characteristics observed in individuals within medical settings. The information indicates that a significant proportion of patients, namely 68.9%, fell below the age of 65, whilst 31.1% of patients were aged 65 years or above. With regards to gender, the predominant demographic of patients consisted of males, accounting for 72.8% of the total sample, while the rest of the sample (27.2%) encompassed females.

The participants' marital status had been documented, revealing that nearly all of the participants were married (96.1%), whereas a tiny proportion were unmarried (3.9%). The table below presents data on the weight status of the participants, indicating that 48.7% were classified as obese, 34.2% were categorized as overweight, while 17.1% were considered to have a normal weight.

Additionally, the table presents data pertaining to risk variables linked to ACS. The data indicates that 32.0% of the individuals studied experienced a family history to CAD, but the larger proportion of individuals, amounting to 68.0%, did not possess such a family history. The study covered information pertaining to smoking habits, revealing that 40.8% of the participants identified as smokers. Among the individuals who disclosed their smoking habits, a significant proportion (93.5%) were using cigarette smoking, although a lesser proportion indicated their usage of a hookah (6.5%).

In terms of age, the data displayed in the following table indicates a notable disparity in the survival rates of participants. Specifically, the percentage of individuals who remained alive was found to be much greater for individuals below the age of 65 (68.9%) in comparison to those aged 65 or above (31.1%). In the same direction, there was a notable disparity in mortality rates between individuals aged 65 years or more (81.8%) and those under the age of 65 (18.2%); the P value is less than 0.05.

The study of gender distribution among two distinct groups, one comprising individual who are now living and the other consisting of those who had died, yielded the following findings: Within the alive group, 66.8% of individuals identified as males, whereas within the died group, 54.5% of individuals identified as men. In the same way, it was observed that 33.2% of the group classified as alive consisted of females, but 45.5% of the persons in the died group were of the female gender. Nevertheless, the observed disparity in gender distribution between the groups of those who survived and those who did not was found to lack statistical significance, as shown by a p-value exceeding 0.05.

According to the data, a majority of the participants, namely 94.4%, were determined to be married, while a minority, comprising 5.6%, were identified as unmarried. Within the group of married individuals, a total of 219 participants were found to be living, while a minority of 17 participants had died. Among the group of unmarried individuals, a total of 9 participants were found to be living, while the remaining 5 participants were seen to have died. Nevertheless, the data analysis revealed that there was no statistically significant variance observed between married status and survival.

The proportion of participants classified as having a normal weight was significantly greater among the surviving group (90.9%) in comparison to the participants in died group (0%). In contrast, the proportion of participants classified as overweight was found to be greater amongst the dead group (50%) in comparison to the surviving group (0%). Similarly, the proportion of participants classified as obese was found to be greater amongst the participants in died group (40.9%) when compared with the surviving group (9.1%), with a P-value equal to 0.249 for this comparison.

The findings indicate that amongst individuals with a family history to CAD, a total of 32% are still living, while 22.7% were died. The obtained P-value of 0.369 indicates that there is insufficient evidence to support a statistically significant difference in the percentage of persons who are either alive or died amongst individuals having a family history of CAD and those without. The table indicates that 40.8% of those who were alive had a history of smoking compared to 27.3% of those who died. However, the p-value of 0.215 indicates that this difference is not statistically significant between alive and died groups.

The findings indicated that a greater ratio of individuals who were alive reported smoking cigarettes compared to those who died (93.5% vs. 83.3%, respectively). On the other hand, a higher percentage of individuals who died reported smoking hookah compared to those who were alive (16.7% vs. 6.5%, respectively). However, the Chi square test revealed there is statistically significant difference in type of smoking between those who were alive and those who died was not statistically significant (P > 0.05).

Table 1

Distribution of participants according to socio-demographic characteristics

Socio-demographic characteristics	Total (n=250) n (%)	Survival status		Statistical test	
		Alive (n=228)	Died (n=22)	Chi-square (χ2)	P-value
Age (years)					
Less than 65	161 (64.4)	157 (68.9)	4 (18.2)	22.476	0.000*
65 +	89 (35.6)	71 (31.1)	18 (81.8)		
Gender					
Male	178 (71.2)	166 (72.8)	12 (54.5)	3.263	0.070
Female	72 (28.8)	62 (27.2)	10 (45.5)		
Marital status					
Married	236 (94.4)	219 (96.1)	17 (77.3)	13.386	0.000*
Unmarried	14 (5.6)	9 (3.9)	5 (22.7)		
Obesity					
Normal weight	41 (16.4)	39 (17.1)	2 (9.1)	2.444	0.294
Overweight	89 (35.6)	78 (34.2)	11 (50)		
Obese	120 (48)	111 (48.7)	9 (40.9)		
Family history of CAD					
Yes	78 (31.2)	73 (32)	5 (22.7)	0.807	0.369
No	172 (68.8)	155 (68)	17 (77.3)		
Smoking					
Yes	99 (39.6)	93 (40.8)	6 (27.3)	1.533	0.215
No	151 (60.4)	135 (59.2)	16 (72.7)		
If yes, specify:	N=93	N=93	N=6		
Cigarettes	92 (92.9)	87 (93.5)	5 (83.3)	0.895	0.344
Hookah	7 (7.1)	6 (6.5)	1 (16.7)		

3.3 Distribution of participants according to medical diagnosis

Table 2 indicate the distribution of patients with different types of medical diagnosis between those who are alive and those who have died. For example, among patients with unstable angina, 64% of them were alive while only 9.1% of them died. Similarly, among patients with STEMI, 4.8% of them were alive while 22.7% of them died. And

among patients with NSTEMI, 31.1% of them were alive while 68.2% of them died. The results show that there is a statistically significant association between medical diagnosis and survival status.

Table 2

Distribution of participants according to medical diagnosis

Medical diagnosis	Total (n=250) n (%)	Survival status n (%)			Statistical test
		Alive (n=228)	Died (n=22)	Chi-square (χ^2)	P-value
Medical diagnosis.					
Unstable angina	148 (59.2)	146 (64)	2 (9.1)	28.282	0.000*
STEMI	16 (6.4)	11 (4.8)	5 (22.7)		
NSTEMI	86 (34.4)	71 (31.1)	15 (68.2)		

3.4 Distribution of participants according to clinical data

Table 3 showed a study analyzed of a sample of 250 patients with ACS. Among them, 39.2% had three or more CAD risk factors (n=98), with hypertension being the most prevalent risk factor at 59.2% (n=148), followed by diabetes at 47.6% (n=119). 32% of the sample had known CAD with stenosis ≥50% (n=80). Almost two-thirds of the sample (64.8%, n=162) experienced severe angina, and 58.8% (n=147) reported using aspirin in the past seven days. About 38.4% (n=96) had a positive cardiac marker, and 30.8% (n=77) had ischemic heart disease (IHD). PCI was performed on 23.6% of patients (n=59), and coronary artery bypass graft (CABG) surgery was performed on 15.6% (n=39). Additionally, 20.8% (n=52) had hypercholesterolemia, 18% (n=45) had heart failure (HF), 12.8% (n=32) had chronic kidney disease (CKD), 10.8% (n=27) had atrial fibrillation (AF), 9.6% (n=24) had cerebrovascular accidents (CVA), 8.8% (n=22) had EKG ST changes ≥0.5mm, and 6.4% (n=16) had the end-stage renal disease (ESRD). Finally, 53.6% (n=134) of patients had other conditions.

Table 3 represents the percentage of patients with specific medical conditions in the alive and dead groups, as well as the associated p-values. The results indicate that patients in the dead group had a significantly higher prevalence of medical conditions compared to those in the Alive group, as evidenced by the low P-values (<0.05) for all medical conditions listed. For instance, patients in the dead group had a higher prevalence compared who alive in ≥3 CAD risk factors (72.7% vs. 36%), hypertension

(81.8% vs. 57%), hypercholesterolemia (50% vs. 18%), diabetes (77.3% vs. 44.7%), known CAD (stenosis ≥50%) (86.4% vs. 26.8%), ASA use in the past 7 days (86.4% vs. 56.1%), severe angina (≥2 episodes in 24 hrs.) (86.4% vs. 62.7%), EKG ST changes ≥0.5mm (45.5% vs. 5.3%), positive cardiac marker (95.5% vs. 32.9%), IHD (54.5% vs. 28.5%), PCI (72.7% vs. 18.9%), HF (77.3% vs. 12.3%), CKD (77.3% vs. 6.6%), CABG (72.7% vs. 10.1%), CVA (81.8% vs. 2.6%), AF (72.7% vs. 4.8%), ESRD (27.3% vs. 4.4%), and others (77.3% vs. 51.3%), respectively. These results showed that the presence of these all-previous risk factors is associated with increased mortality in patients with ACS ($P<0.05$).

Table 3

Distribution of participants according to clinical data

Clinical data	Total (n=250) n (%)	Survival status n (%)		Statistical test	
		Alive (n=228)	Died (n=22)	Chi-square ($\chi 2$)	P-value
≥3 CAD risk factors					
Yes	98 (39.2)	82 (36)	16 (72.7)	11.377	0.001*
No	152 (60.8)	146 (64)	6 (27.3)		
Hypertension					
Yes	148 (59.2)	130 (57)	18 (81.8)	5.109	0.024*
No	102 (40.8)	98 (43)	4 (18.2)		
Hypercholesterolemia					
Yes	52 (20.8)	41 (18)	11 (50)	12.485	0.000*
No	198 (79.2)	187 (82)	11 (50)		
Diabetes					
Yes	119 (47.6)	102 (44.7)	17 (77.3)	8.515	0.004*
No	131 (52.4)	126 (55.3)	5 (22.7)		
Known CAD (stenosis ≥50%)					
Yes	80 (32)	61 (26.8)	19 (86.4)	32.763	0.000*
No	170 (68)	167 (73.2)	3 (13.6)		
ASA use in past 7 days					
Yes	147 (58.8)	128 (56.1)	19 (86.4)	7.565	0.006*
No	103 (41.2)	100 (43.9)	3 (13.6)		
Severe angina (≥2 episodes in 24 hrs)					
Yes	162 (64.8)	143 (62.7)	19 (86.4)	4.918	0.027*
No	88 (35.2)	85 (37.3)	3 (13.6)		
EKG ST changes ≥.5mm					
Yes	22 (8.8)	12 (5.3)	10 (45.5)	40.384	0.000*
No	228 (91.2)	216 (94.7)	12 (54.5)		
Positive cardiac marker					
Yes	96 (38.4)	75 (32.9)	21 (95.5)	33.197	0.000*
No	154 (61.6)	153 (67.1)	1 (4.5)		
IHD					
Yes	77 (30.8)	65 (28.5)	12 (54.5)	6.382	0.012*
No	173 (69.2)	163 (71.5)	10 (45.5)		
PCI					
Yes	59 (23.6)	43 (18.9)	16 (72.7)	32.290	0.000*
No	191 (76.4)	185 (81.1)	6 (27.3)		
HF					
Yes	45 (18)	28 (12.3)	17 (77.3)	57.418	0.000*
No	205 (82)	200 (87.7)	5 (22.7)		
CKD					
Yes	32 (12.8)	15 (6.6)	17 (77.3)	89.837	0.000*
No	218 (87.2)	213 (93.4)	5 (22.7)		
CABG					
Yes	39 (15.6)	23 (10.1)	16 (72.7)	59.793	0.000*
No	211 (84.4)	205 (89.9)	6 (27.3)		
CVA					
Yes	24 (9.6)	6 (2.6)	18 (81.8)	144.971	0.000*
No	226 (90.4)	222 (97.4)	4 (18.2)		
AF					
Yes	27 (10.8)	11 (4.8)	16 (72.7)	96.029	0.000*
No	223 (89.2)	217 (95.2)	6 (27.3)		
ESRD					
Yes	16 (6.4)	10 (4.4)	6 (27.3)	17.544	0.000*
No	234 (93.6)	218 (95.6)	16 (72.7)		
Others					
Yes	134 (53.6)	117 (51.3)	17 (77.3)	5.436	0.020*
No	116 (46.4)	111 (48.7)	5 (22.7)		

3.5 Distribution of participants according to medical settings

The results show that Out of the total sample of 250 patients with ACS, 70 (28%) had EF less than 50%, while 180 (72%) had EF between 50-60%. The given results show the distribution of heart rate at admission among the participants of the study shows that out of the total sample of 250 ACS patients, 16 patients (6.4%) had a heart rate less than 60 beats per minute, 223 patients (89.2%) had a heart rate between 60 and 100 beats per minute, and 11 patients (4.4%) had a heart rate greater than 100 beats per minute. Regarding SBP at admission in patients with ACS, the results showed that, 122 (48.8%) had a normal SBP at admission, while 128 (51.2%) had an abnormal SBP. Out of a total sample of 250 patients with ACS, 122 patients (48.8%) had a normal DBP at admission, while 128 patients (51.2%) had an abnormal DBP at admission (Table 4).

These results show the distribution of EF in patients who were either alive or died during the study. Among patients with EF less than 50%, 24.6% of those who were alive and 63.6% of those who died had this EF range. For patients with EF between 50-60%, 75.4% of those who were alive and 36.4% of those who died had this EF range. The differences in the distribution of EF between the two groups are statistically significant, with a p-value of less than 0.001, indicating that EF may be an important factor in predicting patient outcomes.

Table 4 shows the relationship between the heart rate at admission and the mortality outcome in patients with ACS. Among the patients with heart rate less than 60 beats per minute, 7.0% were alive and none died. Among those with heart rate between 60-100 beats per minute, 91.2% were alive and 68.2% died. Among the patients with heart rate more than 100 beats per minute, only 1.8% were alive and 31.8% died. The statistical analysis indicates a significant association between heart rate at admission and mortality outcome ($p < 0.001$), with higher mortality rates observed among patients with higher heart rates. The study found that patients with abnormal SBP at admission had a higher risk of mortality. Among patients with abnormal SBP, 47.8% were alive and 86.4% died. Among those with normal SBP, 52.2% were alive and 13.6% died ($P<0.05$). Similarly, Patients with abnormal DBP had a much higher risk of mortality (86.4%) than those with normal DBP (13.6%) at $P< 0.05$.

The distribution of participants according to laboratory test results showed that out of the total 250 participants, 176 (70.4%) had normal creatinine levels at admission, while 74 (29.6%) had abnormal levels. In terms of troponin levels, 102 (40.8%) participants tested positive, while 148 (59.2%) tested negative. Table 5 showed that higher risk of mortality in ACS associated with abnormal levels of creatinine and troponin at admission. Among patients who died, the percentage of those with abnormal creatinine levels was much higher than those with normal creatinine levels (63.6% vs. 36.4%, respectively), and the difference was statistically significant with a P-value less than 0.001. Similarly, a higher percentage of patients who died had positive t levels at admission compared to those who survived (95.5% vs. 35.5%, respectively), with a statistically significant P-value less than 0.001.

Table 4

Distribution of participants according to medical status and lab test

Medical status	Total (n=250) n (%)	Survival status n (%)		Statistical test	
		Alive (n=228)	Died (n=22)	Chi-square (χ2)	P-value
Ejection fraction					
Less than 50%	70 (28)	56 (24.6)	14 (63.6)	15.196	0.000*
50-60%	180 (72)	172 (75.4)	8 (36.4)		
Heart rate at admission					
Less than 60	16 (6.4)	16 (7)	0 (0)	43.953	0.000*
60-100	223 (89.2)	208 (91.2)	15 (68.2)		
More than 100	11 (4.4)	4 (1.8)	7 (31.8)		
SBP at admission					
Normal	122 (48.8)	119 (52.2)	3 (13.6)	11.938	0.001*
Abnormal	128 (51.2)	109 (47.8)	19 (86.4)		
DBP at admission					
Normal	122 (48.8)	119 (52.2)	3 (13.6)	11.938	0.001*
Abnormal	128 (51.2)	109 (47.8)	19 (86.4)		
Creatinine at admission					
Normal	176 (70.4)	168 (73.7)	8 (36.4)	13.411	0.000*
Abnormal	74 (29.6)	60 (26.3)	14 (63.6)		
Troponin at admission					
Positive	102 (40.8)	81 (35.5)	21 (95.5)	29.833	0.000*
Negative	148 (59.2)	147 (64.5)	1 (4.5)		

3.6 Distribution of participants according to Killip Class

Table 5 reported the frequency and number of several cardiac complications in a group of patients. Cardiogenic shock was observed in 9 patients, which represents 3.6% of the total population. Pulmonary edema was present in 20 patients (8%). Rales and/or JVD were detected in 15 patients, (6%). CHF was observed in 56 patients, (22.4%). A total of 14 individuals (5.6%) were documented to have had cardiac arrest upon admission. Lastly, a total of 18 individuals, representing 7.2% of the entire population, had ST segment deviation.

The research findings revealed that amongst the overall participants (n=250), just 1.3% of the surviving patients experienced cardiogenic shock, in contrast to a much higher proportion of 27.3% observed among dead participants (P<0.001). In the same manner, it was observed that among those suffering from pulmonary edema, a small percentage of 4.4% of the survivors had this disease, whereas a much higher proportion of 45.5% of dead individuals suffered from it (P<0.001). Participants experiencing rales and/or jugular venous distention (JVD) had a markedly elevated rate of death, as shown by a finding that only 4.8% of survivors presented with this medical issue, in contrast to 18.2% of individuals who died (P<0.001). Participants who had been admitted experiencing CHF or had cardiac arrest had notably greater rates of death. Approximately 18.9% of individuals having CHF and 0.9% of individuals having cardiac arrest in alive group, in contrast to 59.1% having CHF and 54.5% having cardiac arrest in died group (P<0.001). Furthermore, it was observed that individuals exhibiting ST segment deviation had a significantly elevated rate of death in comparison to individuals without this condition. Specifically, only 5.3% of the surviving patients presented with ST segment deviation, but 27.3% of dead individuals experienced this deviation (P<0.001).

Table 5

Distribution of participants according to Killip class

Killip class	Total (n=250) n (%)	Survival status n (%)		Statistical test	
		Alive (n=228)	Died (n=22)	Chi-square ($\chi 2$)	P-value
Cardiogenic shock					
Yes	9 (3.6)	3 (1.3)	6 (27.3)	38.953	.000*
No	241 (96.4)	225 (98.7)	16 (72.7)		
Pulmonary edema					
Yes	20 (8)	10 (4.4)	10 (45.5)	45.979	0.000*
No	230 (92)	218 (95.6)	12 (54.5)		
Rales and /or JVD					
Yes	15 (6)	11 (4.8)	4 (18.2)	6.347	0.012*
No	235 (94)	217 (95.2)	18 (81.8)		
CHF					
Yes	56 (22.4)	43 (18.9)	13 (59.1)	18.683	0.000*
No	194 (77.6)	185 (81.1)	9 (40.9)		
Cardiac arrest at admission					
Yes	14 (5.6)	2 (0.9)	12 (54.5)	109.318	0.000*
No	236 (94.4)	226 (99.1)	10 (45.5)		
ST segment deviation					
Yes	18 (7.2)	12 (5.3)	6 (27.3)	14.547	0.000*
No	232 (92.8)	216 (94.7)	16 (72.7)		

3.7 Distribution of participants according Cath lab intervention and readmission to hospital.

Table 7 showed the highest frequency of intervention was PCI, which was performed in 134 cases (58.8%). The next most common intervention was medical treatment, which was performed in 59 cases (25.9%). Normal coronary was performed in 23 cases (10.1%), and CABG was performed in 12 cases (5.3%). Overall, the majority of Cath lab interventions were PCI, accounting for more than half of the cases in this dataset. It seems that 78 patients were readmitted to the hospital (31.2%), while the majority of patients (n=172, 68.8%) did not require readmission. The chi square test showed that there is no associated between survival status and Cath lab intervention (P>0.05). The results showed that 58.8% of patients who survived underwent PCI compared to 68.2% of those who died. The frequency of normal coronary was 10.1% in patients who survived and 9.1% in those who died. The frequency of medical treatment was 25.9% in patients who survived and 22.7% in those who died. Finally, only 5.3% of patients who survived underwent CABG compared to 0% of those who died (P>0.05). The

percentage of patients who were readmitted to NNUH as 29.8% among those who survived and 45.5% among those who died. This difference was no statistically significant with a p-value of more than 0.05.

Table 6

Distribution of participants according to Cath lab intervention and Readmission to NNUH

Cath lab intervention and Readmission to NNUH	Total (n=250) n (%)	Survival status n (%)		Statistical test	
		Alive (n=228)	Died (n=22)	Chi-square ($\chi 2$)	P-value
Cath lab intervention					
PCI	149 (59.6)	134 (58.8)	15 (68.2)	1.554	0.670
Normal coronary	25 (10)	23 (10.1)	2 (9.1)		
Medical treatment	64 (25.6)	59 (25.9)	5 (22.7)		
CABG	12 (4.8)	12 (5.3)	0 (0)		
Re-admission to the hospital					
Yes	78 (31.2)	68 (29.8)	10 (45.5)	2.283	0.130
No	172 (68.8)	160 (70.2)	12 (54.5)		

3.8 Quantitative variables parameters

The results show that the frequencies and percentages for the qualitative variables such as age, Hight, weight, BMI, Smoking (cigarettes or hookah per years), length of staying, ejection fraction, heart rate at admission, SBP at admission, DBP at admission, creatinine at admission, and troponin at admission. Means and standard deviations for the quantitative variables for study participants. Table 8 shows the mean ± standard deviation for various demographic and clinical variables. The age of the participants was 60.65 ± 11.29 years, and their average height was 167.77±7.84 cm. The mean weight and BMI were 80.82±16.71 kg and 28.56±4.78 kg/m^2, respectively. On average, the participants reported smoking 74.09 ± 111.27 cigarettes or hookah per years. The average length of stay was 52.13 ± 30.7 Hours. The ejection fraction was 50.66 ± 11.12, and the heart rate at admission was 76.37 ± 13.14 beats per minute. The systolic and diastolic blood pressures at admission were 136.47 ± 20.8 mmHg and 78.72 ± 12.09 mmHg, respectively. The creatinine level at admission was 1.41 ± 1.69 mg/dL, and the troponin level at admission was 221.07 ± 604.1 mg/dL.

A comparison between the died and alive groups reveals statistically significant differences ($P<0.05$) for several studied variables. The died group had a significantly

higher mean age of 72.73±9.34 years compared to 59.49±10.78 years in the alive group. Additionally, the dead group had an elevated mean height (173.36±11.3 cm) and weight (95.05±26.73 kg) compared to the alive group (167.23±7.23 cm and 79.45±14.78 kg, respectively). However, there was a significant difference in BMI between the two groups (31.1±5.51 kg/m^2 in the dead group and 28.32±4.64 kg/m^2 in the alive group; P<0.05).

The died group also had a significantly higher mean number of cigarettes or hookah smoked per day (199.17±233.12) compared to the alive group (66.02±95.65). The length of stay in the hospital was also significantly longer in the dead group (75.32±43.95 hrs.) compared to the alive group (49.89±28.25 hrs.) and P <0.05.

Furthermore, the dead group had a significantly lower mean EF of 40.86±13.51 compared to 51.61±10.42 in the alive group. Additionally, the dead group had a significantly higher mean heart rate (92.14±21.29) at admission compared to the alive group (74.85±11). However, there was lowering significant in SBP at admission between the two groups (125.32±16.4 in the dead group and 137.54±20.89 in the alive group; P<0.05). By same away, The DBP at admission at admission was significantly lowering in the group of patients who died were compared to those who alive, with a mean (± SD) of 72.95±12.02 mmHg in the alive group and 79.28±11.98 mmHg in the dead group (P<0.05). Moreover, the dead group had a significantly higher mean creatinine level at admission (3.67±4.31) compared to the alive group (1.2±0.94; P<0.05), as well as a significantly higher mean t level at admission (840.63±1113.85) compared to the alive group (161.29±494.71; P<0.05).

Table 7

Means, and standard deviations for the quantitative data of study participants

Quantitative data	Total Mean±SD (n=250)	Survival status Mean±SD		Statistical test	
		Alive (n=228)	Died (n=22)	t	P-value
Age (years)	60.65±11.29	59.49±10.78	72.73±9.34	5.562	0.000*
Hight (cm)	167.77±7.84	167.23±7.23	173.36±11.3	3.589	0.000*
Weight (kg)	80.82±16.71	79.45±14.78	95.05±26.73	4.328	0.000*
BMI (kg/m^2)	28.56±4.78	28.32±4.64	31.1±5.51	2.637	0.009*
Smoking (cigarettes or hookah per years)	74.09±111.27	66.02±95.65	199.17±233.12	2.950	0.004*
Length of staying (Hours)	52.13±30.7	49.89±28.25	75.32±43.95	3.808	0.000*
Ejection fraction	50.66±11.12	51.61±10.42	40.86±13.51	-4.491	0.000*
Heart rate at admission	76.37±13.14	74.85±11	92.14±21.29	6.344	0.000*
SBP at admission	136.47±20.8	137.54±20.89	125.32±16.4	-2.665	0.008*
DBP at admission	78.72±12.09	79.28±11.98	72.95±12.02	-2.364	0.019*
Creatinine at admission	1.41±1.69	1.2±0.94	3.67±4.31	7.198	0.000*
Troponin at admission	221.07±604.1	161.29±494.71	840.63±1113.85	5.305	0.000*

3.9 Means, and standard deviations for the TIMI and GRACE of study participants.

Table 8 shows the mean ± standard deviation for TIMI and GRACE. the results showed that among the study population the TIMI score was 3.13 ± 1.44, and the GRACE score was 113.06 ± 32.82. The independent t test showed that the dead group had a higher mean TIMI score (4.5±1.77) compared to the alive group (3.00±1.34), as well as a higher mean GRACE score (184.64±21.11) compared to the alive group (106.15±24.41).

Table 8

Means, and standard deviations for the TIMI and GRACE of study participants

Risk score	Total Mean±SD (n=250)	Survival status Mean±SD		Statistical test	
		Alive (n=228)	Died (n=22)	t	P-value
TIMI score	3.13±1.44	3.00±1.34	4.50±1.77	4.863	0.000*
GRACE score	113.06±32.82	106.15±24.41	184.64±21.11	14.559	0.000*

3.10 Sensitivity, specificity, PPV, NPV, and AUC of GRAC and TIMI score for predicting the survival status.

Table 9 and Figure 1 showed sensitivity, specificity, PPV, NPV, and AUC of GRAC and TIMI score for predicting the survival status. The current study has found that the GRACE score has excellent diagnostic accuracy in predicting survival status, with a sensitivity, specificity, PPV, NPV, and accuracy of 100%. The AUC was also 1.000, indicating excellent discrimination between the survival and non-survival groups. Regarding TIMI, the ROC curve detected the AUC was 0.739 (P <0.001), sensitivity and specificity were 68.2% & 63.6%, respectively. PPV was 15.3%, NPV was 95.4%, and accuracy was 64.0% to the diagnostic and predicting the survival status (alive or died).

Table 9

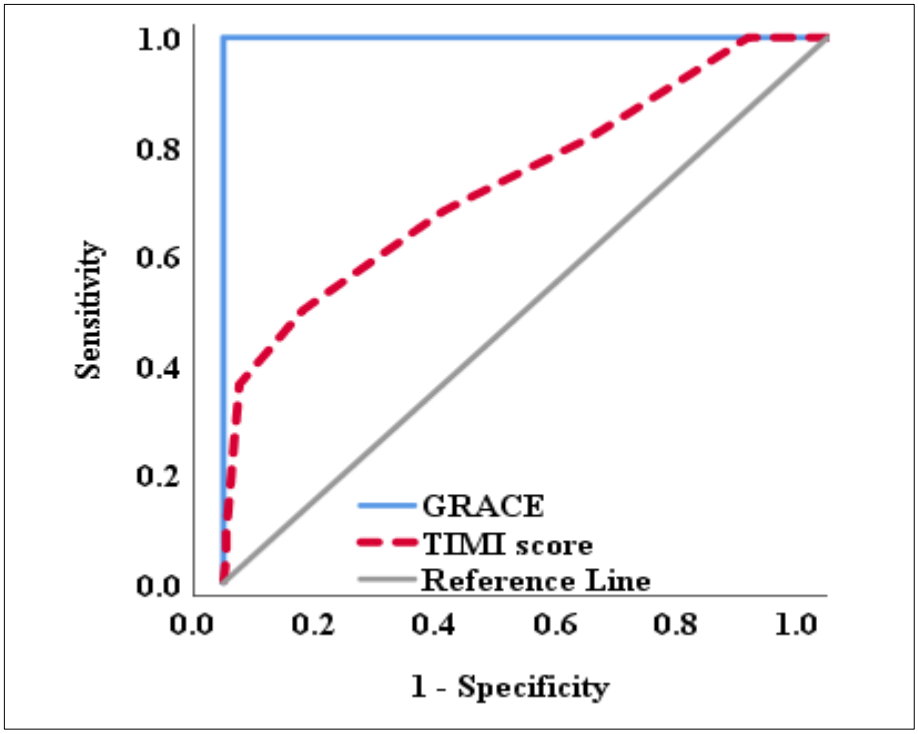
Sensitivity, specificity, PPV, NPV, and AUC of GRAC and TIMI for predicting the survival status

Score	Cut point	Survival status (n=250)		Screening tests					Statistical test	
		Died (n=22)	Alive (n=228)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)	AUC (95% CI)	P-value
GRACE										
Died (n=22)	>160	22	0	100	100	100	100	100	1.000 (1.00-1.000)	<0.001*
Alive (n=228)	≤160	0	228							
TIMI										
Died (n=22)	>3	22	0	68.2	63.6	15.3	95.4	64.0	0.739 (0.619-0.856)	<0.001*
Alive (n=228)	≤3	0	228							

*P-value significant at P ≤0.05; **n:** number of the subjects; **PPV:** Positive predictive value; **NPV:** Negative predictive value; **AUC:** area under the curve & **95% CI**: 95% confidence interval.

Figure 3

ROC test to predict the survival status



3.11 Distribution GRACE and TIMI among study population according to socio-demographic characteristics

The study found that among the variables examined, patients who were 65 years or older, female, unmarried, and smoked cigarettes or hookah had significantly higher mean GRACE scores. However, no significant differences were observed in mean GRACE scores for other variables, such as obesity and family history of CAD. For TIMI scores, only patients aged 65 years or older showed a significant difference in mean scores, while no significant differences were observed for other variables, including gender, marital status, obesity, family history of CAD, and smoking (including cigarettes and hookah).

The table illustrates the distribution of GRACE and TIMI scores among participants based on medical diagnosis. The results indicate that patients diagnosed with STEMI had significantly higher mean GRACE and TIMI scores compared to those diagnosed with NSTEMI and Unstable angina ($P<0.05$). The mean GRACE score was 147.5±44.93 for STEMI, 127.88±30.59 for NSTEMI, and 100.72±25.81 for Unstable angina. The mean TIMI score was 4.25±2.38 for STEMI, 3.55±1.26 for NSTEMI, and

2.77±1.29 for Unstable angina. These findings suggest that patients with STEMI are at higher risk for adverse outcomes than those with NSTEMI or Unstable angina according to both GRACE and TIMI risk assessment tools.

Table 10

Distribution GRACE and TIMI among study population according to socio-demographic and medical diagnosis characteristics

Socio-demographic characteristics	Total (n=250)	GRACE		TIMI	
		Mean±SD	P-value	Mean±SD	P-value
Age (years)					
Less than 65	157	101.65±27.42	0.000*[t]	2.62±1.21	0.000*[t]
65 +	71	133.7±31.81		4.06±1.37	
Gender					
Male	166	110.28±30.9	0.035*[t]	3.11±1.29	0.664[t]
Female	62	119.92±36.47		3.19±1.77	
Marital status					
Married	219	111.85±31.02	0.017*[t]	3.11±1.4	0.242[t]
Unmarried	9	133.36±52.56		3.57±2.1	
Obesity					
Normal weight	39	111.61±27.39	0.137[F]	3.32±1.71	0.650[f]
Overweight	78	118.21±34.67		3.07±1.44	
Obese	111	109.73±32.88		3.12±1.35	
Family history of CAD					
Yes	73	114.76±34.07	0.225[t]	3.04±1.37	0.138[t]
No	155	109.31±29.74		3.33±1.58	
Smoking					
Yes	93	117.32±32.67	0.011*[t]	3.25±1.47	0.106[t]
No	135	106.56±32.13		2.95±1.4	
If yes, specify:	n=9				
Cigarettes	87	105.09±31.95	0.099[t]	2.87±1.38	0.038*[t]
Hookah	6	125.86±30.15		4±1.15	
Medical diagnosis.					
Unstable angina	148	100.72±25.81	0.000* t	2.77±1.29	0.000* t
STEMI	16	147.5±44.93		4.25±2.38	
NSTEMI	86	127.88±30.59		3.55±1.26	

t: independent t test; & **F**: one way ANOVA

3.12 Distribution GRACE and TIMI among study population according to clinical data

The results show that patients with ≥3 CAD risk factors, hypertension, hypercholesterolemia, diabetes, known CAD (stenosis ≥50%), ASA use in the past 7 days, severe angina (≥2 episodes in 24 hours, EKG ST changes ≥0.5 mm, positive cardiac marker), ischemic heart disease, percutaneous coronary intervention (PCI), heart failure, chronic kidney disease, coronary artery bypass grafting, cerebrovascular accident, atrial fibrillation, end-stage renal disease, and other comorbidities had significantly higher GRACE and TIMI scores ($P<0.05$), indicating an increased risk for adverse outcomes. These findings suggest that these clinical factors can serve as predictors of adverse outcomes and can be used in risk stratification and management planning for patients with ACS.

Regarding distribution GRACE and TIMI among study population according to clinical features showed in (Table A, Appendix C); Distribution GRACE and TIMI among study population according to clinical data (Table B, Appendix C); Distribution GRACE and TIMI among study population according to Killip class and site of death (Table C, Appendix C); and correlation between risk score and studied quantitative parameters and among participants (Table D, Appendix C).

2.13 Summary

A study on 250 patients with acute coronary syndrome (ACS) found that 91.2% of the patients were alive while 8.8% had died. The majority of patients were under 65 years old, male, and married. Regarding weight status, 48.7% were obese, 34.2% were overweight, and 17.1% had normal weight. The study revealed that 32% had a family history of CAD, and 40.8% reported smoking, primarily cigarettes. However, there were no significant differences in survival based on gender, marital status, smoking history, or type of smoking. The analysis showed that patients diagnosed with unstable angina had a higher survival rate compared to those with STEMI or NSTEMI. Patients who died had higher prevalence rates of various risk factors and medical conditions such as CAD, hypertension, hypercholesterolemia, diabetes, severe angina, EKG ST changes, positive cardiac markers, ischemic heart disease, heart failure, chronic kidney disease, atrial fibrillation, cerebrovascular accidents, end-stage renal disease, and others.

The EF was associated with patient outcomes, as those with EF less than 50% had higher mortality rates. Higher heart rates and abnormal blood pressure at admission were associated with increased mortality risk. Abnormal creatinine and positive troponin levels at admission were also associated with higher mortality rates. Higher death rates have been associated with cardiac complications, including cardiogenic shock, cardiac arrest upon admission, congestive heart failure, pulmonary edema, and ST segment deviation and rales and/or JVD. PCI emerged as the prevailing medical procedure, whereas the study revealed no statistically significant relationship between survival rates and interventions conducted in the cardiac catheterization laboratory. Furthermore, the research revealed that the GRACE score had remarkable diagnostic precision in predicting survival outcomes, exhibiting a specificity, sensitivity, NPV, PPV, and total precision of 100%. The ROC curve achieved a value of 1.000, suggesting excellent discriminatory ability in distinguishing between the surviving and dead groups. In contrast, the diagnostic precision of the TIMI score was shown to be lower. The ROC curve analysis for the TIMI scoring system yielded an AUC value of 0.739, indicating a statistically significant result ($P < 0.001$). The sensitivity and specificity of the TIMI scoring system were determined to be 68.2% and 63.6%, respectively. The PPV was found to be 15.3%. Conversely, the NPV was determined to be 95.4%. The total precision of the prediction model in determining survival status (alive or died) was measured at 64.0%.

Chapter Four
Discussions and Conclusions

4.1 Discussion

4.1.1 Introduction

The present study offers an introductory context and establishes the framework for the investigation that aims to compare the accuracy of the TIMI score and the GRACE score in predicting the outcomes experienced by patients with ACS during their hospital stay, as well as in the short-term and long-term periods. ACS is a cardiovascular disorder that is recognized as a major health concern due to its substantial impact on mortality as well as morbidity rates on a global level. Precise stratification of risks and prediction models play a crucial role in the identification of patients at high risk, the optimization of treatment approaches, and the enhancement of outcomes for patients. Therefore, the purpose of this research is to compare the accuracy of the TIMI score and the GRACE score, which are widely used risk stratification tools in ACS, in predicting various outcomes. The outcomes of this research may have significant clinical effects, guiding healthcare providers in decision-making and patient management strategies. This study seeks to give insights for subsequent studies in the field by doing an in-depth review of the existing literature and use stringent statistical techniques to examine the prediction capacities of the TIMI and GRACE scores.

The findings of this study illustrate the relative ACCURACY of the TIMI score and the GRACE score in predicting the outcomes experienced by patients with ACS during their hospital stay, as well as in the short-term and long-term periods after their admission. The present study discusses the aforementioned results within the framework of prior research, underlining both the commonalities and disparities seen in the ACCURACY of the scoring systems. The clinical implications of the results are explored, considering how they can contribute to risk stratification and prediction models in ACS, and their potential impact on decision-making and patient management. The strengths point and constraints of the research are critically evaluated, acknowledging factors that may have influenced the results. Recommendations for future research are provided, suggesting areas of improvement for the scoring systems and proposing alternative approaches to risk prediction in ACS. Overall, this research

contributes to the understanding of risk assessment in ACS patients and provides valuable insights for healthcare professionals. The conclusions drawn from this study reinforce the significance of accurate risk stratification and prediction models in optimizing patient care and improving outcomes for individuals with ACS.

4.1.2 The TIMI and GRACE of study participants

TIMI and GRACE scores were higher in died patients compared to survived patients. The findings of the GRACE and TIMI scores, reveal a potentially elevated risk or increased severity in the group of individuals that died when compared to the group of individuals who survived.

In a study conducted by Chen et al. (2023), it was observed that individuals who passed away demonstrated significantly higher mean GRACE and TIMI scores in comparison to those who were keep alive. The findings point out that there may be an association between increased risk or severity and the death rate for patients. The scores take into account significant clinical parameters and contribute in evaluating the likelihood of negative cardiac events and mortality.

The group of the individuals who died had a greater mean TIMI score, suggesting a larger prevalence of risk factors or greater severe clinical findings, in contrast to those in the group of individuals who lived(Kao, Hsieh et al. 2020); (Tsao, Aday et al. 2022).

The aforementioned studies imply a greater likelihood of experience adverse cardiac events or elevated risk of mortality. Similarly, the higher mean GRACE score in the group that died further supports the notion of increased risk and severity in these patients. Additionally,) showed the GRACE score incorporates variables like “age, heart rate, blood pressure, creatinine level, and ST-segment deviation” to estimate the risk of mortality or major complications in individuals with ACS (Kao, Hsieh et al. 2020); (Tsao, Aday et al. 2022) .

(Chapman, Hesse et al. 2018)and (Niazi, Bukhari et al. 2023)underscore the significance of employing risk stratification tools to recognize individuals with a heightened risk and to guide the implementation of appropriate management approaches. These tools assign higher scores to individuals requiring increased vigilance, aggressive interventions, and potentially more intensive medical therapies, all

aimed at enhancing outcomes. The findings indicate that individuals who succumbed to the condition likely experienced a more intricate or advanced clinical trajectory, which could have played a role in their unfavorable prognosis.

(Chen, Liang et al. 2022)and (Neto, Sousa et al. 2023)showed TIME and GRACE are worth noting that risk scores alone cannot determine individual outcomes with absolute certainty. Other factors, such as individual patient characteristics, comorbidities, and treatment approaches, also play crucial roles in determining patient outcomes. Nonetheless, the observed differences in the mean TIMI and GRACE scores between the groups that died and survived provide valuable insights into the overall risk profiles and potential severity in these two groups.

Herrera Castillo et al (2023) showed that the group that died had a higher mean TIMI and GRACE scores than the group that survived indicating a potentially higher risk or severity in the participants who did not survive. These findings underscore the importance of risk stratification tools in recognizing elevated-risk individuals and tailoring proper management approaches to improve outcomes in ACS. The TIMI and GRACE scores provide valuable insights into overall risk profiles and potential severity, they should be considered alongside other factors such as patient characteristics, comorbidities, and treatment approaches for determining individual outcomes in ACS. Risk stratification tools play a crucial role in recognizing elevated - risk individuals and guiding proper management approaches for improved outcomes.

4.1.3 Sensitivity, specificity, PPV, NPV, and AUC of GRAC and TIMI for predicting the survival status.

The results illustrated presented the diagnostic ACCURACY of GRACE and TIMI scores in predicting survival status. The study findings revealed that the GRACE score demonstrated excellent accuracy in predicting survival. It exhibited sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of 100%. The AUC had been estimated to be 1.000, which signifies exceptional discriminatory ability in distinguishing between the survival and died groups. On the contrary, the diagnostic precision of the TIMI score was shown to be lower when compared with the GRACE score. The analysis of the ROC curve showed an AUC of 0.739 ($P < 0.001$) for the TIMI score, indicating a modest level of

discriminating capacity. The sensitivity and specificity values of the TIMI score have been determined to be 68.2% and 63.6%, correspondingly. The PPV was found to be 15.3%. Conversely, the NPV reached a value of 95.4%. The total accuracy rate for the prediction of survival status (alive or dead) was found to be 64.0% in the study.

Based on the results of this study, it was seen that the GRACE score demonstrated higher accuracy in diagnosis in comparison to the TIMI score, as well as in its ability to predict survival outcomes. The GRACE score demonstrated optimal specificity, sensitivity, PPV, NPV, and accuracy, but the TIMI score had comparatively less favorable results in similar ACCURACY parameters. Hence, it may be stated that the GRACE score demonstrates more reliability in evaluating the survival status.

The research investigation conducted by (Ji, Song et al. 2023) offers significant contributions to our understanding of the diagnostic ACCURACY of the GRACE and TIMI scores in prediction survival status. The researchers discovered that the GRACE score exhibited a high level of accuracy in predicting survival, but the TIMI score exhibited comparatively poorer accuracy for diagnosis.

Sensitivity pertains to the test's capacity to accurately identify people who possess the particular condition under consideration, while specificity denotes the test's ability to accurately identify those who do not possess this condition. The GRACE score demonstrated optimal specificity, sensitivity, PPV, NPV, and accuracy. These findings indicate that the GRACE score effectively distinguished between persons who lived as well as who died without any instances of false-positive or false-negative outcomes (Wang, Zhang et al. 2021) .

(Martha, Sihite et al. 2021)showed that the PPV and NPV for the GRACE score indicate that all individuals classified as surviving or non-surviving based on the score were correctly identified. The PPV signifies the percentage of true positives amongst wholly positive test results, while the NPV signifies the percentage of true negatives amongst wholly negative test results. They concluded the GRACE score exhibited exceptional diagnostic ACCURACY in predicting survival status.

Additionally(Zheng, Wang et al. 2020)illustrated that the AUC was 1.000 for the GRACE score. An AUC of 1.000 signifies perfect discrimination between the survival

and non-survival groups. The authors showed that the GRACE score is highly precise in distinguishing between individuals who survived and those who did not, further supporting its effectiveness in predicting survival outcomes.

(Yang, Bai et al. 2022) presented that the TIMI score displayed a lesser diagnostic accuracy in comparison to the GRACE score. The ROC curve analysis suggests a moderate discriminatory ability. They were notably lower than the corresponding values for the GRACE score. This indicates that the TIMI score had a greater probability of false-positive and false-negative outcomes in predicting survival status.

According to(Martha, Sihite et al. 2021), the PPV and NPV of the TIMI score indicate a higher proportion of false-positive outcomes and a lesser proportion of false-negative outcomes. This implies that a notable percentage of persons who were categorized as survived according to the TIMI score was not actually survive, whereas a substantial percentage of those categorized as non-survivors demonstrated, in actually, survive. The study authors provided evidence to support the idea that the GRACE score displayed a higher level of ACCURACY in comparison to the TIMI score with regard to of accurately diagnosing patients and predicting their survival outcomes. The GRACE score demonstrated high specificity, sensitivity, PPV, NPV, and accuracy, as well as a perfect AUC, showing exceptional discriminatory capability. In contrast, the findings revealed that the TIMI score exhibited reduced accuracy in diagnosis as well as specificity, sensitivity, PPV, NPV, and a modest level of discriminating capacity. The authors indicated that the GRACE score exhibited greater diagnostic accuracy, specificity, sensitivity, PPV, NPV, and discriminating capability in comparison to the TIMI score. Consequently, the GRACE score may be considered a more reliable instrument for evaluating survival status.

4.2 Conclusion

The findings of this study indicate that the GRACE score has exceptional accuracy for diagnosis when predicting survival status; The specificity, sensitivity, PPV, NPV, and accuracy, all of which were observed to be 100%; Moreover, the AUC value of 1.000 indicates exceptional discriminatory ability in distinguishing between alive and died populations. In contrast, the accuracy of diagnosis of the TIMI score was shown to be lower in comparison to that of the GRACE score. The ROC curve produced an AUC

value of 0.739, with a statistically significant p-value of less than 0.001; This suggests a modest discriminating. The sensitivity and specificity values of the TIMI score were found to be 68.2% and 63.6%, correspondingly. The PPV was found to be 15.3%. Similarly, the NPV was determined to be 95.4%. The accuracy of the prediction of survival status (alive or died) was measured at 64.0%.

In conclusions, the GRACE score demonstrated an elevated degree of ACCURACY for prediction the survival status of patients diagnosed with ACS in comparison to the TIMI score. The results exhibited a notable level of specificity, sensitivity, PPV, NPV, and AUC, which together reflect the high accuracy for recognizing people who are at a heightened risk of death. The aforementioned results underscore the significance of employing the GRACE score to serve as a reliable instrument in healthcare settings to evaluate prognosis and make well-informed decisions with regard to patient care. In the case of ACS, which is complicated by cardiogenic shock, pulmonary edema, rales and/or JVD, CHF, cardiac arrest upon admission, and ST segment deviation, it was observed that both the GRACE and TIMI scores exhibited markedly elevated values among individuals who dead in comparison to those who survived. This finding implies that these scoring systems possess the capability to effectively differentiate individuals at elevated risk as well as in predict the adverse clinical outcomes.

The elevated scores reported in dead individuals suggest the heightened severity of the medical condition and a poorer prognosis. Health care providers have can employ these scores for the purpose of risk assessment and making decisions, especially in individuals who have accompanying complications. Furthermore, the research emphasizes the significance of the GRACE score in prediction events related to cardiovascular disease, while the TIMI score demonstrate less ACCURACY. There was a positive correlation noticed between the duration of stay in the hospital and each of the GRACE or TIMI scores. Numerous medical variables, such as risk factors for CAD, elevated blood pressure, elevated cholesterol levels, diabetes, known CAD, Acetylsalicylic acid (ASA) usage, ischemic heart disease, severe angina, and comorbidities, exhibited a statistically significant association with elevated GRACE and TIMI scores. These findings suggest a heightened risk to have adverse outcomes among individuals possessing these attributes. The aforementioned medical variables possess

the potential to serve as significant predictors for the stratification of risk and for the development of treatment plans for patients with ACS.

4.2.1 Limitations

- The study's sample size may be fairly small. This constraint implies that the study's sample size may be restricted, thereby impacting the extent to which the results may be generalized. A small sample size reduces the statistical power of the study, making it more challenging to detect significant differences or associations accurately. It may also increase the risk of sampling bias and limit the ability to draw robust conclusions. To address this limitation, future studies could aim for larger sample sizes to improve the representativeness and reliability of the findings.
- Lack of comparison with other scoring systems: This limitation indicates that the study did not compare the ACCURACY of the TIMI and GRACE scores with other existing risk stratification tools or scoring systems. Comparing different scoring systems would provide a more comprehensive understanding of their relative strengths and weaknesses, allowing for a better assessment of their clinical utility. It would help determine whether the TIMI and GRACE scores are superior or inferior to alternative methods of risk prediction. Future studies could incorporate such comparisons to enhance the validity and applicability of the findings.

4.3 Recommendations

4.3.1 Recommendations for practice

- Implement the GRACE score as the primary tool for predicting survival status in patients with ACS and associated complications. Its high sensitivity, specificity, PPV, NPV, and AUC make it a reliable prognostic indicator.
- Discontinue the routine use of the TIMI score for predicting survival status in ACS patients. Its lower diagnostic accuracy and moderate discrimination compared to the GRACE score suggest limited effectiveness in identifying individuals at risk of non-survival.
- Incorporate the GRACE score into clinical settings to assess prognosis and guide informed decision-making for patient management. Its superior ACCURACY in predicting survival status highlights its importance as a valuable tool.

- Utilize both the TIMI and GRACE scores as effective risk stratification tools for patients with ACS complicated by cardiogenic shock, pulmonary edema, rales and/or JVD, CHF, cardiac arrest at admission, and ST segment deviation. The higher scores observed in patients who died indicate a greater severity of disease and a poorer prognosis in these specific clinical scenarios.
- Recognize the association between higher GRACE scores and increased likelihood of mortality in both the short and long term. Use the GRACE score to identify high-risk individuals and tailor treatment strategies accordingly.
- Consider the impact of Cath lab intervention on risk stratification and outcomes, as indicated by the significant difference in GRACE scores among patients undergoing this procedure.
- Consider the positive correlation between the length of hospital stays and both the GRACE and TIMI scores. Also, consider extended monitoring and tailored interventions for patients with higher scores to optimize outcomes.
- Identify and closely monitor patients with multiple CAD risk factors, hypertension, hypercholesterolemia, diabetes, known CAD, ASA use, severe angina, ischemic heart disease, and various comorbidities. These clinical factors are associated with significantly higher GRACE and TIMI scores and indicate an increased risk for adverse outcomes.

4.3.2 Recommendations for administrators/policy makers

- Continuously update and educate healthcare professionals on the use and interpretation of the GRACE score, emphasizing its superiority over the TIMI score in predicting survival status and guiding treatment decisions.
- Encourage further research and validation studies to explore the application of the GRACE score in diverse populations and clinical settings, as well as investigate its potential role in predicting cardiovascular outcomes and informing treatment strategies beyond survival status prediction.

4.3.3 Recommendations for education

- Promote awareness of the significance of risk stratification tools in ACS management and their role in guiding treatment decisions.

- Emphasize the significance of clinical factors associated with higher GRACE and TIMI scores, encouraging healthcare professionals to identify and closely monitor patients with these risk factors for improved patient outcomes.
- Foster a culture of continuous learning and staying updated with the latest research and advancements in risk stratification and prognosis assessment for ACS patients.
- Support and facilitate research initiatives focused on further validating and expanding the usage of the GRACE score in clinical practice.

List of Abbreviations

Abbreviation	Meaning
ACR	Acute Contrast-induced Nephropathy
ACS	Acute Coronary Syndromes
AF	Atrial Fibrillation
AHA	American Heart Association
AMI	Acute Myocardial Infarction
ASA	Acetylsalicylic acid
AUC	Area Under the Curve
AV	Atrioventricular
BMI	Body Mass Index
CABG	Coronary Artery Bypass Graft
CADILLAC	Controlled Abciximab and Device Investigation to Lower Late Angioplasty Complications
CCU	Cardiac Care Unit
CHD	Congenital heart Disease
CHF	congestive heart failure
CKD	Chronic Kidney Disease
CKMB	Creatine kinase-MB
cm	Centimeter
CVA	Cerebrovascular Accidents
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
DM	Diabetes Mellitus
ECG	Electrocardiogram
EF	Ejection Fraction
ESC	European Society of Cardiology
ESRD	End-Stage Renal Disease
GRACE	Global Registry of Acute Coronary Events
GS	GRACE score

HEART	Heart Score
HF	Heart Failure
hrs.	Hours
HTN	Hypertension
IHD	Ischemic Heart Disease
IRB	An Institutional Review Board
IV	Intravenous
JVD	Jugular vein distention
kg	Kilogram
MACE	Major Adverse Cardiac Events
mg/dL	Milligrams per deciliter
MI	Myocardial Infarction
mmHg	Millimeter of mercury
n	Number
NNUH	An-Najah National University Hospital
NPV	Negative Predictive Value
NSTE-ACS	Non-ST-elevation acute coronary syndrome
NSTEMI	Non –ST-elevation myocardial infarction
PO	Per oral/orally
PPV	Positive Predictive Value
RCTs	Randomized Controlled Trials
ROC	Receiver Operating Characteristic
RS	Risk Score
SBP	Systolic Blood Pressure
SCD	Sudden Cardiac Death
SD	Standard Deviation
SPSS	Statistical Package for Social Science
STE-ACS	STE-Acute Coronary Syndrome
STEMI	ST-elevation myocardial infarction
SYNTAX	Synergy Between PCI With Taxus and CABG

t	Troponin
T2DM	Type 2 Diabetes Mellitus
TIMI	Thrombolysis in Myocardial Infarction
UA	Unstable Angina
US	United States
vs.	Versus
χ^2	Chi-Square

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Appendices

Appendix A

Data collection sheet

An-Najah National University
Faculty of Graduate Studies
Master of Critical Care Nursing

COMPARING THE ACCURACY OF TIMI AND GRACE IN PREDICTING IN-HOSPITAL SHORT AND LONG-TERM OUTCOMES AMONG PATIENTS WITH ACUTE CORONARY SYNDROME.

By

Ahmed Adnan Zamel

Supervisor

Dr. Nizar Said

1- <u>Sociodemographic data:</u>

- **Patient's file number: ……**
- **Patient's mobile number: ……**
- **Age:** ……
- **Gender:**
  - ☐ Male.
  - ☐ Female.
- **Marital status:**
  - ☐ Single.
  - ☐ Married.
  - ☐ Divorce.
  - ☐ Widow.
- **Hight (cm):** ……
- **Weight (kg.):** ……
- **BMI:** ……
- **Family history of CAD**
  - ☐ Yes.
  - ☐ No.
- **Smoking**
  - ☐ Yes.
  - ☐ No.

If yes, specify:

- ☐ Cigarettes.
- ☐ Hookah.

On average, how many cigarettes or hookah a day do you smoke?
……

2- <u>Medical diagnosis.</u>

- ☐ Unstable angina
- ☐ STEMI
- ☐ NSTEMI

3- <u>Clinical data.</u>

- **Length of staying (days): ……..**
- **≥3 CAD risk factors**
  - ☐ Yes.
  - ☐ No.
- **Hypertension**
  - ☐ Yes.
  - ☐ No.
- **Hypercholesterolemia**
  - ☐ Yes.

- □ No.

- ❖ **Diabetes**
  - □ Yes.
  - □ No.
- ❖ **Known CAD (stenosis ≥50%)**
  - □ Yes.
  - □ No.
- ❖ **ASA use in past 7 days**
  - □ Yes.
  - □ No.
- ❖ **Severe angina (≥2 episodes in 24 hrs)**
  - □ Yes.
  - □ No.
- ❖ **EKG ST changes ≥0.5mm**
  - □ Yes.
  - □ No.
- ❖ **Positive cardiac marker**
  - □ Yes.
  - □ No.
- ❖ **If the patient suffering from any other medical diseases, specify:**
  .....
- ❖ **Ejection fraction (EF):** .....
- ❖ **Heart rate at admission:** .....
- ❖ **Systolic BP at admission:** .....
- ❖ **Diastolic Bp at admission:** .....

4- <u>Lab test</u>

- ❖ **Creatinine at admission: .....**
- ❖ **Troponin (t)at admission :.....**

5- <u>Killip Class.</u>

- ❖ **Cardiogenic shock**
  - □ Yes.
  - □ No.
- ❖ **Pulmonary edema**
  - □ Yes.
  - □ No.
- ❖ **Rales and /or JVD**
  - □ Yes.
  - □ No.

❖ **CHF**

- Yes.
- No.

6- Cardiac arrest at admission

- Yes.
- No.

7- ST segment deviation

- Yes.
- No.

8- Risk scores

❖ **Value of TIMI score** ……...……...

❖ **Value of GRACE score in hospital** ……...……...

❖ **Value of GRACE score within 6 months of admission** ……...……...

9- Patient survival

- A lived.
- Dead.

10- Date of death:

- The death occurred in the hospital.
- The death occurred within 14 days after discharge.
- The death occurred within 1 month after discharge.
- The death occurred within 6 months after discharge.

11- Cath lab intervention:

……
……
……
……
……

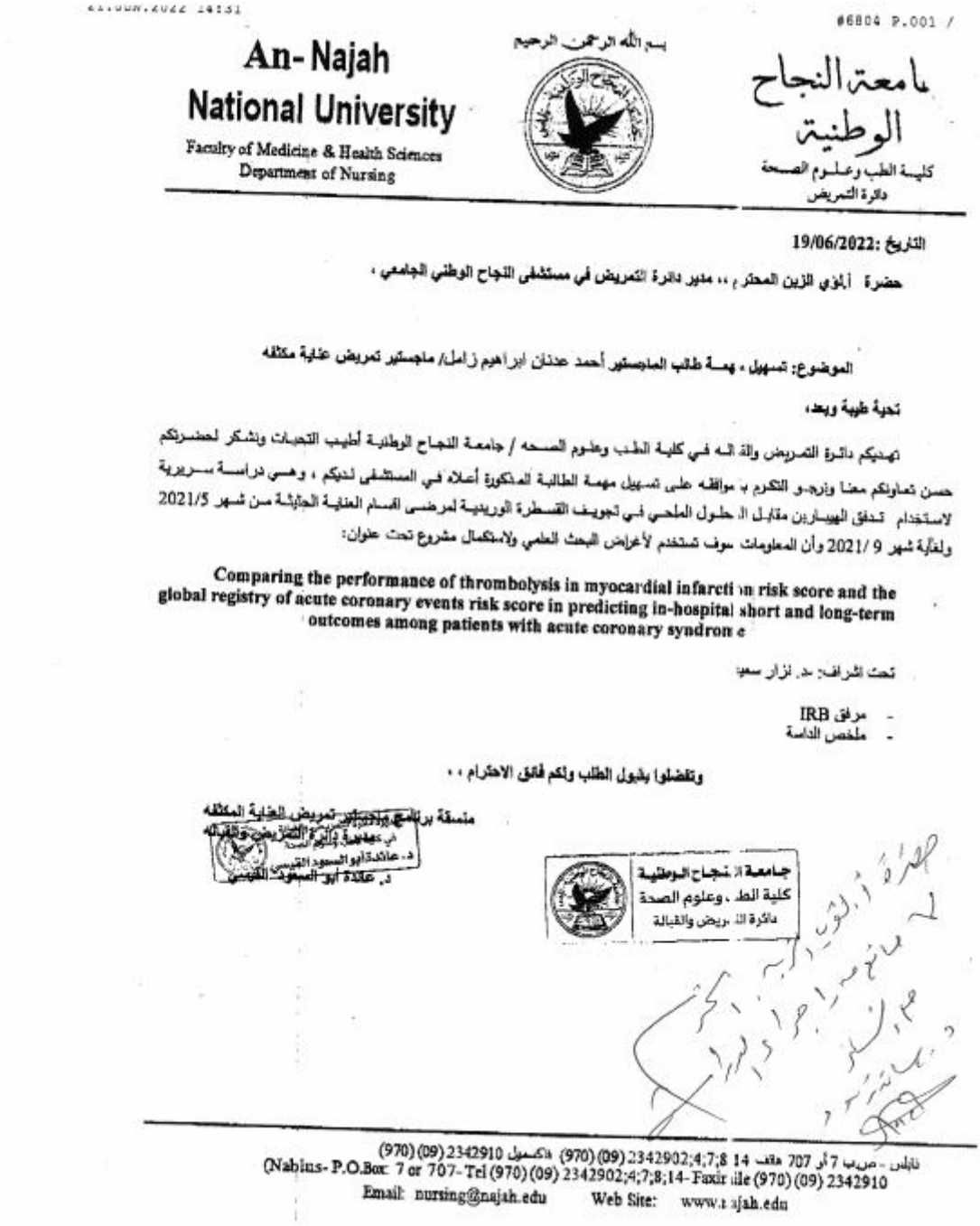
12- Readmission to NNUH

- Yes.
- No.

Appendix B

Approval Letters

IRP Approval Letter



#6804 P.001 /

An- Najah National University
Faculty of Medicine & Health Sciences
Department of Nursing

بسم الله الرحمن الرحيم

جامعة النجاح الوطنية
كلية الطب وعلوم الصحة
دائرة التمريض

التاريخ :19/06/2022

حضرة أبوي الزين المحترم ،، مدير دائرة التمريض في مستشفى النجاح الوطني الجامعي ،

الموضوع: تسهيل مهمة طالب الماجستير أحمد عدنان ابراهيم زامل/ ماجستير تمريض عناية مكثفه

تحية طيبة وبعد،

تهديكم دائرة التمريض والة الـه في كلية الطب وعلوم الصحه / جامعة النجاح الوطنية أطيب التحيات وتشكر لحضرتكم حسن تعاونكم معنا وترجو التكرم بموافقه على تسهيل مهمة الطالبة المذكورة أعلاه في المستشفى لديكم ، وهي دراسة سريرية لاستخدام تدفق الهيبارين مقابل الحلول الملحي في تجويف القسطرة الوريدية لمرضى اقسام العناية الحاثية من شهر 2021/5 ولغاية شهر 2021/ 9 وأن المعلومات سوف تستخدم لأغراض البحث العلمي ولاستكمال مشروع تحت عنوان:

Comparing the performance of thrombolysis in myocardial infarction risk score and the global registry of acute coronary events risk score in predicting in-hospital short and long-term outcomes among patients with acute coronary syndrome

تحت اشراف: د. نزار سعيد

- مرفق IRB
- ملخص الدراسة

وتفضلوا بقبول الطلب وأكم فائق الاحترام ،،

منسقة برنامج ماجستير تمريض العناية المكثفه
د. عائدة أبو السعود القيسي

جامعة النجاح الوطنية
كلية الطب وعلوم الصحة
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Email: nursing@najah.edu Web Site: www.najah.edu

An-Najah National University
Faculty of Medicine & Health Sciences
Institutional Review Board

جامعة النجاح الوطنية
كلية الطب وعلوم الصحة
لجنة اخلاقيات البحث العلمي

Ref: Mas. June. 2022/11

IRB Approval Letter

Title of Research:

Comparing the performance of thrombolysis in myocardial infarction score and the global registry of acute coronary events score in predicting in-hospital short and long-term outcomes among patients with acute coronary syndrome: A retrospective study

Submitted by:
Ahmad Adnan Ibraheem Zamel

Supervosor:
Yonis Dar Ammori, Nizar Said

Approved:
15th June 2022.

Your Study Title **"Comparing the performance of thrombolysis in myocardial infarction score and the global registry of acute coronary events score in predicting in-hospital short and long-term outcomes among patients with acute coronary syndrome: A retrospective study "**reviewed by An-Najah National University IRB committee and was approved on 15th June 2022.

Hasan Fitian, MD
IRB Committee Chairman

IRB

Nablus - P.O Box :7 or 707 | Tel (970) (09) 2342902/4/7/8/14 | Faximile (970) (09) 2342910| E-mail : IRB@najah.edu

Appendix C

Tables

Table C.1

Distribution GRACE and TIMI among study population according to clinical features

Clinical data	Total (n=250)	GRACE		TIMI	
		Mean±SD	P-value	Mean±SD	P-value
≥3 CAD risk factors					
Yes	98	122.13±36.66	0.000* [t]	3.73±1.35	0.000* [t]
No	152	107.2±28.72		2.74±1.37	
Hypertension					
Yes	148	118.16±32.44	0.003* [t]	3.52±1.41	0.000* [t]
No	102	105.66±32.1		2.57±1.3	
Hypercholesterolemia					
Yes	52	128.1±35.95	0.000*	3.62±1.42	0.000* [t]
No	198	109.11±30.84		3.01±1.43	
Diabetes					
Yes	119	122.04±32.51	0.000*	3.71±1.35	0.000* [t]
No	131	104.89±31.03		2.6±1.32	
Known CAD (stenosis ≥50%)					
Yes	80	129.74±37.76	0.000*	3.64±1.3	0.000* [t]
No	170	105.21±26.96		2.89±1.45	
ASA use in past 7 days					
Yes	147	119.29±32.3	0.000*	3.54±1.35	0.000* [t]
No	103	104.16±31.63		2.54±1.37	
Severe angina (≥2 episodes in 24 hrs)					
Yes	162	118.12±33.79	0.001*	3.31±1.41	0.008*
No	88	103.73±28.87		2.81±1.46	
EKG ST changes ≥.5mm					
Yes	22	152.82±48.29	0.000*	3.73±2.25	0.043* [t]
No	228	109.22±28.24		3.07±1.33	
Positive cardiac marker				0.000*	
Yes	96	133.5±33.69	0.000* [t]	3.71±1.49	0.000* [t]
No	154	100.31±24.95		2.77±1.29	
IHD					
Yes	77	128.95±32.44	0.000* [t]	3.9±1.27	0.000* [t]
No	173	105.98±30.51		2.79±1.39	
PCI					
Yes	59	135.56±37.51	0.000* [t]	3.85±1.28	0.000* [t]
No	191	106.1±27.86		2.91±1.42	
HF					
Yes	45	143.04±38.03	0.000* [t]	3.69±1.55	0.004* [t]
No	205	106.47±27.59		3.01±1.39	
CKD					
Yes	32	156.28±33.66	0.000* [t]	4.31±1.4	0.000* [t]
No	218	106.71±27.53		2.96±1.37	
CABG					

Yes	39	144.77±38.16	0.000* [t]	4.13±1.45	0.001* [t]
No	211	107.19±28.15		2.95±1.37	
CVA					
Yes	24	166.92±33.17	0.000* [t]	4.08±1.74	0.000* [t]
No	226	107.34±27.15		3.03±1.37	
AF					
Yes	27	152.93±41.76	0.000* [t]	3.78±1.74	0.014* [t]
No	223	108.23±28.06		3.05±1.39	
ESRD					
Yes	16	142.19±30.29	0.001* [t]	4.13±1.02	0.004* [t]
No	234	111.06±32.09		3.06±1.44	
Others					
Yes	134	117.13±34.3	0.034* [t]	3.3±1.39	0.049* [t]
No	116	108.34±30.5		2.94±1.48	

t: independent t test; & **F**: one way ANOVA

Table C.2

Distribution GRACE and TIMI among study population according to clinical data

Medical settings	Total (n=250) n (%)	GRACE		TIMI	
		Mean±SD	P-value	Mean±SD	P-value
Ejection fraction (EF)					
Less than 50%	70	132.03±34.25	0.000* [t]	3.51±1.5	0.009* [t]
50-60%	180	105.68±29.17		2.98±1.4	
Heart rate at admission					
Less than 60	16	101.06±13.2	0.000* [F]	3±1.79	0.888 [F]
60-100	223	111.52±31.16		3.13±1.41	
More than 100	11	161.55±46.16		3.27±1.62	
Systolic BP at admission					
Normal	122	107.41±27.51	0.008* [t]	2.84±1.46	0.002* [t]
Abnormal	128	118.44±36.48		3.41±1.38	
Diastolic BP at admission					
Normal	122	107.42±27.53	0.008* [t]	2.84±1.46	0.002 [t]
Abnormal	128	118.43±36.47		3.41±1.38	
Creatinine at admission					
Normal	176	106.01±30.09	0.000*[t]	2.83±1.4	0.000*[t]
Abnormal	74	129.81±33.16		3.85±1.28	
Troponin (t) at admission					
Positive	102	131.93±33.09	0.000*[t]	3.69±1.51	0.000*[t]
Negative	148	100.05±25.58		2.75±1.27	

t: independent t test; & **F**: one way ANOVA

Table C.3

Distribution GRACE and TIMI among study population according to Killip Class and site of death

Killip Class	Total (n=250)	GRACE		TIMI	
		Mean±SD	P-value	Mean±SD	P-value
Cardiogenic shock					
Yes	9	168.78±44.48	0.000* [t]	4.89±1.83	0.000* [t]
No	241	110.98±30.51		3.07±1.39	
Pulmonary edema					
Yes	20	156.8±35.65	0.000* [t]	4.4±1.39	0.000* [t]
No	230	109.25±29.73		3.02±1.40	
Rales and /or JVD					
Yes	15	141.27±30.78	0.000* [t]	4.27±1.10	0.002* [t]
No	235	111.26±32.18		3.06±1.43	
CHF					
Yes	56	139.79±32.64	0.000* [t]	3.77±1.48	0.000* [t]
No	194	105.34±28.62		2.95±1.38	
Cardiac arrest at admission					
Yes	14	180.36±31.57	0.000*t	4.36±1.91	0.001* [t]
No	236	109.06±28.29		3.06±1.38	
ST segment deviation					
Yes	18	146.94±45.01	0.000* [t]	4.39±2.20	0.000* [t]
No	232	110.43±30.26		3.03±1.33	
Cath lab intervention					
PCI	149	117.98±33.11	0.028* [F]	3.38±1.44	0.008* [F]
Normal coronary	25	101.08±30.58		2.56±1.33	
Medical treatment	64	107.02±31.96		2.83±1.39	
CABG	12	109.08±29.35		2.83±1.53	
Re-admission to the hospital					
Yes	78	109.17±31.94	0.005* [t]	2.91±1.41	0.000* [t]
No	172	121.62±33.32		3.63±1.41	
Site of death					
In hospitals	4	216±10.86	0.000* [F]	4.25±2.63	0.119 [F]
Short term	8	190.25±14.24		5.5±1.69	
Long term	10	167.6±7.43		3.8±1.14	

t: independent t test; & **F**: one way ANOVA

Table C.4

Correlation between risk score and studied quantitative parameters and among participants

	Risk score			
	GRACE		TIMI	
	r	P-value	r	P-value
GRACE	-	-	0.466	0.000*
TIMI score	0.466	0.000*	-	-
Age (years)	0.617	0.000*	0.487	0.000*
Hight (cm)	0.079	0.216	0.074	0.243
Weight (kg)	0.087	0.171	0.074	0.246
BMI (kg/m^2)	0.516	0.041	0.028	0.659
smoking (cigarettes or hookah per years)	0.226	0.025	0.185	0.067
Length of staying (Hours)	0.315	0.000*	0.223	0.000*
Ejection fraction (EF)	-0.410	0.000*	-0.215	0.001*
Heart rate at admission	0.235	0.000*	-0.045	0.481
Systolic BP at admission	-0.245	0.000*	0.092	0.149
Diastolic Bp at admission	-0.210	0.001*	-0.138	0.029*
Creatinine at admission	0.386	0.000*	0.272	0.000*
Troponin (t) at admission	0.293	0.000*	0.143	0.024*

جـامعـــة النجاح الوطنية

كليـــة الدراســـات العليـــا

مقارنة دقة مقياس انحلال الخثرة في احتشاء عضلة القلب (TIMI) ومقياس السجل العالمي للأحداث التاجية الحادة (GRACE) في التنبؤ بالنتائج داخل المستشفى والنتائج قصيرة وطويلة الأجل بين مرضى متلازمة الشريان التاجي الحادة.

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قدمت هذه الأطروحة استكمالا لمتطلبات الحصول علي درجة الماجستير في تمريض العناية المكثفة، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

2023

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الملخص

الخلفية: إن مقياس انحلال الخثرة في احتشاء عضلة القلب (TIMI) والسجل العالمي للأحداث التاجية الحادة (GRACE) هما من أدوات تقييم المخاطر المستخدمة على نطاق واسع في مجال أمراض القلب. تقييم درجة TIMI احتمالية حدوث نتائج سلبية في مرضى متلازمة الشريان التاجي الحادة (ACS)، بينما يركز مقياس GRACE على توقع الوفيات والأحداث القلبية الوعائية الرئيسية.

الهدف: هدفت الدراسة إلى مقارنة دقة مقياس TIMI ومقياس GRACE في التنبؤ بالنتائج داخل المستشفى والنتائج قصيرة المدى وطويلة المدى بين مرضى متلازمة الشريان التاجي الحادة.

المنهجية: تم إجراء دراسة بأثر رجعي في الفترة من يونيو إلى ديسمبر 2022. وكان حجم العينة 250 شخصًا. ركزت هذه الدراسة على مرضى متلازمة الشريان التاجي الحادة الذين يتلقوا الرعاية الصحية في مستشفى جامعة النجاح الوطنية (NNUH). كانت نسبة الاستجابة 92.6%. تم استخدام برنامج الحزمة الإحصائية للعلوم الاجتماعية (SPSS) لتحليل البيانات.

النتائج: أظهرت النتائج أن 228 مريضا 91.2% كانوا على قيد الحياة و22 مريضا 8.8% ماتوا. أظهرت درجة GRACE دقة تشخيصية ملحوظة في التنبؤ بالبقاء على قيد الحياة بين المشاركين، كما

يتضح من الحساسية والنوعية والقيمة التنبؤية الإيجابية (PPV) والقيمة التنبؤية السلبية (NPV) والدقة الإجمالية بنسبة 100%. أظهر منحنى خاصية تشغيل المستقبِل (ROC) تمايزًا بارزاً بين الناجين وغير الناجين، كما يتضح من قيمة المنطقة الواقعة أسفل المنحنى (AUC) البالغة 1.000. في المقابل، كانت دقة نتيجة TIMI أقل قوة. أسفرت دراسة منحنى ROC عن AUC بقيمة 0.739 (P <0.001). وكانت الحساسية والنوعية 68.2% و63.6% على التوالي. وكانت القيمة التنبؤية الإيجابية والقيمة التنبؤية السلبية 15.3%و95.4% على التوالي. بينما كانت الدقة الإجمالية للتنبؤ وتشخيص حالة البقاء على قيد الحياة 64.0%.

الاستنتاج: أظهرت درجة GRACE دقة تشخيصية ممتازة في التنبؤ بحالة بقاء المريض على قيد الحياة، مع حساسية مثالية ونوعية وقيمة تنبؤية إيجابية وقيمة تنبؤية سلبية ودقة شاملة. في حين، أظهرت درجة TIMI أداءً أضعف نسبيًا، مع حساسية أقل ونوعية وقيمة تنبؤية إيجابية وقيمة تنبؤية سلبية ودقة شاملة.

الكلمات المفتاحية: السجل العالمي للأحداث التاجية الحادة، انحلال الخثرة في احتشاء عضلة القلب، درجة أحداث الشريان التاجي الحادة، التنبؤ بالنتائج داخل المستشفى، النتائج قصيرة وطويلة المدى، مستشفى جامعة النجاح الوطنية.