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Evaluating the Usefulness of HEAR Score in Stratifying Patients with Suspected Non-ST Elevation Myocardial Infarction: A Retrospective Observational Study

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Abstract: ***Background**: Chest pain is the common reason for admissions to the cardiac emergency department. The challenge is identifying patients with acute coronary syndrome (ACS), where early diagnosis improves outcomes. Based on history, EKG, age, and risk factors, the HEAR score assigns 0-2 points per category. **Objectives**: To evaluate the usefulness of HEAR SCORE in stratifying patients with suspected Non-ST Elevation Myocardial Infarction (NSTEMI). **Method**: This retrospective observational study included 195 patients presenting chest pain and suspected NSTEMI at the Department of Emergency Medicine, KIMSHEALTH, Thiruvananthapuram. The outcomes were observed, and the HEAR scores were subsequently applied. **Results**: A majority (65%) of patients with a HEAR score of ≤3 were discharged. Patients with scores 4 to 6 HEAR (75%) were admitted and evaluated in the hospital. In the ≥7 group, 60.5% received early intervention. The HEAR scores for discharge, Hospital admission, evaluation, and early intervention are 2.9000, 4.8018, and 6.6591, respectively. These differences are statistically significant with p-value less than < 0.001. The sensitivity and specificity of a HEAR score greater than 3 for hospitalization are 91% and 65%, respectively. **Conclusion**: HEAR score effectively stratifies NSTEMI risk, minimizing unnecessary Troponin tests and admissions using a ≤3 cutoff strategy.*

Keywords: HEAR score, non-ST elevation myocardial infarction, risk stratification, emergency medicine, cardiac care

1. Introduction

Acute myocardial infarction is a common condition with serious consequences, involving significant mortality, morbidity, disability, and healthcare expenses [1]. Chest pain is the leading cause of admission to the cardiac emergency department, accounting for 20% of hospitalizations. The primary challenge is identifying patients with acute coronary syndrome (ACS). Delays in diagnosing and managing these patients will cause immense pressure on emergency and medical departments [2].

On the contrary, many patients are at low risk and do not require hospitalization or prolonged observation [3]. Over the years, physicians have explored various tools, ranging from specific diagnostic tests to entire strategies/evaluation guidelines, to suitably risk-stratify patients suspected of experiencing ACS. These efforts aimed to prevent major adverse cardiac events (MACE) while decreasing unnecessary testing and hospitalizations [4].

Most existing criteria for diagnosing acute coronary syndrome (ACS), rely on cardiac biomarkers detected through biochemical tests, which can cause significant delays in diagnosis and treatment [5]. The diagnostic process should be quick and efficient since the prognosis improves dramatically when ACS patients receive targeted treatment as early as possible [6].

The HEAR score is a clinical risk stratification tool that assigns 0-2 points based on history, EKG, age, and risk factors, weighing each equally. A total score of 0-3 suggests immediate discharge; 4-6 supports admission for clinical observation, and a score of>7 indicates the need for early intervention [7].

Derived from the HEART score (HEAR and Troponin), which has already been implemented in European clinical practice [7, 8]. Leaving Troponin (a biochemical marker that requires material, money, manpower, and time) from the HEART score will make the score more applicable in resource-limited settings. Incorporating the HEAR score into routine clinical practice can help optimize patient triage by reducing unnecessary hospital admissions and associated healthcare costs while ensuring patient safety is not compromised. This study aims to evaluate the effectiveness of the HEAR score in stratifying risk among patients presenting with suspected NSTEMI in an emergency department setting. "

2. Review of Literature

A review of the literature of this study is discussed under the following heads:

a) Myocardial Infarction
b) NON-ST Elevation Myocardial Infarction
c) Scores for Risk Assessment
d) HEART Score
e) HEAR Score
f) Similar studies done on the same topic

Myocardial Infarction:
Myocardial infarction (MI) is the death of myocardial cells caused by inadequate oxygen supply to the myocardium. It is due to the coronary thrombus overlying a disrupted atherosclerotic plaque.

Classification:
Chronic Myocardial injury is identified by cardiac troponin >99th percentile upper reference limit without any acute change. Acute myocardial injury, cardiac troponin >99th percentile upper reference limit, with any one of the acute symptoms of myocardial ischemia.

a) Symptoms of acute myocardial ischemia
b) Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality in a pattern consistent with an ischemic aetiology
c) New ischemic ECG changes
d) Development of pathological Q waves
e) Identification of a coronary thrombus by angiography or autopsy (not for type 2 MI)

Acute nonischaemic myocardial injury is diagnosed with an increase and fall in cardiac biomarkers in the absence of a primary cause. Type 1 MI resulted from atherothrombotic coronary artery disease (CAD) and triggered by disruption of atherosclerotic plaque. Type 2 MI is caused by the mismatch between the oxygen supply and demand due to non-atherothrombotic causes [12]. The following figure represents the classification of myocardial injury [12].

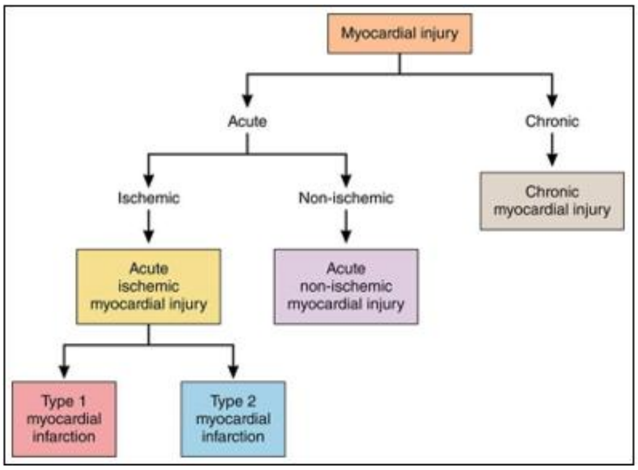

Figure 1: Classification of myocardial injury

Pathophysiology:
The following image represents the risk factors, Pathophysiology, clinical presentation, and management of myocardial infarction [13].

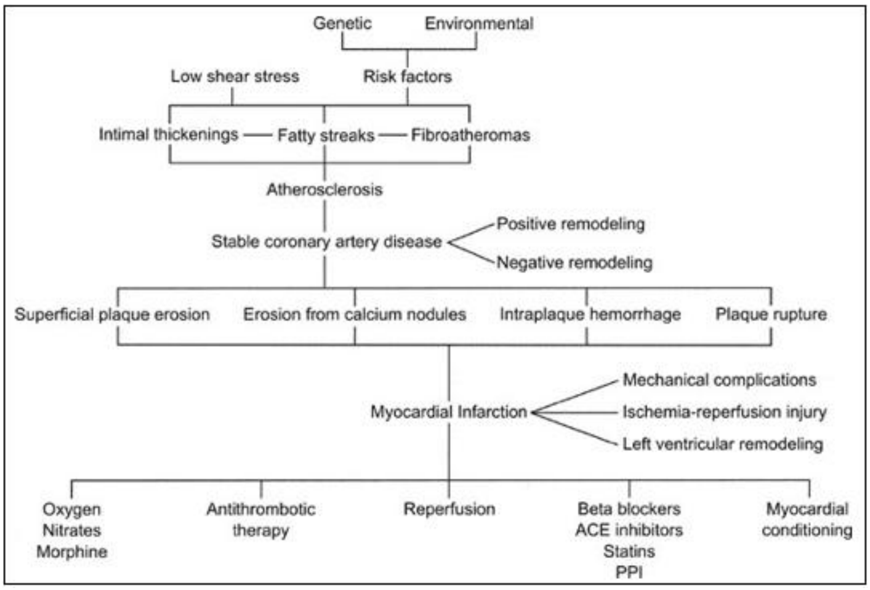

Figure 2: Pathophysiology of Myocardial infarction.

Phases of repair:

The following image represents the three phases of Cardiac repair after myocardial infarction [14].

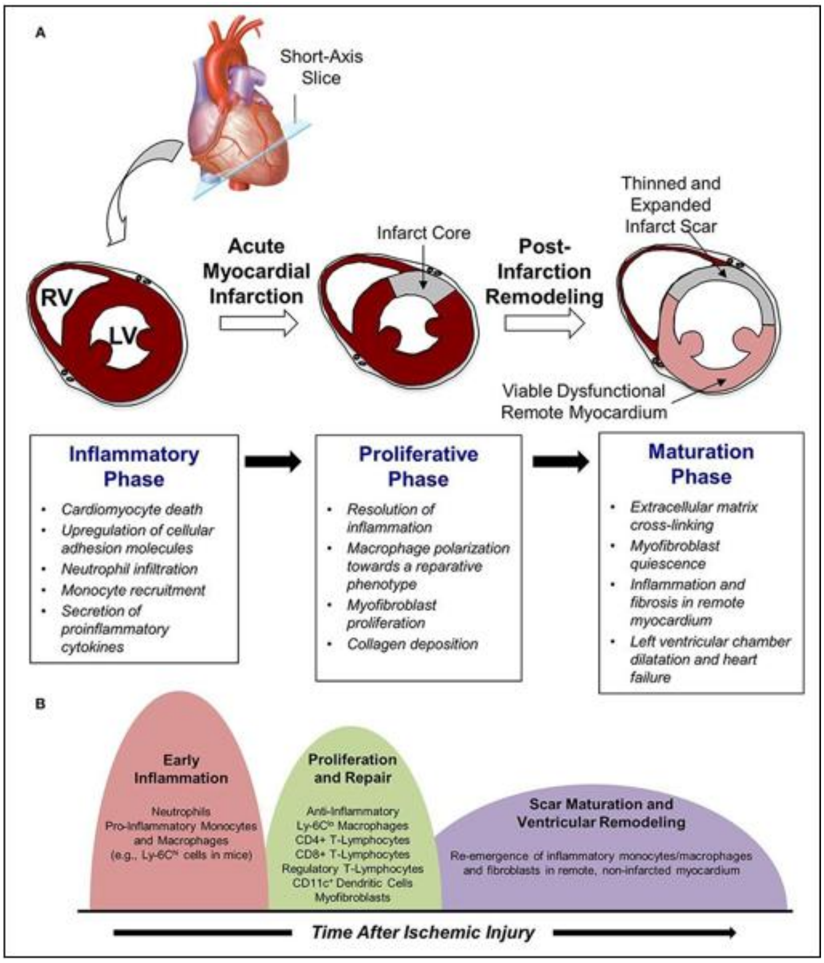

Figure 3: Cardiac repair after myocardial infarction

NON-ST Elevation Myocardial Infarction:

Acute Coronary Syndrome can be classified into three different types depending on the severity of the obstruction.

1) Unstable angina (partial rupture of an artery doesn't cause permanent heart damage),
2) STEMI ("classic" heart attack-major coronary artery is completely or near completely blocked by the ruptured plaque),
3) NSTEMI, believed to be the "intermediate" form of ACS, involving a minor coronary artery or partial obstruction of a major coronary artery, but the heart tissue damage is far less extensive [15].

The following image represents the types of acute coronary syndromes based on the severity of the obstruction [15].

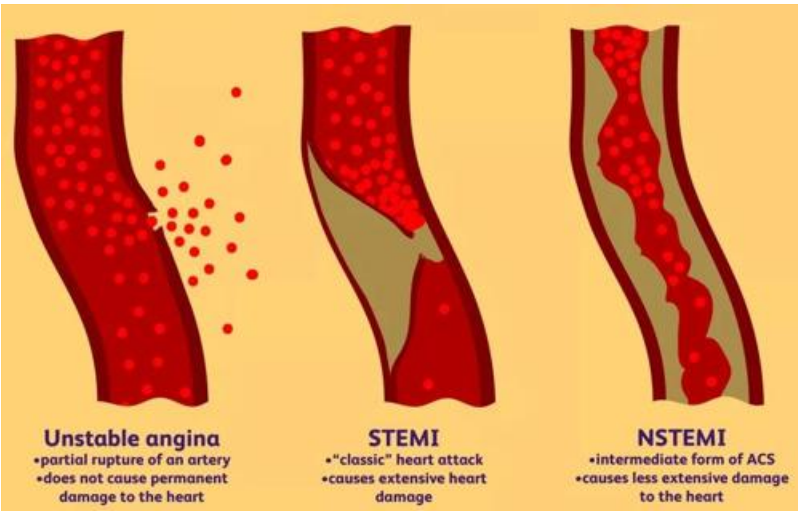

Figure 4: Types of the acute coronary syndromes

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The following image represents the pathophysiological mechanisms causing ST-segment elevation myocardial infarction (STEMI) (acute plaque rupture and thrombus formation) and non-ST-segment elevation myocardial infarction (NSTEMI) (dynamic imbalance between myocardial oxygen demand and supply) [16].

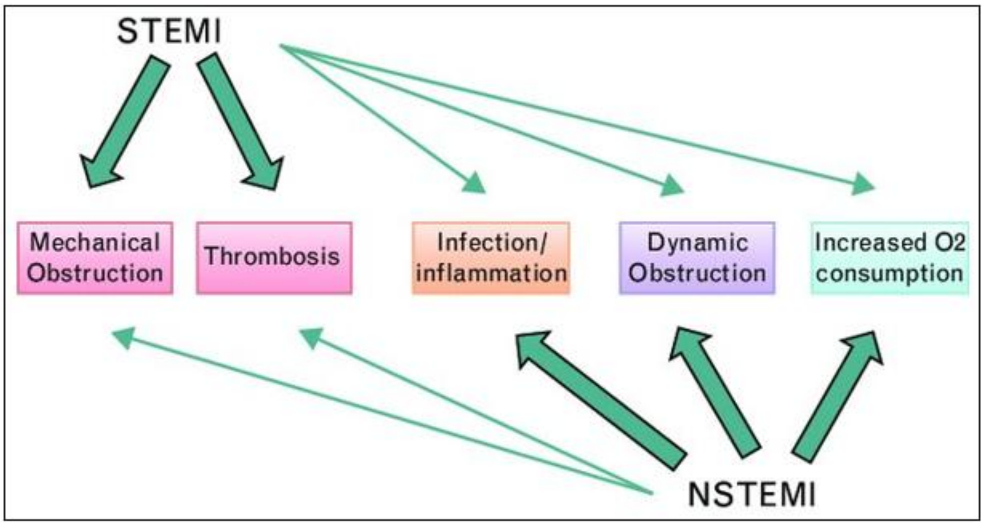

Figure 5: Mechanism of STEMI and NSTEMI

a) Scores for Risk assessment:

Several scoring systems are used for the assessment of the severity of the myocardial infarction and prediction of risk of major adverse cardiac events (MACE), and risk for mortality. PURSUIT (not including troponin assays, more weightage to patient age), TIMI (Simple to use, but poor accuracy), GRACE (complex to use and more weightage to patient age), FRISC, and HEART scores are commonly used scales for the assessment of the severity of the myocardial infarction. The following table compares the severity scales, score range, risk stratification, usefulness, and accuracy [17].

Table 1: Comparison of the severity scales

Risk Score	Year of Publication	Score Range	Score Predicts	C-Statistic of Original Study
PURSUIT	2000	1 - 18	Risk of Death or Death/MI at 30 Days After Admission	0.84 (Death) & 0.67 (Death/MI)
TIMI	2000	0 -7	Risk of all Cause Mortality, MI, and Severe Recurrent Ischemia Requiring Urgent Revascularization Within 14 Days after Admission	0.65
GRACE	2003	1 - 372	Risk of Hospital Death and Post-Discharge Death at 6 Months	0.83
FRISC	2004	0 -7	Treatment Effect of Early Invasive Strategies in ACS	0.77 (Death) & 0.7 (Death/MI)
HEART	2008	0 - 10	Prediction of Combined Endpoint of MI, PCI, CABG or Death Within 6 Weeks After Presentation	0.90

The following image represents the Risk Stratification in Patients with Coronary Artery Disease at different stages of the disease.

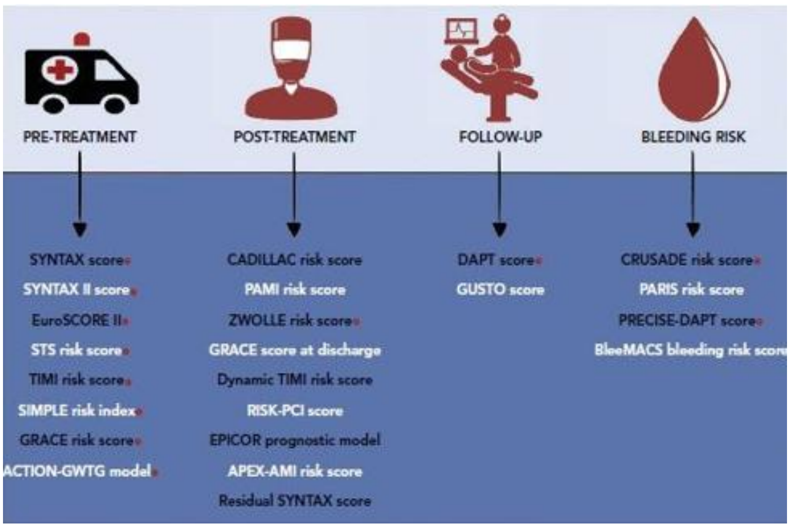

Figure 6: Risk Stratification in Patients with Coronary Artery Disease

TIMI Score:
The TIMI (Thrombolysis in Myocardial Infarction) score is used to ascertain the risk of major adverse cardiac events (MACE) and risk for mortality among patients with unstable angina or non-ST segment elevation myocardial infarction (NSTEMI). The following table represents the TIMI score and its components for assessment of the severity of the UA/NSTEMI. (18, 19)

Table 2: TIMI score for the severity of the UA/NSTEMI

1) Age ≥65	1 point
2) ≥3 risk factors for CAD	1 point
3) Use of ASA (last 7 days)	1 point
4) Known CAD (prior stenosis ≥50%)	1 point
5) >1 episode rest angina in <24 h	1 point
6) ST-segment deviation	1 point
7) Elevated cardiac markers	1 point

Grace risk Score:
The Global Registry of Acute Coronary Events (GRACE) risk score estimates the probability of mortality within 6 months of hospital discharge in patients with acute coronary syndrome (ACS). The following image represents the Grace risk Score components and their risk stratification [20].

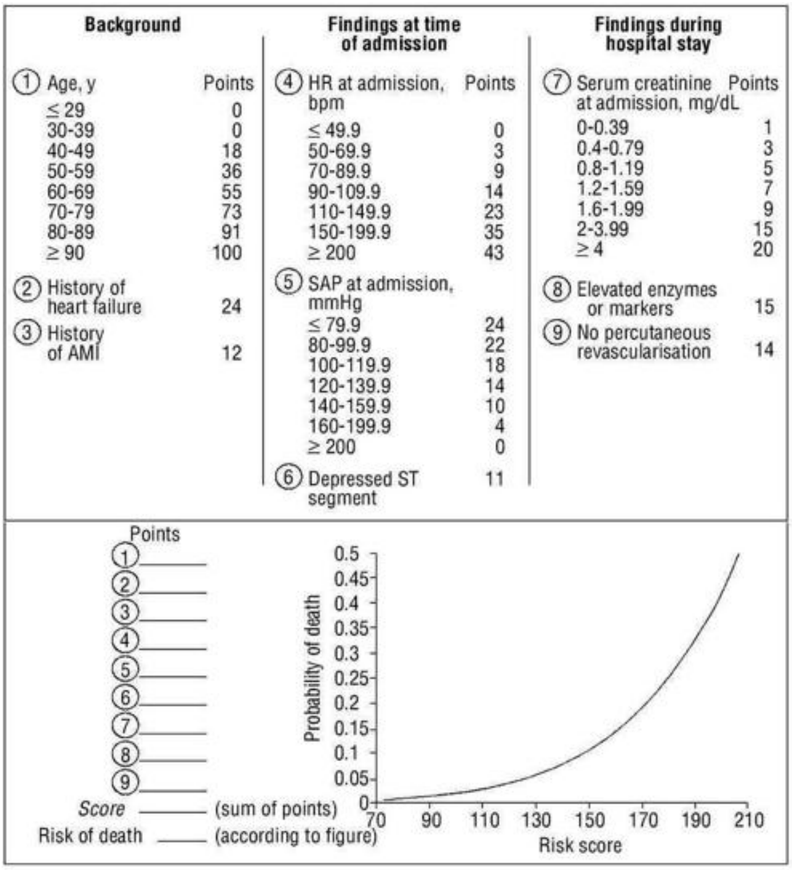

Figure 7: Grace risk Score components and its risk stratification

HEART Score:
The following table represents the HEART Score Algorithm for Chest Pain Patients at the Emergency Department [21].

Table 3: HEART Score for Chest Pain Patients at the Emergency Department

Variable	Description	Score
History	Highly suspicious	2
	Moderately suspicious	1
	Slightly or nonsuspicious	0
ECG	Significant ST-depression	2
	Nonspecific repolarization disturbances	1
	Normal	0
Age	≥65 y	2
	45 to 65 y	1
	≤45 y	0
Risk factors	≥3 risk factors*, or history of atherosclerotic disease†	2
	1 or 2 risk factors	1
	No risk factors known	0
Troponin	≥3x normal limit	2
	1 to 2x normal limit	1
	≤normal limit	0

Total score: 0 to 10 points. 0 to 3 points, low risk; 4 to 6 points, intermediate risk; 7 to 10 points, high risk.
*Risk factors: hypertension, hypercholesterolemia, diabetes mellitus, family history of premature coronary artery disease, current smoking (or quit smoking <1 month ago), and obesity (body mass index ≥30 kg/m^2).
†History of atherosclerotic disease: previous myocardial infarction, percutaneous coronary intervention, coronary artery bypass graft, stroke, or peripheral artery disease.

The following table compares the components of the TIMI UA/NSTEMI, GRACE non-STE ACS, and HEART scores [22].

Table 4: Comparison of TIMI UA/NSTEMI, GRACE non-STE ACS, and HEART scores

TIMI UA/NSTEMI (0–7 points)	GRACE non-STE ACS (1–372 points)	HEART (0–10 points)
Age ≥ 65 (1 pt)	Age (0–100 pts)	History (0–2 pts)
≥3 risk factors for CAD (1 pt)	Heart rate (0–46 pts)	ECG (0–2 pts)
Significant coronary stenosis (1 pt)	SBP (0–58 pts)	Age (0–2 pts)
ST-deviation (1 pt)	Creatinine (1–28 pts)	Risk factors for CAD (0–2 pts)
Severe angina symptoms (1 pt)	Killip class (0–59 pts)	Troponin (0–2 pts)
Use aspirin in last 7 days (1 pt)	Cardiac arrest at admission (39 pts)	
Elevated serum cardiac markers (1 pt)	ST-deviation (28 pts)	
	Elevated cardiac enzyme (14 pts)	

HEAR Score:
HEAR score is a scoring system that assigns 0-2 points based on history, EKG, age, and risk factors, with each factor being weighed equally. Total scores of 0-3 support immediate discharge; 4-6 suggest the need for clinical observation and >7 indicates the need for early intervention [7].

As the T component of the HEART involves time and equipment, the HEAR Score can be tested for predictive accuracy compared with the HEART score. Patients with HEAR scores ≤ 3 and without elevated troponin measures were categorised as low risk and recommended for discharge from the Emergency Department. The following algorithm represents the usage of the HEAR score in the routine management of chest pain at the emergency department [23].

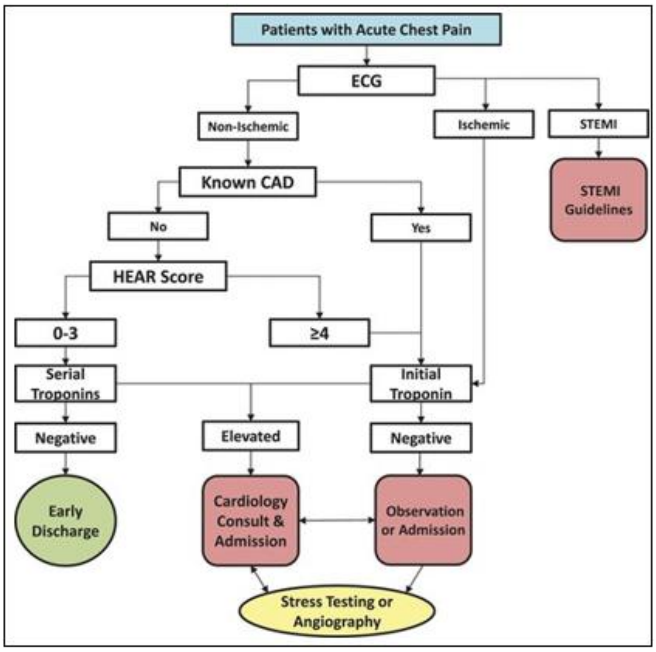

Figure 8: Usage of HEAR score in routine management of chest pain

3. Methodology

Study Subjects:
The study was conducted in the Department of Emergency Medicine at KIMSHEALTH, Trivandrum, from April 2020 to May 2021. A total of 195 Patients admitted with chest pain with suspected NON-ST Elevation Myocardial Infarction, above the age of 18 years, and who had given consent, are included in the study. Patients presented with chest pain, over 18 years of age, and suspected non-ST elevation myocardial infarction were included in this study. Patients were unwilling to participate in this study, and ST elevation myocardial infarction was excluded.

Study procedure:
No intervention was done as required for the study. All patients presenting to the Emergency Medicine department had undergone an initial evaluation of proper history, heart rate, blood pressure, and ECG obtained from the EMR per hospital protocol. The study included all patients presenting with chest pain who were admitted to the Emergency Department of KIMS Trivandrum and were older than 18 years. All patients with inclusion and exclusion criteria will be recruited into the study. After briefing the patients about the nature of the survey, the duty doctor in the emergency department will obtain written informed consent from the accompanying persons/attenders.

To minimize bias, we ensured data completeness by cross-verifying patient records, and cases with missing critical information were excluded from the analysis to maintain data integrity.

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4. Results

Results of the study are discussed under the following headings:
1) Age distribution of the population
2) Sex distribution of the population
3) History of CAD
4) ECG findings among the population
5) Comorbidities (Past history of Diabetes Mellitus, Hypertension, CAD, Smoking and Dyslipidaemia)
6) Body Mass Index
7) HEAR Score
8) Outcomes
9) Relationship between the HEAR score and Outcomes

The study population comprises 195 Patients admitted with chest pain with suspected Non-ST Elevation Myocardial Infarction.

Age distribution of the population:
The majority of the study population (80, 41.0%) belonged to the 45-65 age group, followed by the>65 age group (75, 38.5%), and 40 (20.5%) from the <45 age group. Age distribution of the study population is represented in the following table and visualised using a bar chart.

Table 5: Age distribution of the study population

Age	Frequency	Percent
<45	40	20.5
45-65	80	41
>65	75	38.5
Total	195	100

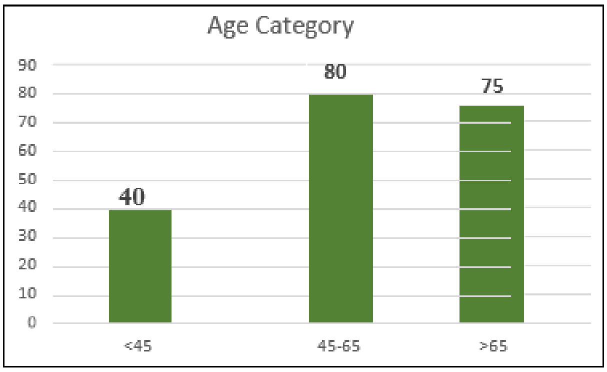

Figure 9: Bar Chart. Age distribution of the study population

Sex distribution of the population:
Among the study population, 102 (52.3 %) were males. Gender distribution of the study population is represented in the following table and visualised using a pie chart.

Table 6: Gender distribution of the study population

Gender	Frequency	Percent
Female	93	47.7
Male	102	52.3
Total	50	100.0

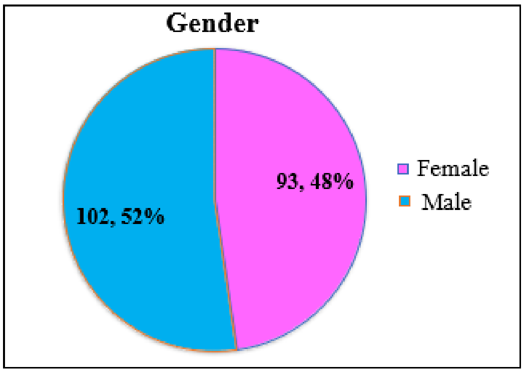

Figure 10: Pie-chart. Gender distribution of the study population

History of CAD:
Among the study population, 44 (22.6%) were highly suspicious, 103 (52.8%) were moderately suspicious, and 48 (24.6%) were slightly suspicious of CAD. The previous history of CAD is represented in the following table and visualised using a bar chart.

Table 7: History of CAD

Previous history of CAD	Frequency	Percent
Highly suspicious	44	22.6
Moderately suspicious	103	52.8
Slightly suspicious	48	24.6
	195	100.0

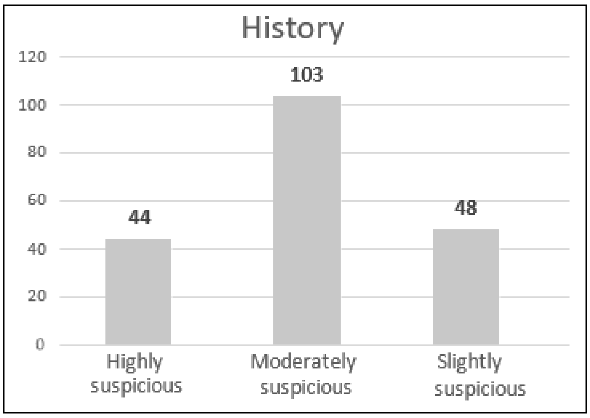

Figure 11: Bar chart. History of CAD

1) ECG findings among the population:
Most of the study population (104, 53.3%) had non-specific repolarization disturbance, 48 (24.6%) had normal ECG, and 43 (22.1%) had Significant ST deviation in ECG. The ECG findings are represented in the following table and visualised using a bar Chart.

Table 8: ECG findings

	Frequency	Percent
Normal	48	24.6
Nonspecific repolarization disturbance	104	53.3
Significant ST deviation	43	22.1
Total	195	100

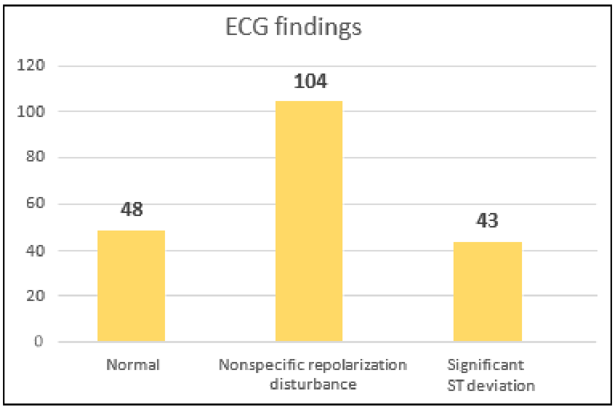

Figure 12: Bar Chart. ECG findings

History of Diabetes Mellitus, Hypertension, CAD, Smoking:
Among the comorbidities of the study population, the majority had hypertension (128, 65.6%), followed by diabetes mellitus (125, 64.1%), CAD (124, 63.6%), and dyslipidaemia (104, 53.3%). Smoking was present in 71 (36.4%) of the study population. Comorbidities of the study population are represented in the following table and visualised using a bar chart.

Table 9: Comorbidities of the study population

Comorbidities	Frequency	Percent
Diabetes Mellitus	125	64.1
Hypertension	128	65.6
CAD	124	63.6
Smoking	71	36.4
Dyslipidaemia	104	53.3

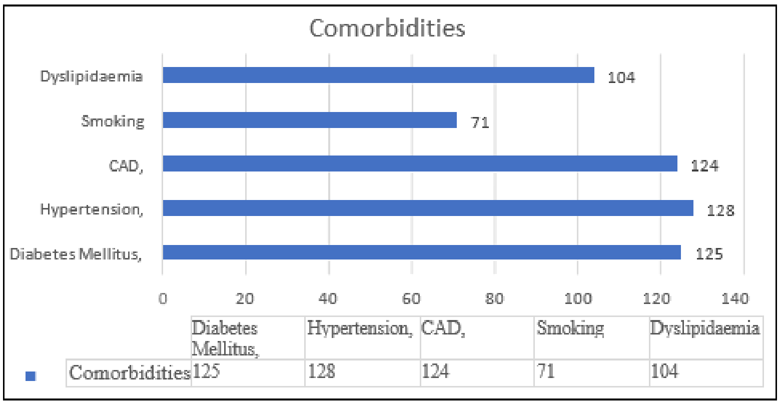

Figure 13: Bar Chart. Comorbidities of the study population

Body Mass Index:
A total of 71 (36.4%) of the study population had a body mass index greater than 30 and can be termed obese. The BMI of the study population is represented in the following table and visualised using a pie chart.

Table 10: BMI

BMI	Frequency	Percent
<30	124	63.6
>30	71	36.4
Total	195	100

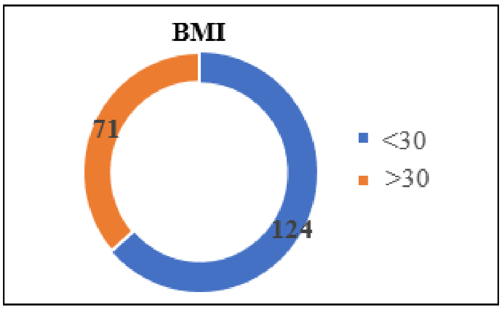

Figure 14: Pie Chart. BMI

HEAR Score:
The HEAR score among the study population ranged from a minimum of 1 to a maximum of 8. The mean HEAR Score and Standard deviation are 4.83 and 1.7, respectively. The median and mode of the HEAR Score are 5 and 4, respectively. HEAR Score of the study population is represented in the following table and visualised using a histogram,

Table 11: HEAR Score

	Mean	Median	Mode	Std. Deviation	Minimum	Maximum
HEAR Score	4.8308	5	4	1.7282	1	8

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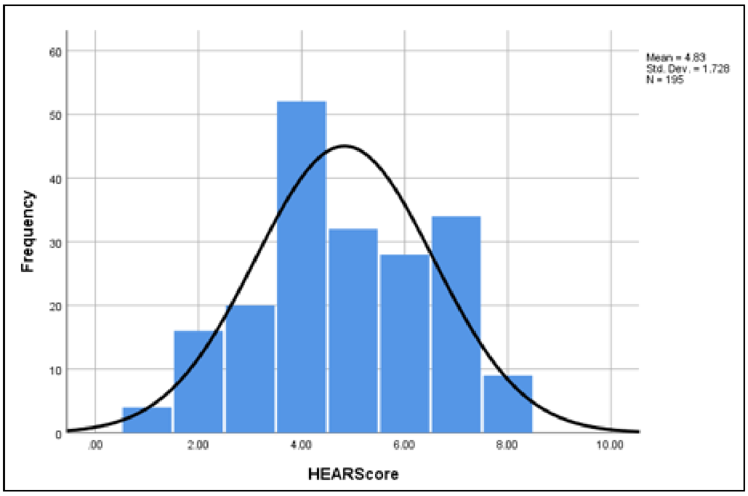

Figure 15: Histogram. HEAR Score

Most of the study population (112, 57.4%) had a HEAR Score between 4 and 6. The HEAR Score categories are represented in the following bar chart.

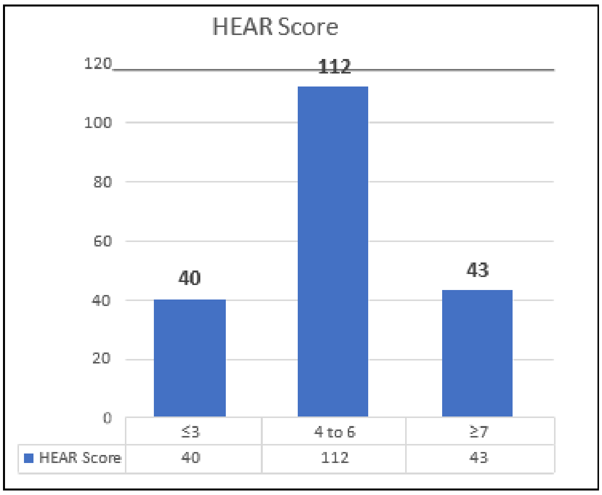

Figure 16: Bar chart. HEAR Score

2) Outcomes:

The majority of the study population outcomes were hospital admission and evaluation (111, 56.9%), followed by early intervention (44, 22.6%) and discharge (40, 20.5%). Study outcomes are represented in the following table and visualised using a bar chart.

Table 12: Study outcomes

Outcomes	Frequency	Percent
Discharge	40	20.5
Hospital admission and evaluation	111	56.9
Early intervention	44	22.6
Total	195	100.0

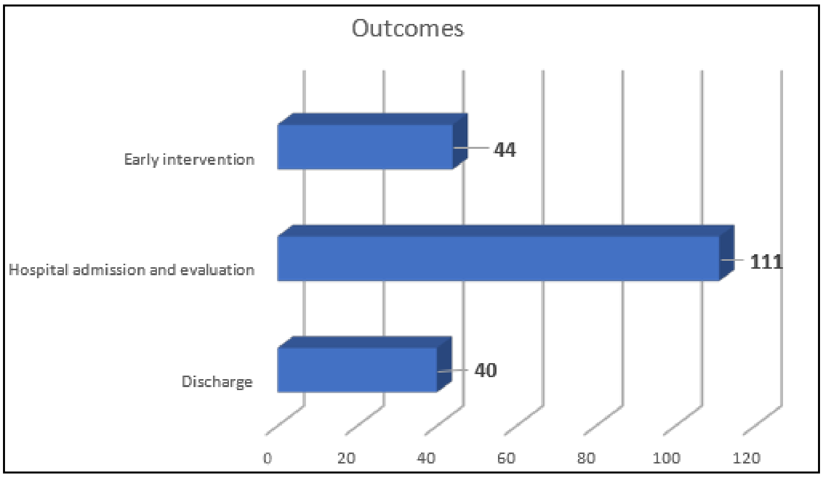

Figure 17: Bar Chart. Study outcomes

Relationship between the HEAR score and Outcomes:

Most patients with a HEAR score ≤3 (65%) were discharged. Among those with scores between 4 and 6 (75%), patients were admitted and evaluated in the hospital. The majority of the ≥7 HEAR Score (60.5%) were given early intervention.

These differences in outcomes among the different HEAR scores are statistically significant using the chi-square test with a p-value less than < 0.001. The following table and bar chart represent the relationship between the HEAR score and Outcomes.

Table 13: Relationship between the HEAR score and Outcomes

			Outcome			Total
			Discharge	Hospital admission and evaluation	Early intervention	
HEAR Score	≤3	Count	26	12	2	40
		% within HEAR Score	65.00%	30.00%	5.00%	100.00%
	4 to 6	Count	12	84	16	112
		% within HEAR Score	10.70%	75.00%	14.30%	100.00%
	≥7	Count	2	15	26	43
		% within HEAR Score	4.70%	34.90%	60.50%	100.00%
Total		Count	40	111	44	195
		% within HEAR Score	20.50%	56.90%	22.60%	100.00%
		p-value <0.001 (Significant) using chi-square test.				

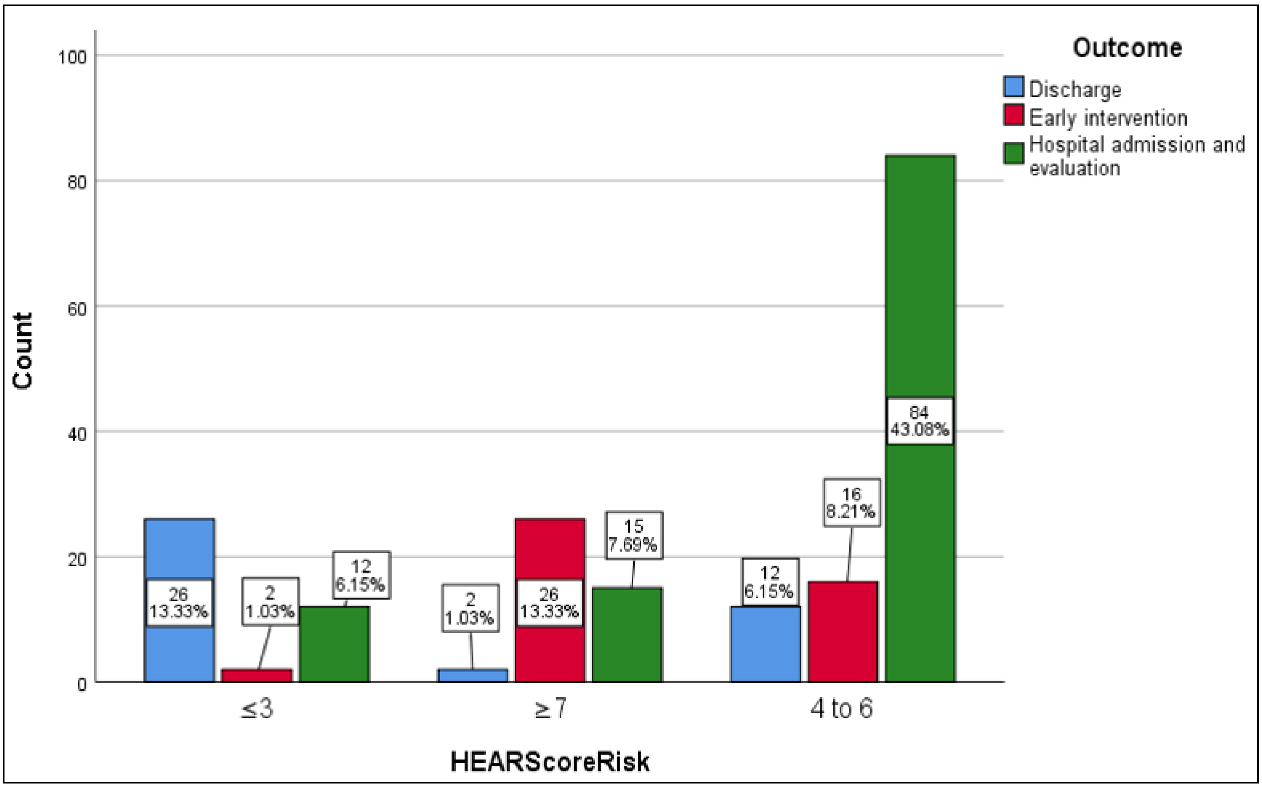

Figure 18: Bar Chart. Relationship between the HEAR score and Outcomes

The HEAR scores among Discharge, Hospital admission, evaluation, and Early intervention are 2.9000, 4.8018, and 6.6591, respectively. These differences in mean values of HEAR score are statistically significant using the ANOVA test with a p-value less than < 0.001. The mean values of the HEAR score are represented in the following table and visualised utilizing a means plot.

Table 14: Mean values of HEAR score among different outcomes.

	N	Mean	Std. Deviation
1	40	2.9	1.39229
2	111	4.8018	1.1895
3	44	6.6591	1.09848
Total	195	4.8308	1.7282
	p-value <0.001 (Significant) using ANOVA test.		

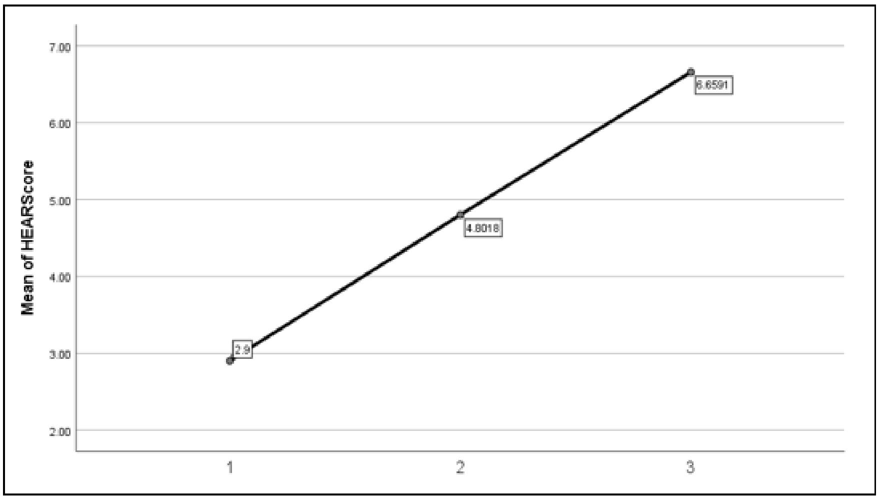

Figure 19. Means plot. Mean values of HEAR score among different outcomes

Diagnostic value of HEAR score >3 for Hospitalisation:

The sensitivity and specificity of HEAR score >3 for Hospitalisation are 91% and 65%, respectively. The outcome and HEAR score are tabulated below.

Table 15: Outcome and HEAR score

			Outcome		Total
			Hospitalised	Discharge	
HEAR Score	>3	Count	141	14	155
	≤3	Count	14	26	40
Total		Count	155	40	195
Sensitivity = 91% Specificity: 65%					

The ROC curve with Sensitivity and specificity for the HEAR score for the hospitalisation is given below.

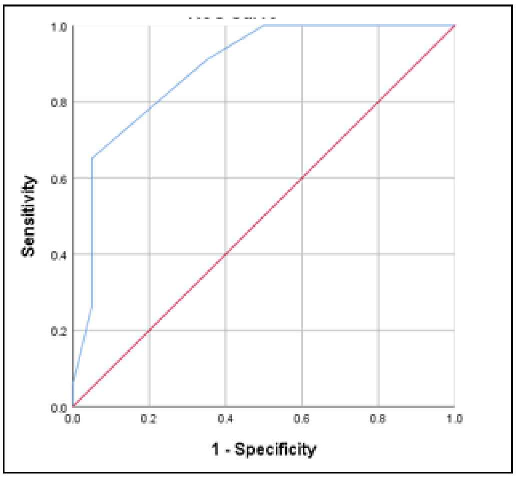

Figure 20: ROC Curve

The following table represents the Sensitivity and specificity for the HEAR scores for different cut-off values.

Table 16: Sensitivity and specificity for the HEAR scores for different cut-off values

Positive if Greater Than or Equal Toa	Sensitivity	Specificity
0	100	0
1.5	100	10
2.5	100	50
3.5	91	65
4.5	65.2	95
5.5	44.5	95
6.5	26.5	95
7.5	5.8	100
9	0	100

5. Discussion

HEAR score is a scoring system that assigns 0-2 points based on history, EKG, age, and risk factors, with each factor being weighed equally. Total scores of 0-3 support immediate discharge; 4-6 suggest admission for clinical observation, and >7 indicates early intervention [7].

The primary objective of the study was to evaluate the usefulness of the HEAR Score to stratify patients with suspected NON-ST Elevation Myocardial Infarction in the Emergency Medicine Department of KIMSHEALTH, a tertiary care centre in Trivandrum, over one year.

In this study, 80 (41.0%) belonged to the 45-65 age group, followed by the>65 age group (75, 38.5%), and 40 (20.5%) were in the <45 age group. Acute Myocardial infarctions are known to occur 50-70% of elderly individuals. Nearly 80% of the deaths occur in those aged over 65 years [26, 27]. Various studies have reported a significant relationship between age and the prevalence and mortality due to myocardial infarction [28-30].

Among the study population, 102 (52.3 %) were males. The role of gender on the morbidity and mortality due to myocardial infarction has been explored widely and has been proven to be higher among males gender [31, 32]. In this study, 44 (22.6%) of them were highly suspicious, 103 (52.8%) of them were moderately suspicious, and 48 (24.6%) of them were slightly suspicious of CAD.

A study by Robert D. Welch et al. studied the prognostic value of a standard or nonspecific initial electrocardiogram in the outcome of acute myocardial infarction. They found lower in-hospital mortality rates among those patients with normal or nonspecific ECGs compared to the diagnostic ECGs [33]. In this study, 104 (53.3%) had nonspecific repolarization disturbance, and 48 (24.6%) had normal ECG and 43 (22.1%) had a significant ST deviation in ECG. In a study by **William R. Hathaway et al.** studying the prognostic value of initial

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electrocardiogram, they found that the initial ECG helped predict 30-day mortality. [34].

Patients hospitalized with AMI comorbidities impact their 30-day and longer-term survival [35]. In this study, among the comorbidities of the study population, the majority had hypertension (128, 65.6%), followed by diabetes mellitus (125, 64.1%), CAD (124, 63.6%), and dyslipidaemia (104, 53.3%). Smoking was present in 71 (36.4%) of the study population.71 (36.4%) of the study population had a body mass index greater than 30 and can be termed obese.

On the contrary, **Miguel Gili et al.** in their study, observed that the acute myocardial infarction mortality has reduced among the MI patients with comorbidities, probably because of more frequent reperfusion and revascularization therapy and better medical treatment [36].

In this study, the HEAR score ranged from 1 to 8, with a mean of 4.83 and a standard deviation of 1.7. The median and mode of the HEAR Score are 5 and 4, respectively. The majority of the study population (112, 57.4%) had a HEAR Score between 4 and 6.

In this study, the majority of the study population outcomes were hospital admission and evaluation (111, 56.9%), followed by early intervention (44, 22.6%) and discharge (40, 20.5%).

This analysis found that 65% of patients with a ≤3 were discharged.75% of those scoring 4-6 were admitted for further evaluation, and 60.5% of patients with scores ≥7 underwent early intervention. These differences in outcomes among the different HEAR scores are statistically significant using the chi-square test with a p-value less than < 0.001.

Thomas Moumneh et al. observed that for the HEAR score low risk < 2, the incidence of MACE or death was 1.1%. The sensitivity and specificity of the HEAR score in predicting the incidence of MACE or death during the 30-day follow-up period were 97.9% and 18.8%, respectively [24].

Yohei Otsuka and Satoshi Takeda also observed in their study that the HEAR scores had good sensitivity and negative predictive value but poor specificity and positive predictive value [9]. This is similar to our study's findings.

In this study, the ROC curve yielded an accuracy of 0.885, which is similar to the findings of the study by Costabel et. al., where the ROC curve for MACE yielded an accuracy of 0.893. So, using the two-step HEART score can prevent the unnecessary assessment of Troponin [25].

In this study, the HEAR scores among discharge, Hospital admission, evaluation, and Early intervention are 2.9000, 4.8018, and 6.6591, respectively. These differences in mean values of HEAR score are statistically significant using the ANOVA test with a p-value less than < 0.001. The sensitivity and specificity of HEAR score >3 for hospitalisation are 91% and 65%, respectively. For scores less than or equal to 2, the sensitivity and specificity were 100% and 50%, respectively. Hence, lowering the cut-off can increase the sensitivity to be used as an effective screening tool.

Thomas Moumneh et al. reported that among the HEAR score low risk <2, the incidence of MACE was 0.4%, whereas applying the HEART score low risk <4, the incidence of MACE was 0.3%. So, using the two-step HEART score can prevent the unnecessary assessment of Troponin [7]. In our study, the MACE rates were 9% among <3 and that of MACE rates was 0% among <2. Connor M. O'Rielly et al. HEAR ≤ 1 was assumed as low risk and has good accuracy in determining MACE or death with a 98.4% (95% CI 91.6-99.9%) sensitivity [11].

6. Conclusion

The HEAR score demonstrates strong potential as an effective screening tool for stratifying patients with suspected NSTEMI in emergency settings. With a clear cutoff of <3, supporting discharge and >7 advocating early intervention, its application can meaningfully reduce unnecessary hospital admissions while maintaining patient safety. Further research into broader implementation and validation in diverse populations is recommended.

Scope for Future Research The HEAR score shows promise for broader use in chest pain evaluation. Future research should validate it across diverse populations and settings, including low-resource environments. Integrating the score into electronic health records and decision support tools could improve real-time risk assessment.

Combining the HEAR with other tools like HEART or TIMI or enhancing it with machine learning may boost predictive accuracy. The studies should also examine its impact on reducing unnecessary tests, hospital admissions, and healthcare costs.

Further exploration of the long-term safety of HEAR-guided discharge and its effect on patient outcomes, such as satisfaction and anxiety, is needed. Finally, efforts should focus on training and implementation to ensure consistent use in clinical practice.

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