Clinical Scores for Chest Pain Patients in the Emergency Department

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Abstract

Background: Despite being a frequent presenting complaint in emergency rooms, chest pain's clinical therapy varies greatly. The HEART (History, Electrocardiogram, Age, Risk factors, and initial Troponin) score is an easy-to-apply to stratify patients with chest pain according to their short-term risk for major adverse cardiac events (MACEs).

Aim of Study: To evaluate the value and effect of the clinical HEART score on patient outcomes.

Patients and Methods: Clinical information on 103 individuals with chest pain admitted to the Emergency room March 2023 until August 2023. A prospective registry was used to record information about patients with nontraumatic chest discomfort who were admitted from the emergency department.

Results: The low-risk group, HEART score ≤3, consisted of 33/103 patients (32.1%). The high-risk population, HEART score 7-10, consisted of 26 patients (25.2%) with a moderate risk of MACE of (42.7%).

Conclusion: Using the clinical HEART score during initial assessment of patients with chest pain is safe, a simple, rapid, and accurate predictor of outcome in patients with chest pain hospitalization and troponin level had a strong positive link.

Key Words: Chest pain – Clinical score – Emergency department.

Introduction

ACCORDING to estimates, 17.9 million people die from cardiovascular diseases each year, accounting for 32% of all fatalities worldwide [1]. Coronary heart disease, cerebrovascular disease, rheumatic heart disease, and other illnesses are included in the group of heart and blood vessel disorders known as cardiovascular disease. Chest pain is a common ED presentation, and several conditions associated with chest pain result in patient morbidity and mortality

[2]. One major disease is acute coronary syndrome (ACS). Despite the fear associated with this disease [3], it accounts for a minority of patients with chest pain in the ED. Emergency physicians rarely miss myocardial infarction (MI) or ACS, with miss rates <1% [4]. Many have sought a score and pathway that allow physicians to safely and reliably risk stratify patients [5]. The HEART score and pathway have revolutionized chest pain evaluation, as they can risk stratify a significant number of patients accurately into separate categories based on history, electrocardiogram (ECG), troponin, age, and risk factors while displaying high sensitivity for MACE [6]. Several intricacies must be considered in the use of this score including risk factors, ECG, troponin, age, history, gestalt, follow-up, borderline score, and shared decision making. The HEART pathway can supplement clinician decision making [7]. Typically, patients are checked by in the emergency room based on a general impression, patient history, risk factors, ECG and levels of myocardial infarction markers it is decided whether or not to admit the patient for clinical observation [8].

Typically, all patients under suspicion of the diagnosis of non-STE-ACS are treated as such, awaiting confirmation or exclusion of the diagnosis [9]. The focus of the diagnostic process in chest pain patients at the emergency department is to identify both low and high-risk patients for an ACS. The HEART score (History, ECG, Age, Risk factors and Troponin) was designed to facilitate this process, provides the clinician with a quick and reliable predictor of outcome [10]. The HEART score yields all crucial information that can correctly place patients into low-, inter mediate and high-risk groups for clinically important irreversible adverse cardiac events: Myocardial infarction, revascularization and cardiac death [11]. The challenge in the ED is not only to identify patients at the highest risk, but also to identify patients with no urgent diseases or even the absence of disease. These patients may be discharged immediately with minimal testing or intervention [12]. HEART score helps in making accurate diagnostic and therapeutic decisions without

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the use of radiation or invasive procedures and consider an easy, quick, and reliable predictor of outcome in chest pain patients [13]. Well known markers of increased risk, such as higher age, presence of risk factors and history of coronary atherosclerosis, are all incorporated in the HEART score. The combination of the five elements will allow for a more firmly based decision, mainly in cases of atypical presentation or absence of ECG abnormalities [14]. The heart score provides the physician with a formal recommendation for admission, observation or discharge in individual patients, and has shown promising results in external validation studies in various countries and hospital settings [15].

The HEART scoring on a scale of 0 to 10 for patients presenting with chest pain at the emergency department, assigning by zero, one, or two points towards a patient history, ECG abnormalities, the patient's age, any risk factors present, and troponin measurement [16]. The HEART score has been validated in several studies and has proven to be a powerful, easy, and above all practical instrument to separate patients into a low, medium and high-risk group [17]. Patients scoring 0-3 have a 1.6% chance of experiencing a cardiac event; those with a score 4-6 have a 13% chance, and those scoring 7 or higher have a 50% chance of developing a myocardial infarction, percutaneous transluminal coronary angioplasty, coronary artery bypass graft or death within 6 weeks following presentation [18]. With the HEART score it is immediately clear which patient is eligible for discharge without additional tests or emergency invasive procedures. In addition to the validation studies, an implementation study with a non-inferiority design has been performed in the Netherlands, which showed that the HEART score is just as safe as usual care. The results of this study are recently published in the Annals of Internal Medicine. Furthermore, a number of international studies using the HEART score are in progress or have been completed [19].

Aim of the study: To evaluate the value and effect of the clinical HEART score on patient outcomes.

Patients and Methods

The study was performed at Emergency Clinic in Aden-Yemen. It is a cross sectional study that included 103 patients. This population-based, study assessed ED visits through HEART score for patients with coronary artery disease and chest pain from March 2023 till August 2023. The HEART (History, EKG, Age, Risk factors, and Troponin) score is a clinical prediction tool used to evaluate the risk of MACE in patients who present to the ED with chest pain to stratify patients into low, moderate, and high-risk groups. The HEART score stratifies patients into three risk categories, that is, low risk 0–3, intermediate risk 4–6, and high risk 7–10.

Each patient followed-up regarding the incidence of MACE via phone call and the hospital's integrated health information system. Inclusion criteria for this study were any patient admitted to the emergency room due to chest pain irrespective of previous medical treatments. Exclusion criteria was the age of the patients, and thus patients under age of 18 were excluded from the study. Prior to participating in the study, a verbal consent was taken from the participants as per suggestions for diagnostic procedure. This study is registered in Al-Gamuhria Typical Hospital Emergency Department. Total HEART Score: Risk category & recommended management strategy.

The HEART score presenting with chest pain at the emergency department by assigning zero, one, or two points - towards a patient history, ECG abnormalities, the patient's age, any risk factors present, and troponin measurement -patients receive a score on a scale of 0-10 and categorized as following: 0-3: low risk potential candidate for early discharge. 4-6: moderate risk, potential candidate for observation & further evaluation. 7-10 high risk, candidate for urgent or emergent intervention.

The SPSS program, version 26.0 was used to perform the analysis the categorical variables were compared between groups using the chi-square test. Categorical variables were expressed as frequencies by application of the integrated QAW and according to the preliminary calculation.

Ethical consideration:
Verbal informed consent for all patients was obtained after providing them detailed explanation of the objectives, importance and benefits of the study. They were informed that the obtainable information would be confidentially handled and used only for research purposes. Patients were given the complete choice to be enrolled in this study and the right to withdrawal from it anytime.

Results

In 6 months, 103 patients were admitted to the medical emergency department with chest pain with mean age of study population was 53±15 years. The clinical characteristics of the patients and their variation with score are summarized in Table (1).

Table (1) The low-risk group, HEART score 0-3, consisted of 33/103 studied patients (32.1%). 44/103 (42.7%) patients were moderate-risk group, HEART score 4-6. The high-risk group studied patients, HEART score 7-10 consist of 26/103 (25.2%). Highly statistically significant in patients with cardiovascular risk factors (*p*-value 0.001).

Both elements of HEART scores (ECG and Troponin levels) in studied patients were highly statistically significant (*p*-value 0.001).

Table (1): Clinical characteristic of 103 studied patients with chest pain.

Variable	HEART score								*p*
	Low (0-3) (n=33)		Moderate (4-6) (n=44)		High (7-10) (n=26)		Total (n=103)		
	No.	%	No.	%	No.	%	No.	%	
Sex:									
Male	20	60.6	32	72.7	21	80.8	73	70.9	0.127
Female	13	39.4	12	27.3	5	19.2	30	29.1	
Age (years):									
<45	13	39.3	5	11.4	0	0.0	18	17.5	0.001 **
45 - <65	15	45.5	26	59.1	16	61.5	57	56.3	
≥65	5	15.2	13	29.5	10	38.5	28	26.2	
Typical pain	11	33.3	17	38.6	18	69.2	46	44.7	
Cardiovascular risk factor:									
Smoking	14	42.4	25	56.8	15	57.7	54	52.4	0.245
Hypertension	9	27.3	21	40.9	17	50	47	45.6	0.001**
Hypertriglyceridemia	11	33.3	14	31.8	16	61.5	41	39.8	
Diabetes mellitus	6	18.1	16	36.5	17	65.4	39	37,9	
Chronic kidney disease	0	0	5	11.4	3	11.5	8	7.8	

Table (2): Characteristics of ECG and Troponin level in studied patients with chest pain.

Variable	HEART score								*p*
	Low (0-3) (n=33)		Moderate (4-6) (n=44)		High (7-10) (n=26)		Total (n=103)		
	No.	%	No.	%	No.	%	No.	%	
ECG:									
Normal	23	69.7	11	25	0	0.0	34	33	0.001**
Repolarization	4	12.1	27	61.4	10	38.5	41	39.8	
ST elevation ≥1mm in at least 2 leads	1	3	3	6.8	15	57.7	19	18.4	
STdeprsssion ≥1mm in at least 2 leads	5	15.2	2	4.5	0	0	7	6.9	
Left bundle branch block	0	0	1	2.3	1	3.80	2	1.9	
Troponin:									
Normal	25	75.8%	39	88.6	6	23.1.	70	68	0.001**
1-2xUNL	5	6.1	5	11.4	11	42.3	21	20.4	
3xUNL	3	3	0	0.0	9	34.6	12	11.6	

Table (3): Number of patients in each HEART score and occurrence of MACE.

HEART score:	MACE				*p*
	No (n=78)		Yes (n=25)		
	No.	%	No.	%	
0	1	100.0	0	0.0	0.001**
1	5	100.0	0	0.0	
2	9	100.0	0	0.0	
3	15	100.0	0	0.0	
4	11	91.7	1	8.3	
5	18	90.0	2	10.0	
6	8	66.7	4	33.3	
7	6	54.5	5	45.5	
8	5	55.6	4	44.4	
9	0	0.0	7	100.0	
10	0	0.0	2	100.0	

(% from row cases).

Discussion

Chest pain is one of the most common, potentially serious presenting complaints for adult emergency department (ED) visits. A significant proportion of these patients undergo advanced medical evaluation during these visits, resulting in longer and costlier ED stays; during this period, the percentage of these ED presentations with resulting diagnosis of acute coronary syndrome (ACS) decreased [20].

The serious consequences of a missed diagnosis of AMI, that occur in 2-6% of ED presentationsand on the other hand the high rate of atypical presentations for AMI, encourages clinicians to investigate large numbers of ED patients with possible ACS and in most time, to admit them to hospital for prolonged work up. If it was possible to safely rule out patients who do not have AMI, then it would be possible to safely manage those patients in the outpatient clinic [21].

Physicians have searched since a while for a system that ranging from specific diagnostic tests to entire strategies of evaluation, to appropriately risk stratify patients suspected of experiencing ACS; these efforts are aimed at preventing major adverse cardiac events (MACE) while reducing unnecessary testing and hospitalizations. A majority of physicians assume a miss rate of <1% for MACE as acceptable in screening tools. Patients, on the other hand, feel that a higher risk of missing an ACS presentation is acceptable with considering the management strategy [22].

HEART score is one of the more recently proposed model to identify ED patients presenting with undifferentiated chest pain for short-term MACE occurrence, calculated based on medical History, ECG, Age, Risk factors and Troponin. Several scientific societies are encouraging the use of HEART score, for evaluating patients with chest pain suggestive of ACS in the ED [23].

The sex distribution of study population showed male preponderance (70.9%) which is similar to male preponderance reported by Braunwald, et al., from Grace [24] (56.3%) and Paichadze et al., at from Pakistan [25] (58%). The mean age of study population was 53±15 years which was nearly similar to the mean age reported by Sallena et al., from India [26] (53±7 years) and Paichadze et al., from Pakistan (25) (42±14 years).

The peak prevalence of chest pain patients attending emergency department during the study period was in the age group 45-65 years (56.3%). Followed by the age group more than 65 years (26.2%).

Cigarette smoking was found to be the most risk factor in the studied population (52.4%). However, Than M et al., from Netherlands [22] and Juan et al., from Turkey [27] had a lower percentage (27.1% and 18.1% respectively). Hypertension coming next (45.6%), that was approximately similar to Sanchis J et al., from Spanish [28] (60.4%), and Juan et al., from Turkey [27] (53.2%). Diabetes mellitus had occurred in (37.9%) of studied population, Six AJ et al from Netherlands (29) had nearly similar percentage (35%) for family history, but had lower for diabetes (18.3%). Khalil et al., from Tunis [30] was reported that (43%) had diabetes. Hyperlipidemia was found to be lesser (39.8) in compared to Markel et al., [9] (47% and 37%) and Waxman, A., et al. from USA [31] (50.4%), and higher in compared to Sandhu et al., from China (32) (10.2% and 19.2%) that difference could be because of sedentary life and consuming of fast food in western.

The above risk factors (Cigarette smoking, Hypertension, Diabetes mellitus, and Hyperlipidemia) were statistically significant with HEART score categories (*p*=0.001).

This study showed that the majority of patients with typical chest pain were categorized in the high risk group (69.2%), and the minority were with the low risk group (33.3%) which is consistent with the study by Six et al., from Netherlands (55.8% and 28.2%) [29], Khalil et al., from Tunis (55.3% and 30%) [30], while the study by Melki et al., from Sweden [33] stated that 60.2% of patients were categorized as a low-risk group and the moderate risk group (35.1%).

More than 70% of studied population presented with negative troponin, and only 11.6% had triple the UNL, this in contrast to Alimohammadi et al., from Iran [34] (65.8% and 8.9%), Mahler et al from USA [35] (94.3% and 2.8%) and Crim et al., from Spain [36] (89.7% and 6%). 33% of studied population accounted to have normal ECG, and 18.4% had significant ST segment elevation, in contrast to Mahler et al., from USA (35) (56% and 1.4%) and Alimohammadi et al from Iran [34] (50.4 and 18.3%). All the ECG changes score were statistically significant (*p* 0.001).

Data analysis of this study showed that there is a statistically significant relationship (*p* 0.001) between HEART score variables and the incidence of MACE, which comparable to the study by Six et al., from Netherlands [29] and Khalil et al., from Tunis [30] stating that the incidence of adverse cardiac events is strongly correlated with HEART score. High-risk patients (HEART score 7-10) found to have the highest incidence of MACE (88%), followed by intermediate-risk patients (4-6) (28%) that was consistent with Six et al from Netherlands [29] (72.7% and 20.3%), Backus, B.E. et al., from Netherlands [37] (50.1% and 16.6%) and Khalil et al., from Tunis [30] (62.4% and 16.2%) which might show the ability of HEART score to correctly categorize patients and predict their short-term outcome. On the other hand, no patient from the low risk group developed MACE, in comparison to the three mentioned above (2.5%, 1.7% and 1.2% respectively). That could be due to small sample size in our study.

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النتائج السريرية لمرضى آلام الصدر
فى قسم الطوارئ

على الرغم من كونها شكوى متكررة في غرف الطوارئ، فإن العلاج السريرى لألم الصدر يختلف بشكل كبير. تعد درجة القلب (التاريخ، مخطط كهربية القلب، العمر، عوامل الخطر، والتروبونين الأولى) سهلة التطبيق لتقسيم المرضى الذين يعانون من آلام فى الصدر إلى طبقات وفقًا لمخاطرهم على المدى القصير لأحداث قلبية سلبية كبيرة .

الهدف من هذه الدراسه هو إيجاد قيمة وتأثير درجة القلب السريرية على نتائج المرضى.

تمت هذه الدراسه من خلال جمع معلومات سريرية عن ١٠٣ أفراد يعانون من آلام فى الصدر تم إدخالهم إلى غرفة الطوارئ من مارس ٢٠٢٣ حتى أغسطس ٢٠٢٣. تم استخدام سجل محتمل لتسجيل معلومات حول المرضى الذين يعانون من آلام فى الصدر غير ناتجة عن الصدمة والذين تم إدخالهم من قسم الطوارئ.

وأشارت نتائج الدراسه إلى ان مجموعة منخفضة المخاطر، درجة القلب ≤ ٣، تتألف من ١٠٣/٣٣ مريض (٣٢,١٪). المجموعة ا عالية لخطورة، درجة HEART من ٧ إلى ١٠، تتألف من ٢٦ مريضًا (٢٥,٢٪) مع خطر معتدل للإصابة بـ MACE بنسبة (٤٢,٧٪).

هذه الدراسة ادت أستنتاج إن استخدام درجة القلب السريرية أثناء التقييم الأولى للمرضى الذين يعانون من آلام فى الصدر هو أمر آمن، وكان للتنبؤ البسيط والسريع والدقيق للنتائج فى المرضى الذين يعانون من آلام الصدر فى المستشفى ومستوى التروبونين ارتباط إيجابى قوى.