How to Cite:
Kandil, H. I. H., Elhossary, H. E. G., Mohamed, A. S., & Fouad, M. N. M. (2022). Diagnostic and prognostic significance of normal ECG in non-ST elevation acute coronary syndromes. *International Journal of Health Sciences*, *6*(S6), 2456–2472. https://doi.org/10.53730/ijhs.v6nS6.9864

Diagnostic and prognostic significance of normal ECG in non-ST elevation acute coronary syndromes

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***Abstract*---**Background: Admission electrocardiogram (ECG) give diagnostic data, prognostic information, and rapid risk evaluation for people who are suffering from acute coronary syndrome (ACS), in particular those who have had a myocardial infarction that does not include ST-segment elevation (NSTEMI). 1 Aim: In the context of non-ST elevation acute coronary syndrome, The significance of the admission ECG on the final prognosis is what we want to determine with this research. Methods: Observational study conducted at a single centre that involved the participation of 200 patients diagnosed with acute coronary syndromes that did not involve ST-elevation over the course of one year, with post-discharge clinical follow-up lasting for six months and a focus on the rates of all types of mortality as well as the rate of major unfavourable cardiovascular events. The population was divided into two groups based on the findings from the ECG that was performed upon admission. Patients who had normal ECG readings at the time of presentation were included in the Normal ECG Group, whereas patients who presented with abnormal ECGs are included in the Abnormal ECG Group. Results: There was no statistically significant difference between the two groups assessed after admission in the rate at which new ischemic ECG abnormalities occurred ($p = 0.172$) or the timing of these changes ($p = 0.414$). With regards to the overall number of diseased coronaries, there was a statistically significant difference between the normal and abnormal

Manuscript submitted: 9 March 2022, Manuscript revised: 27 May 2022, Accepted for publication: 18 June 2022

ECG groups (p = 0.014), with the abnormal ECG group having a higher diseased coronary count. It was shown that the only meaningful predictor of later events was the left ventricular ejection fraction. All subsequent incidents occurred in those with abnormal ECGs, and the difference between the abnormal ECG group and the normal ECG group was statistically significant. Conclusion: A normal admission electrocardiogram in cases of acute coronary syndromes that do not include ST elevation, may serve as an early predictor of a favourable prognosis and intact left ventricular function.

***Keywords*---**ECG, ACS, NSTEMI.

Introduction

The pandemic of coronary artery disease (CAD) is a significant cause for worry for public health on an international scale. It is the biggest cause of mortality and sickness across the whole globe, and women and men are both equally affected by it. The most common kind of cardiovascular illness that results in mortality in the United States is coronary artery disease (CAD), commonly known as coronary heart disease. This is followed by stroke and hypertension. 2 According to the statistics provided by the American Heart Association, cardiovascular disease was the cause of death for more than 17.6 million people in the year 2016, 17.5 million people in the year 2014, and this figure is projected to rise to more than 23.6 million by the year 2030. According to the data published by the World Health Organization (WHO), cardiovascular diseases are responsible for the deaths of 17.5 million individuals worldwide each year. This statistic represents 31 percent of the total number of fatalities that take place throughout the whole world. There have been around 7.4 million of these fatalities attributed to CAD, according to some estimates. 3

Acute coronary syndrome, often known as ACS, is a collection of signs and symptoms that are brought on by a decrease in the amount of blood that is able to flow through the coronary arteries. Because of the decrease in blood flow, a section of the heart muscle becomes hypo perfused, and as a result, it is unable to function correctly. In the long run, an acute coronary syndrome (ACS) diagnosis does not portend well for the patient's prognosis. 4 Because of its widespread availability and high diagnostic yield, the electrocardiogram, often known as an ECG, is the most important tool for early risk assessment in ACS patients. ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina are the three subtypes that are most often associated with acute coronary syndrome (ACS). Ischemic symptoms, in conjunction with ST deviations and cardiac troponin levels, are used to categorise patients into one of these categories (UA). 5

There are no ECG-related criteria for non-ST elevation myocardial infarction (NSTEMI), also known as uncomplicated arrhythmia, other than the lack of ischemic ST elevations on the electrocardiogram (ECG) (UA). Patients who have been given the diagnosis of NSTEMI or UA may have a wide range of abnormalities on their electrocardiogram (ECG), each of which has the potential

to have an effect on the patient's prognosis. Some of these modifications may be the result of ischemia to the myocardium, while others may be a sign of an underlying problem with the circulatory system. Ischemia is a condition that occurs when there is a restriction in the blood flow to the heart. On an electrocardiogram (ECG), some of the abnormalities of the heart that may be detected include Q waves, ST depression (ST-D), left ventricular hypertrophy (LVH), T wave inversions (TWI), left bundle branch block (LBBB), and right bundle branch block. LVH stands for left ventricular hypertrophy. ST-D stands for ST depression (RBBB). 6

Each patient given a diagnosis with ACS who has a standard ECG at the time of presentation should get a thorough examination that includes the measurement of troponin T and troponin I levels to dismiss the possibility of myocardial damage caused by myocardial ischemia. This will make it feasible to treat and manage any later cardiac concerns in the most efficient way possible. 7 It is not impossible for a patient to develop NSTEMI or UA while having a normal electrocardiogram (ECG). A broad range of electrocardiogram (ECG) rhythms have been studied, and their short-term and long-term ramifications have been analysed. However, there is a dearth of information about the long-term prognosis of ACS patients whose ECGs are normal, in contrast to those whose ECGs are aberrant or abnormal. 8

Patients and Methods

Observational study conducted at a single centre that involved the participation of 200 patients diagnosed with acute coronary syndromes that did not involve ST-elevation over the course of one year, with clinical follow-up after discharge that lasts for a full six months and has an emphasis on both the overall mortality rate and the MACE rate. According on the results of the admission ECG, the population was split into two groups. Patients who presented with normal ECGs are included in the Normal ECG Group, whereas patients who presented with abnormal ECGs are included in the Abnormal ECG Group.

Inclusion criteria

Non-ST-segment elevation acute coronary syndrome is diagnosed in patients older than 18 who present with acute chest discomfort but no persistent ST-segment elevation. This subtype of acute coronary syndrome is characterised by a lack of sustained ST-segment elevation on the electrocardiogram (NSTEACS). In accordance with the 2015 ESC Guidelines for the management of ACS in patients presenting without persistent ST-segment elevation, an ECG may be normal if the patient shows modifications such as continual or transient ST-segment depression, flat T waves, or pseudo-normalization of T waves, T-wave inversion. The purpose of these recommendations is to standardise the evaluation and management of individuals with acute coronary syndromes who do not have persistent ST-segment elevation.

Exclusion criteria

Those under the age of 18, people suffering from acute myocardial infarction, characterised by a ST elevation, patients whose electrical rhythms are being artificially paced, patients receiving digoxin medication, and patients who meet the criteria for LVH as determined by an electrocardiogram.

Methodology

All patients were required to provide their informed permission before undergoing the following procedures:

Baseline assessment

Comprehensive history taking and clinical examination, including vital signs, demographics, variables that increase the risk of cardiovascular disease, weight, height, and BMI.

Electrocardiogram assessment

An electrocardiogram with 15 leads (V1-V9) on the surface showed that a normal ECG indicated sinus rhythm and that there were no acute ischemia alterations. In order to be taken into consideration, When measured 60 milliseconds (ms) after the J point in two consecutive leads, the ST depression must be at least one millimetre (mm). ST depression is not evaluated when any of the following conditions are present: T wave inversion must be at least 1 mm, and all leads are checked with the exception of lead AVR if any of the following conditions were present on a previous ECG: left ventricular hypertrophy with strain, timed rhythms, bundle branch block, etc. When doing this kind of study, the electrocardiogram (ECG) obtained at the time of admission is given the most weight. "De novo" refers to electrocardiographic findings that have not previously been documented in the patient's medical history or in the most recent ECG recorded before to presentation. Chronic or transient ST-segment depression, T-wave inversion, flat T waves, or pseudo-normalization of T waves are all indicators of an aberrant ECG. However, if a patient presents without persistent ST-segment elevation, the ECG may be considered normal according to the 2015 ESC Guidelines for the management of ACS. Serial electrocardiograms should be taken at 0, 3, 6, 9, and 12 hour intervals in conjunction with cardiac enzymes to detect ECG ischemia changes, as recommended by the 2015 ESC Guidelines for the management of ACS in patients who report no persistent ST-segment elevation. These tracings should be done to detect ECG ischemic alterations at intervals of 0, 3, 6, 9, and 12 hours.

Echocardiography assessment

For the purpose of the echocardiogram that is going to be performed on the patients, they are going to be placed in the left lateral decubitus posture. In order to detect any localised contractile abnormalities that may be present, echocardiograms will be subjected to a rigorous visual assessment. Systolic and diastolic volumes of the left ventricle (LV) and ejection fraction (EF) will be

determined from biplane apical (2- and 4-chamber) images utilising the modified Simpson's rule algorithm. Additionally, an estimate of the ejection fraction will be performed utilising m-mode in parasternal long and short axis views. The measurements will be performed out in accordance with the recommendations that were formulated by the European Society of Cardiovascular Imaging in the year 2016. 9

Further assessment

Patients presenting without persistent ST-segment elevation should follow the strategy of non-invasive testing vs invasive coronary angiography outlined in the European Society of Cardiology (ESC) Guidelines for the treatment of acute coronary syndrome (ACS). It is recommended to explore invasive coronary angiography in individuals with a high clinical suspicion of NSTE-ACS. Patients with low-to-intermediate likelihood for this condition, based on clinical judgement, should be discharged from the emergency room without undergoing invasive imaging that used CCTA or stress testing [stress echocardiography, positron emission tomography, single-photon emission tomography (SPECT), or CMR for the detection of ACS features.

Follow up assessment

Clinical follow-up while the patient is still in the hospital and for the next six months after hospital release. The information may be gathered in the outpatient clinic, over the phone, or through the medical records of the hospital. Primary endpoints include preventing cardiovascular-related mortality, nonfatal myocardial infarction, hospital readmission for unstable angina, and unscheduled percutaneous coronary intervention. The main objectives are death from any cause and the total number of severe adverse cardiac events that occur throughout the study.

Primary outcome parameters

This study aims to determine the connection between a normal ECG in the setting of non-ST elevation acute coronary syndrome and the territory of ischemia as ascertained by non-invasive modalities or the diseased culprit vessel as determined by coronary angiography. Additionally, this study will evaluate implications of admission ECG for prognosis in patients with non-ST-elevation acute coronary syndrome.

Secondary outcome parameters

To compare the clinical and angiographic findings of patients with normal ECG versus patients with abnormal ECG who present with non-ST elevation acute coronary syndrome. Also, to determine the timing of ECG changes in patients with normal ECG versus patients with abnormal ECG who have non-ST elevation acute coronary syndrome.

Statistical Methodology

The collected data is analysed using SPSS 20.0, the statistical tool for the social sciences (SPSS Inc., Chicago, Illinois, USA). Mean and standard deviation are used to illustrate the spread of numerical information (SD). Quantitative information is often expressed as a frequency or percentage of occurrence.

The following tests were done

Independent-samples When comparing two means, the t-test of significance is the statistical tool of choice. Mr. Whitney Mann The U test is used to compare two groups when the data are not parametric. When comparing proportions of qualitative parameters, the chi-square (x2) test of significance is the statistical method of choice. The margin of error that is acceptable has been set at five percent, and the confidence interval has been set at ninety-five percent. Therefore, the following are the reasons why the p-value is deemed significant: Probability (P-value), P-value <0.05 is deemed significant. A p-value of less than 0.001 is regarded as being very significant. If the P-value is more than 0.05, the result is not significant.

Results

Two hundred people who went to the emergency department because of chest discomfort were included in the present research. Each patient was given an electrocardiogram (ECG), and those who had normal readings were placed in one group, while those who received abnormal readings were placed in the other (Patients presented with an abnormal ECG). The average age of the participants in the research was 57.73. with a standard deviation of 10.15 years. The majority of the people in the study were males (85%), while only 15% of the people in the study were females. The most common cardiovascular risk factors in our study population were dyslipidemia and hypertension. Table (1)

Table 2
Demographics and clinical data descriptive parameters

Parameters	Total (N=200) Mean±SD or No. (%)
Demographic data	
Age (years)	57.73±10.15
Gender	
Male Female	170 (85.0%) 30 (15.0 %)
Risk factors	
Smoking	97 (48.5%)
Hypertension	157 (78.5%)
DM	93 (46.5%)
Dyslipidemia	172 (86.0%)
History Previous PCI/CABG	43 (21.5%)

Parameters	Total (N=200) Mean±SD or No. (%)
Hemodynamic	
Heart Rate	68.19±7.83
Systolic Blood Pr.	129.00±9.13
Diastolic Blood Pr.	77.80±7.45

Only four percent of patients in the whole study population had positive cardiac enzymes at admission, whereas eight percent of patients in the entire study population had positive serial cardiac enzymes after admission. The mean time for ischemic ECG changes to be detected was 10.09 ± 2.83 hours. The complete study cohort had an ejection fraction that averaged out to (57.1 ± 39.79 percent), 54 percent of the whole study population did not have RSWMA, and only 7 percent of the overall research population had global hypokinesia. Table (2)

Table 3
ECG, Cardiac Enzymes and Echo descriptive parameters

ECG change Time	
ECG changed	44 (22.0%)
No new ECG changes	156 (78.0%)
Time (hrs)	10.09±2.83
Cardiac Enzymes changes	
Cardiac Enzymes positive at presentation	8 (4.0%)
Positive Serial cardiac enzymes	24 (12.0%)
Delta change	16 (8%)
Echo finding	
Presence RSWMA	
No RSWMA	109 (54.5%)
LAD Territory	34 (17.0%)
LCX/RCA Territory	43 (21.5%)
Global Hypokinesia	14 (7.0%)
Ejection Fraction%	57.13±9.79

In terms of ischemic ECG alterations and ECG change time, there was statistically insignificant difference between the groups. Table (3)

Table 3
Comparison between normal and abnormal presenting ECG groups according to ECG change time

ECG change Time	Normal ECG Group (N=100) Mean±SD Or No. (%)	Abnormal ECG Group (N=100) Mean±SD Or No. (%)	p-value

ECG Changed No new ECG changes	26 (26.0%) 74 (74.0%)	18 (18.0%) 82 (82.0%)	0.172
Time (hrs)	10.38±2.71 6-12	9.67±3.01 6-12	0.414

There was a very significant and statistically larger presence of RSWMA in the abnormal ECG group in comparison to the normal ECG group. In addition, there was a substantial drop in the mean of ejection fraction in the abnormal ECG group in comparison to the normal ECG group. Table (4)

Table 4
Comparison between normal and abnormal presenting ECG groups according to echo finding

Echo finding	Normal ECG Group (N=100) Mean±SD Or No. (%)	Abnormal ECG Group (N=100) Mean±SD Or No. (%)	p-value
Presence RSWMA			
No RSWMA	71 (71.0%)	38 (38.0%)	<0.001**
LAD Territory	12 (12.0%)	22 (22.0%)	
LCX/RCA Territory	17 (17.0%)	26 (26.0%)	
Global Hypokinesia	0 (0.0%)	14 (14.0%)	
Ejection Fraction%	59.93±7.73	54.33±10.83	<0.001**
	43-77	27-77	

In terms of Myocardial Bridge, Left Main Territory, LCX Territory, and Total vessels diseased, there was a difference between the groups that could be considered statistically significant. Table (5)

Table 5
Comparison between normal and abnormal presenting ECG groups according to coronary angio-findings

Coronary angio findings	Normal ECG Group (N=100) Mean±SD Or No.(%)	Abnormal ECG Group (N=100) Mean±SD Or No.(%)	p-value
No significant lesion	15 (15.0%)	10 (10.0%)	0.285
Myocardial Bridge	5 (5.0%)	0 (0.0%)	0.024*
Ectasia & slow flow	11 (11.0%)	8 (8.0%)	0.469
Left Main Territory	3 (3.0%)	11 (11.0%)	0.027*
LAD Territory	41 (41.0%)	50 (50.0%)	0.201
LCX Territory	32 (32.0%)	51 (51.0%)	0.006*
RCA Territory	32 (32.0%)	34 (34.0%)	0.764
Total vessels diseased			

No vessels 1 vessel 2 vessels 3 vessels 4 vessels	20 (20.0%) 53 (53.0%) 17 (17.0%) 8 (8.0%) 2 (2.0%)	10 (10.0%) 52 (52.0%) 20 (20.0%) 10 (10.0%) 8 (8.0%)	0.116
Total vessels diseased Median (IQR) Range	 1 (1) 0-4	 2 (1) 0-4	0.014*

According on the follow-up Events, there was a difference that might be considered statistically significant between the normal and abnormal presenting ECG groups. Table (6)

Table 6
Comparison between normal and abnormal presenting ECG groups according to follow up events

Follow up Events	Normal ECG Group (N=100) Mean±SD Or No.(%)	Abnormal ECG Group (N=100) Mean±SD Or No.(%)	Total (N=200) Mean±SD Or No.(%)	p-value
No Event	100 (100.0%)	94 (94.0%)	194 (97.0%)	0.013*
Event	0 (0%)	6 (6%)	6 (3%)	
ACS	0 (0.0%)	3 (3.0%)	3 (1.5%)	
CHF	0 (0.0%)	1 (1.0%)	1 (0.5%)	
Death	0 (0.0%)	2 (2.0%)	2 (1.0%)	

The only factor that was shown to be a meaningful predictor for follow-up events was the LV Ejection Fraction. Table (7)

Table 7
Multivariate logistic regression analysis to determine the predictors of follow up events

	OR	Wald	Sig.	95% CI
Age	1.145	1.284	.257	.906 - 1.448
Male	12.15	1.199	.273	.139 - 1061.79
Smoking	.465	.363	.547	.039 - 5.592
DM	.573	.187	.666	.046 - 7.167
Previous PCI/CABG	3.725	.555	.456	.117 - 118.321
Admission ECG	0	.000	.995	.000
ECG change Time	1.267	2.613	.106	.951 - 1.688
LVEF	.792	4.315	.038*	.636 - .987

Discussion

The electrocardiogram, often known as an ECG, is the diagnostic tool that is used the most frequently and is also the one that can be obtained with the least

amount of difficulty when a patient is suspected of having acute coronary syndrome (ACS). Admission In individuals who have acute coronary syndrome (ACS), especially those who have non-ST-segment elevation myocardial infarction, the results of an electrocardiogram (ECG) might give information on prognosis in addition to a fast risk assessment (NSTEMI). A non-ST-elevation myocardial infarction (NSTEMI) is a diagnosis that is given to a diverse group of individuals, all of whom have unique clinical features and prognosis. 1

The electrocardiogram (ECG) findings of NSTEMI at presentation demonstrate several different forms, including transient elevation of the ST segment, transient depression of the ST segment, inversion of the T wave, and no ischemic alterations. These differences may be seen even when there were no ischemia-related shifts in the data. An increased risk of both short-term and long-term cardiovascular (CV) events has been proven to be associated with the presence of ischemic changes, according to research that was conducted in the past. 10 There is a paucity of data on individuals who reported to the emergency room with NSTEMI and a normal electrocardiogram that lacked any ischemia abnormalities. It is still essential to do risk assessment before choosing suitable therapeutic measures for NSTEMI patients who have normal electrocardiograms. Therefore, doing systematic research on this group of patients with normal electrocardiograms will assist cardiologists in better risk-stratifying patients and give more insight into the selection of medication that is most suitable. 6

Furthermore, current guidelines for NSTEMI patients recommend invasive reperfusion in order to improve clinical outcomes. Even so, the impact of invasive planning on the prognostic value of admission ECG data in contemporary practise has not been researched. This is because the effect of invasive management on prognostic value of admission ECG data has not been studied. In spite of the fact that it is a standard procedure, this is the case. It is not yet known whether patients who receive invasive care or those who do not differ in the prognostic helpfulness of the results of their admission ECG. Those who do not receive invasive care. 11 In this study, we perform a prospective analysis on a total of 200 patients with NSTE-ACS who presented themselves at the emergency room. In order to systematically determine the predictive relevance of qualitative ECG abnormalities at presentation, we evaluate patient demographic data, risk factors, ECG change time, cardiac enzymes results, echo findings, and follow-up events between normal and abnormal ECG groups. The purpose of this study was to investigate whether or not qualitative ECG findings at presentation had a substantial influence on patient outcomes. This analysis was carried out in order to get to this conclusion.

Regarding the prevalence of dyslipidemia, the groups that were investigated varied significantly from one another. According to the findings of the present research, hypertension is a comorbid illness that is more common in individuals whose ECG is abnormal, while dyslipidemia is more common in those whose ECG is normal. There is a discernible gap between the two groups that were investigated. Patients with no major lesion and a myocardial bridge are more likely to have dyslipidemia if their ECG is normal, compared to those with an abnormal ECG. Smoking, hypertension, diabetes, and dyslipidemia are not significantly different between the normal and abnormal ECG groups in individuals with severe lesions.

Patients who were asymptomatic rather than symptomatic with normal or nonspecific ECG findings were more likely to have high cholesterol (27 percent vs. 23 percent; $p = 0.04$), hypertension (58 percent vs. 49 percent; $p < 0.001$), and diabetes (22 percent vs. 17 percent; $p = 0.002$), according to the research conducted by Chase et al. 7. In contrast, the findings of the study that was carried out by Teixeira and colleagues (12) shown that there were insignificant differences in terms of the risk factors for cardiovascular disease, the history of cardiovascular illness, or the medicine that was previously used. There was no significant difference between the normal and abnormal ECG groups regarding hypertension (30 percent vs. 54 percent; $p = 0.15$) and dyslipidemia (26 percent vs. 48 percent; $p = 0.18$) respectively. There was also no significant difference regarding diabetes and smoking. The study by Moustafa et al. 13 found that both hypertension and dyslipidemia were more prevalent in the abnormal ECG group.

In the current study, there is a statistically significant difference between the normal and abnormal ECG groups with regard to previous PCI/CABG (29 percent vs. 14 percent; $p = 0.010$) respectively, with previous PCI/CABG being found more frequently in the normal ECG group. This difference can be attributed to the fact that previous PCI/CABG was found more frequently in the normal ECG group. But in the study by Moustafa et al. 13, there was no significant difference between the normal and abnormal ECG groups in terms of previous PCI (25 percent vs. 32 percent; $p = 0.34$), previous CABG (12 percent vs. 21 percent; $p = 0.24$), and previous PCI/CABG being more common in the abnormal ECG group. In the present research, there is a significant difference between the two groups in terms of the mean value of ejection fraction being lower in the abnormal ECG group and RSWMA being more prevalent in the abnormal ECG group. In patients with significant lesions, there is a significant difference between the normal and abnormal ECG groups in terms of the prevalence of RSWMA. with p value < 0.001 and The ejection fraction is greater in the normal ECG group than in the aberrant ECG group (59.11±7.91 vs. 53.71±11.05 percent, p 0.001), indicating a statistically significant difference between the two groups. In individuals without a substantial lesion or myocardial bridge, there is insignificant difference between the normal and abnormal ECG groups in terms of ejection fraction, however the presence of RSWMA is more frequent in the abnormal ECG group.

Our findings are supported by the research that was carried out by Teixeira et al., 12, who discovered that people with normal ECGs were considerably more likely to be in reduced Killip Kimball classes just at time of enrollment, to have a reduced risk level, and to have a greater left ventricular ejection fraction (LVEF) (55.3±9.5 vs. 52.0±10.6 percent, $p < 0.001$) in their hearts. There was a significant difference between the normal ECG group and the abnormal ECG group in terms of ejection fraction (53.6±11.1 vs. 48.5±13.3 percent, $p = 0.04$). This difference was found in the study that was conducted by Moustafa et al. 13. Ejection fraction was found to be higher in the normal ECG group than in the abnormal ECG group. This research demonstrated a significant difference between the groups with normal and aberrant ECG (33.3% vs. 67.7%, $p = 0.001$) respectively, with RSWMA being more prominent in the group with abnormal ECG.

The study that we have in front of us found no statistically significant differences between the two groups that were studied in terms of the timing of ECG changes, cardiac enzymes, and serial cardiac enzymes. The mean time for the detection of ECG changes was 10.09±2.83 hours. Only 4% of the total population of the study had positive cardiac enzymes upon admission, and only 8% of the total population of the study showed positive serial cardiac enzymes after admission. In the research carried out by Moustafa et al. 13, there was not a discernible difference between the normal and abnormal ECG groups with respect to the peak Troponin I and peak CKMB readings. The timing of changes on an electrocardiogram and the levels of cardiac enzymes were not analysed in this investigation.

However, in the research carried out by Teixeira et al. 12, there was no comparison made between the normal and abnormal ECG groups in terms of ECG changes or the timing of cardiac enzymes. However, there was a significant difference between the two groups in terms of peak Troponin I and peak CKMB values, with the abnormal ECG group having values that were found to be higher. There is a statistically significant increase in the incidence of left main and LCX regions in the group with abnormal ECG. The LAD territory is more frequent in the normal ECG group, while the remainder of the territories are equivalent between the two groups. In addition to these results, there is a significant difference between the normal and abnormal ECG groups with respect to the total number of sick coronaries. The abnormal ECG group had a greater prevalence of diseased coronaries, as shown by a p value of 0.014.

However The research carried out by Teixeira and colleagues 12 found no statistically significant difference between the groups with normal and abnormal ECGs in terms of the total number of diseased coronaries. However, the researchers were unable to identify the specific regions that were affected in either of the groups. Also, the study that was done by Moustafa and his colleagues showed that there was no significant difference between the normal and abnormal ECG groups when comparing the coronary territories that were affected. However, it did show that the LAD territory was the most affected territory in both of these groups (55.6 percent vs. 58.5 percent, p = 0.28), respectively. According to the findings of the present research, in terms of prognosis, 3 percent of patients end up being readmitted with ACS, while 1 percent of patients in the abnormal ECG group either develop CHF or end up being readmitted with it. There is a substantial difference between the normal and abnormal ECG groups with respect to the outcomes of follow-up events since 2 percent of the patients in the abnormal ECG group passed away while in the hospital. Only follow-up events are observed in the patients, and substantial lesions are only identified in the group of patients with an abnormal ECG. There is a statistically significant difference between the abnormal and normal ECG groups, as shown by a p value of 0.019.

In addition, Teixeira et al. 12 observed that patients with aberrant ECGs were more likely to die while hospitalised than those with normal ECGs (4.6 vs. 1.9%, p=0.054). This trend attained statistical significance after 30 days and after one year following the ACS, respectively. A greater risk of re-infarction and readmission for heart failure was associated with patients who had abnormal ECGs at the end of the first year. Furthermore According to the results of the

research conducted by Jessica K. and her colleagues 14, there were substantial disparities in the clinical outcomes of patients who had and did not have entirely normal ECG readings. 12 percent of patients with entirely normal ECG findings had bad hospital outcomes, compared with 37 percent of the group with any ECG abnormalities in the prehospital context (p0.05). This was the overall comparison for the patients' ECG results. Patients admitted to the hospital who had a normal PH ECG were considerably less likely to develop new heart failure (0 percent vs. 17.5 percent; $p < 0.001$) or atrial dysrhythmias that required intervention (4.4 percent vs. 14.7 percent; $p < 0.05$) than patients whose ECGs showed any abnormalities. Patients who had entirely normal ECGs had a considerably shorter length of hospital stay (mean = 1.19 days, standard deviation = 1 day; Mann-Whitney test, $p < .001$) than those who did not have normal ECGs (mean = 3.86 days, standard deviation = 15 days). At the median follow-up of two years, considerably fewer patients who had entirely normal ECGs passed away in comparison to those who had any kind of ECG abnormalities (9 percent vs. 28 percent; <p 0.05).

However, in the research conducted by Moustafa et al. 13, there was not a significant difference seen between individuals with normal and abnormal ECG groups in terms of duration of hospital stay, re-hospitalization, or death while in the hospital. In the research that we have in front of us, the Left Ventricular Ejection Fraction was the only factor that was shown to be a significant predictor for follow-up events. As a result, the ejection fraction was the only factor that was found to be a predictor for follow-up events. But in the study by Teixeira et al. 12, the result for mortality risk at one year was adjusted in accordance with a Cox regression model that also included normal ECG, age over 65 years, glomerular filtration rate less than 60 ml/min, troponin I more than 0.20 U/L, previous diabetes, and a greater Killip class at admission. This was done so that the participants' higher Killip class upon enrollment wouldn't bias the results of the research. There were more patients hospitalised with a higher Killip class, and our model accounts for that. According to this model, the relative risk of death from ACS was reduced by 55% in those who had normal ECGs one year after the occurrence. Normal ECG recipients had their relative risk reduced, therefore that was taken into account in the modification.

According to the research carried out by Jessica K. and her colleagues, a normal electrocardiogram, an individual's age, gender, and a family history of coronary artery disease, hypertension, or smoking were important predictors of any bad hospital outcome. As this was a retrospective study without any long-term follow up outcomes, the researchers at Moustafa et al. 13 did not develop any predictors for follow up events because there were no long-term follow up results. Despite these limitations, the study was nevertheless interesting. Only 30 of the total number of 200 individuals in this research who reported to the emergency department with NSTEMI-ACS had no major lesion or had myocardial bridge in both normal and abnormal ECGs. Patients who have no significant lesions or myocardial bridge are typically younger, with a mean age of 54.85 ± 9.96 years in the normal ECG group and 50.53 ± 11.45 years in the abnormal ECG group. This compares to patients who have significant lesions, who have a mean age of 57.36 $\pm$ 9.75 years in the normal ECG group and 59.44 10.07 years in the abnormal ECG group. There is no statistically significant difference between the normal.

There is no significant difference between normal and abnormal ECG groups as regard presence of no significant lesion (15 percent vs. 10 percent; p= 0.285), but there is a significant difference between ECG groups regarding myocardial bridge being more prevalent in normal ECG group than abnormal ECG group. Patients with no significant lesion and myocardial bridge are found more in normal ECG group than abnormal ECG group with number of patients (n = 20 vs. n =10) respectively. However, in the research conducted by Teixeira et al. 12, there was a significant difference between the normal ECG group and the abnormal ECG group with regard to the existence of no major lesion (23.4% vs. 8.5%) respectively; however, myocardial bridge was not addressed in this study.

Also, in the study by Moustafa et al. 13, there was a significant difference between the normal and abnormal ECG group in patients with no significant lesion (26.2 percent vs. 18 percent; p= 0.045), respectively. However, myocardial bridge wasn't mentioned or wasn't included in the study, so we don't know if patients with myocardial bridge were added to patients with no significant lesion, which could have an effect on the statistical results. There are no ECG changes detected during the hospital stay of patients who have no significant lesions or myocardial bridges, and there is no statistically significant difference between normal and abnormal ECG groups according to ECG change time. On the other hand, there is a statistically significant higher serial cardiac enzyme level in the abnormal ECG group during the hospital stay compared to the normal ECG group. They are all males, and they tend to be younger, and they have no follow up events in comparison to patients who have significant lesions and are referred to as MINOCA patients. The number of patients with no significant lesion who have elevated cardiac enzymes is 2. They make up 1 percent of the total number of patients in the study. Patients with no significant lesion who have elevated cardiac enzymes are all males.

However, in the study conducted by Pawel et al. 15, MINOCA patients only made up 2.94 percent of all patients in the study and were predominately female. Additionally, all-cause mortality at 12 months was higher in MINOCA patients compared to patients with significant lesions (10.94 percent vs 9.54 percent, p < 0.01), but the only area of agreement between our study and this study is that MINOCA patients were younger than patients with significant lesions. In patients with severe lesions, there is no significant difference between patients in the normal ECG group and those in the abnormal ECG group in terms of the proportion of patients who need high-risk PCI or CABG (8.8 percent vs. 14.4 percent, p = 0.250). Our findings are supported by a study conducted by Teixeira and colleagues (12), who found that there was no significant difference between patients in the normal and abnormal ECG groups who required surgical intervention or high risk PCI in patients with significant lesions (3 percent vs 3 percent, p = 0.97). This finding lends credence to our findings. There was no significant difference between the normal and abnormal ECG group in patients with major lesions as respect individuals who required CABG or high risk PCI (2.8 percent vs 9 percent, p = 0.44) in the research that was conducted by Moustafa et al. 13.

Conclusion

Normal admission ECG there is no elevation of the ST segment, is possible to utilise it as an early predictor of a favourable prognosis in instances of acute coronary syndrome. It has been shown via research that having a normal ECG is associated with both the preservation of left ventricular systolic function and a reduced risk of RSWMA. The timing of ECG abnormalities may be delayed by up to more than 9 hours from the time of presentation in patients who seem to have a normal electrocardiogram but who are really suffering from acute coronary syndrome (ACS) that does not include ST elevation. The Left Anterior Descending (LAD) Region is the region that is influenced the most often in individuals who have normal ECGs. People who have aberrant ECGs are more likely to have a greater total number of coronaries that have been diseased than patients whose ECGs are normal. The presence of abnormalities on an electrocardiogram (ECG) is associated with an increased risk of morbidity and mortality in following events, regardless of whether those later events take place during a patient's stay in the hospital or after they have been released from the facility. Patients who have considerable coronary angiography findings often have a worse prognosis, whereas those who have been diagnosed with MINOCA tend to be younger and have a more favourable prognosis. Patients who have been diagnosed with ACS have a variety of distinct prognostic indicators to take into consideration; nevertheless, their left ventricular ejection fraction is one of the most critical of these factors.

Abbreviations

ACC	American College of Cardiology
ACS	acute coronary syndromes
AHA	American Heart Association
CAD	coronary artery disease
CK-MB	Creatine kinase-MB
ECG	electrocardiogram
ESC	European Society of Cardiology
LAD	left anterior descending
LCX	left circumflex
LVH	Left ventricular hypertrophy
MI	myocardial infarction
NSTEMI	non-ST elevation myocardial infarction
RCA	right coronary artery
STD	ST-segment depression
STE	ST-segment elevation
STEMI	ST elevation myocardial infarction

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