Original Article

Non-ST Elevation Myocardial Infarction

Frequency of Non St Elevation Myocardial Infarction on Acute Coronary Syndrome Patient with Normal ECG

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ABSTRACT

Objective: To determine the frequency of non-ST elevation myocardial infarction (NSTEMI) in patients presenting at cardiology emergency with acute coronary syndrome and having normal ECG.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Emergency Department of Cardiology, Chaudhry Pervaiz Elahi Institute of Cardiology (CPEIC), Multan, from Nov, 2019 to May, 2020.

Materials and Methods: A total number of 203 patients presenting with Acute Coronary Syndrome aged 30-80 years. Data, including the patient's age, gender, BMI, family history, diabetes, smoking, and hypertension, was collected. Patients having trop-T >0.4 ng/ml were labelled as having NSTEMI. All patients with NSTEMI was undergone standard 12- lead ECG tracing. ECG findings (normal/ ST-depression, T-wave inversion) was noted.

Results: Mean age was 53.34±11.51 years included in this study. The BMI was 25.11±3.26 kg/m2. There were 137 (67.49%) males and 66 (32.51%) female patients. There were 75 (36.95%) diagnosed with diabetes. Hypertension was found in 107 (52.71%). Family history of was found in 37 (18.23%). 70 (34.48%) out of 203 patients were smokers. NSTEMI with normal ECG was diagnosed in 19 (9.36%) patients.

Conclusion: There is value to completely normal ECG findings acquired in suspected patients of NSTEMI in the emergency department. In the present study, 9.36% of patients who had the suspicion of NSTEMI was found to have normal ECG and diagnosis in these patients were made on clinical symptoms and trop-T values.

Key Words: electrocardiogram, non-ST elevation myocardial infarction, coronary syndrome

Citation of article: Adnan F, Bukhari SN, Zaffar Z, Javed K, Zarif A, Zubair M. Frequency of Non St Elevation Myocardial Infarction on Acute Coronary Syndrome Patient with Normal ECG, Multan-Pakistan. Med Forum 2021;32(4):49-53.

INTRODUCTION

Afatal complication of coronary heart disease (CHD) is Acute coronary syndrome (ACS) which is still a topmost cause of death[1-4]. Acute myocardial infarction is typically categorized as either ST-elevation acute coronary syndrome (STE-ACS) or non-ST-elevation acute coronary syndrome (NSTE-ACS) based on the electrocardiographic (ECG) findings; importantly, NSTE-ACS comprises 70% of all acute myocardial infarctions[5].

The ECG is one of the most potent instruments in diagnosing ACS, differentiating 2 clinical entities, the STE-ACS and the NSTE-ACS, with different management approaches.

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Received: October, 2020
Accepted: December, 2020
Printed: April, 2021

It remains a cheap, easily accessible and non-invasive test at the moment. NSTE-ACS has different ECG trends, including isolated depression in the ST-segment, isolated T-wave abnormality, transient ST-segment elevation, or normal/non-ischemic abnormality [6]. Although invasive evaluation is commonly pursued, management of NSTE-ACS remains heterogeneous and not fully informed by myocardial substrate or ECG changes[7].

Both American and European guidelines over NSTE-ACS recommend admitting a patient for an invasive strategy in the presence of presumably new ST depression (not T wave inversion) on the admission ECG[8,9]. On the other hand, a normal ECG does not exclude an ACS. A study conducted by McCarthy et al. concluded that about 5.0% of patients having normal ECG and are discharged from the hospital have non-ST elevation Myocardial Infarction (NSTEMI)[10]. A recent review conducted by Hollander et al. reported that about 5% to 28% of patients of normal ECG who present in emergency cardiology departments might have NSTEMI[11]. Teixeira et al. alsoreported NSTEMI in 33% of patients having normal ECG findings in the emergency department [12].

The objective of the present study was to determine the frequency of NSTEMI in patients of ACS having

normal ECG on admission to the study site. Many of the patients who have normal ECG are considered to have symptoms triggered by non-cardiac and often benign disorders. Such patients are discharged from the hospital without any further investigation to rule out NSTEMI. Higher frequency of NSTEMI in patients with normal ECG on admission will help us make guidelines regarding further investigations to rule out NSTEMI. It will help to reduce mortality associated with missed diagnosis in patients of ACS.

MATERIALS AND METHODS

A Non-randomized, consecutive sampling, cross-sectional study was conducted at Emergency department of cardiology, Chaudhry Pervaiz Elahi Institute of Cardiology (CPEIC), Multan. Departmental ethical committee approval was obtained before commencement of the study. Informed consent was obtained from the patients after a thorough explanation of study protocols. Data, including the patient's age, gender, BMI, family history, diabetes, smoking, and hypertension, were collected according to the criteria of the operational definition. The sample size for the present study was calculated by following formula N= [Z2 X P(100-P)]/e2. Both gender patients presenting with Acute Coronary Syndrome due to NSTEMI, aged between 30 to 80 years were included in the study. However, Patients with readmissions or already diagnosed cases of the acute coronary syndrome, Patients representing other causes of the rise in Trop-I levels such as sepsis, end-stage renal disease, stroke and rhabdomyolysis diagnosed on clinical examination and laboratory or radiological investigations were excluded from study.

Patients venous blood samples were taken and sent to the hospital's central laboratory for measurement of Troponin-T levels. Patients having Trop-T >0.4 ng/ml were labelled as having NSTEMI. All patients with NSTEMI were undergone standard 12- lead ECG tracing. ECG findings (normal/ ST-depression, T-wave inversion was noted. Patients were categorized as NSTEMI with normal ECG as per operational.

The collected information was analyzed with SPSS version 23.0. Descriptive statistics were used to calculate the mean and standard deviation for continuous variables like age, height, weight and BMI. Frequency and percentage were calculated for categorical variables, i.e. gender, diabetes, hypertension, family history, smoking and NSTEMI with normal ECG. Effect modifiers like age, gender, BMI, diabetes, hypertension, family history and smoking were controlled by stratification. Post-stratification Chi-square test was applied to determine the effect of confounder variables on the frequency of NSTEMI. P-value <0.05 was taken as a significant effect.

RESULTS

The mean age of patients included in this study was 53.34±11.51 years. The minimum age was 30 years, and the maximum age was 80 years. Body mass index (BMI) mean was 25.11±3.26 kg/m^2. There were 137 (67.49%) males and 66 (32.51%) female patients. Hypertension was diagnosed in 107 (52.71%), and it was not found in 96 (47.29%) patients. Positive family history of CAD was found in 37 (18.23%), while the remaining 166 (81.77%) patients were not having a family history of CAD. Out of 203, 70 (34.48%) patients were smokers.

Table No.1: Descriptive Statistics of Study Participants

Variables		**Mean**	**SD**
Age (Years)		53.34	11.51
Height (cm)		161.96	10.36
Weight (kg)		65.86	10.60
BMI (kg/m^2)		25.11	3.26
		n	**%**
Gender	Male	137	67.49
	Female	66	32.51
Diabetes	Yes	75	36.95
	No	128	63.05
Hypertension	Yes	107	52.71
	No	96	47.29
Family History	Yes	37	18.23
	No	166	81.77
Smoking	Yes	70	34.48
	No	133	65.52
NSTEMI with normal ECG	Yes	19	9.36
	No	184	90.64

Table No.2: Association of demographic characteristics with NSTEMI with normal ECG.

Variables		NSTEMI with normal ECG		P-value
		Yes	No	
Age Group	30-52 years	08	89	0.603
	53-70 years	11	95	
Gender	Male	13	124	0.927
	Female	06	60	
BMI	≤ 29.99 kg/m^2	10	91	0.792
	≥ 25.00 kg/m^2	09	93	
Diabetes	Yes	09	66	0.323
	No	10	118	
Hypertension	Yes	14	93	0.054
	No	05	91	
Family History	Yes	07	30	0.027
	No	12	154	
Smoking	Yes	07	63	0.820
	No	12	121	

DISCUSSION

Myocardial ischemia (MI) may develop due to 2 main pathophysiological developments that includes occlusion of coronary due to any thrombus, vasospasm, or increased myocardial demand that leads to altered or reduced blood supply in which there has been intensely amplified cardiac effort probably because of workout or other stress with the existence of CAD. Patients with MI characteristically develop 2 distinct types of complications types of electrocardiogram (ECG) patterns: a) predominant ST-segment elevation acute coronary syndrome (STE- ACS), and are classified as having either "aborted MI" or ST- elevation MI (STEMI) based on the presence or absence of biomarkers of myocardial necrosis; and b) patients without principal ST segment elevation on the 12-lead ECG, Non-ST-elevation ACS (NSTE-ACS)[13,14]. NSTE-ACS has varied etiologies of primarily sub endocardial ischemia, repeatedly instigated by a platelet-rich thrombus [15].

Though sufferers indicating NSTE-ACS characterize a broad spectrum of CAD severity and, possesses substantial differences in the consequences. Crucial reperfusion with thrombolytic therapy has been confirmed helpful only in patients suffering with ST-segment elevation. But in the broad group without ST-segment elevation, including those with negative T wave, ST-segment depression or flat/normal/unchanged ECG, it may be detrimental [16]. Furthermore, studies have revealed the advantage of an invasive strategy over a traditional one in high-risk patients with NSTE-ACS[17]. Rapid risk stratification of patients with NSTE-ACS is crucial for appropriate management of these patients and targets more potent and invasive therapies for higher-risk patients.

The ECG remains the most directly accessible and extensively used diagnostic tool for guiding emergent treatment plans. The ECG taken during acute myocardial ischemia is of diagnostic, therapeutic and prognostic importance. There is a necessity to regulate the subgroups of patients having structurally or functionally severe coronary obstruction established on standard 12- lead ECG understanding. It was lately pointed out that there are unnoticed subgroups with NSTE-ACS who may help from growing reperfusion therapy [18].

Many of the patients of NSTEMI have regular ECG and the aim of this present study was to define the frequency of normal ECG in patients presenting with Non-STEMI. In the present study, normal ECG was in 9.36% of patients who presented with NSTEMI. McCarthy et al. determined that about 5.0% of patients with normal ECG and cleared from the hospital having a MI[10].In a recent review, Hollander et al. stated that approximately 5% to 28% of patients of normal ECG who visit in emergency cardiology departments might have MI[11]. Teixeira et al. reported myocardial infarction in 33% of patients having normal ECG findings on admission in the emergency department [12].

According to Chase et al. patients with regular or nonspecific ECG results with or without active chest angina associate to the symptoms during primary ECG acquisition. Standard ECG criteria were restricted to no electrocardiographic evidence of ischemia (ST-T wave changes), and 80% of patients with ACS symptoms had an average or nonspecific ECG. Of the whole 2.8% was identified with AMI, 11% with ACS either with normal or nonspecific ECG and with or without active symptoms [20].

The association of typical preliminary ECG findings in the ED with a concluding ACS diagnosis was studied among Patients with and without active chest discomfort indications throughout ECG acquisition. Principles for normal ECG were protracted beyond ischemic alterations to include sinus rhythm and standard variants of QRS interval, T-wave morphology, ST-segment, the absence of pathologic Q-waves or LVH and normal QRS axis, and. Out of the total patients, 17% were finally diagnosed with having NSTEMI[19].

It was also conducted by Welch et al. in a wide-ranging registry as 4.4% of the patients' presentation of NSTEMI with regular ECG [21]. However, it was reported that patients with either a usual or generic ECG with Acute MI diagnosis had significantly lesser hospital mortality composite death/adverse hospital events rates. But, patients with primarily normal ECG results who only presented ECG abnormalities on consequent tracings had significantly more deaths and amalgamated death/adverse events in the hospital [22].

CONCLUSION

There is value to totally standard ECG findings learnt in suspected patients of NSTEMI in the emergency department. In the present study, 9.36% of patients who had a suspicion of NSTEMI was found to have normal ECG and diagnosis in these patients were made on clinical symptoms and trop-T values.

Author's Contribution:

Concept & Design of Study:	Fahar Adnan
Drafting:	Syed Naseem Bukhari
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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