PREDICTIVE VALUE OF ST SEGMENT DEPRESSION ON PRESENTATION ELECTROCARDIOGRAM IN PATIENTS WITH NON ST SEGMENT ELEVATION MYOCARDIAL INFARCTION

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ABSTRACT

Background: The presence of ischemic changes on presentation electrocardiogram (ECG) in patients with Non-ST segment elevation myocardial infarction (NSTEMI) are predictive of both short- and long-term mortality. We sought to determine the quantitative relationship of ST segment depression on presentation ECG with in-hospital mortality in patients with NSTEMI.

Methods: All consecutive patients with age >30 years having cardiac chest pain for >30 minutes with raised cardiac biomarkers & ST segment depression ≥0.5 mm in ≥2 leads on presentation ECG admitted to coronary care unit of Hayatabad Medical Complex, Peshawar were recruited into the study. Patients with past history &/or evidence of acute coronary syndrome, percutaneous coronary intervention, coronary artery bypass graft, chronic liver & kidney disease, cerebrovascular accident, thyroid disease, history of diabetes mellitus, segmental wall motion abnormalities & septal dyssynchrony; & myocardial wall thickness on echocardiography were excluded. Patients were segregated into two groups i.e group 1 with ST segment depression <2 mm & group 2 with ≥2 mm. All patients were sent home on 8th day if indicated.

Results: We studied 250 subjects with male:female of 4.45:1. Mean ± SD age was 56.65±10.86 years. Mean ST segment depression was 1.58±0.52 mm (range 0.5-3 mm).

ST segment depression <2 mm was 41.6% and 58.4% has ≥2 mm. The in-hospital mortality was 6.8% while 93.2% had no in-hospital mortality. The in-hospital mortality for male & female was 4.8% & 2%, respectively. There was statistically significant association between magnitude of ST segment depression & in-hospital mortality (χ^2=6.68, df=1, p=0.01). There was linear relationship between STSD & in-hospital mortality.

Conclusion: ST segment depression on presentation ECG in patients with NSTEMI has prognostic value that has linear relationship with patients' in-hospital mortality.

Key words: Non ST Elevation Myocardial Infarction ST Segment Depression Acute Coronary Syndrome

INTRODUCTION

Ischemic heart disease (IHD) is the most common cause of death globally.[1] American Heart Association (AHA) in 2016 reported that 15.5 million Americans greater than 20 years had coronary heart disease (CHD).[2] Non-communicable diseases, including cardiovascular disease (CVD), is predicted to be responsible for seven death of every ten death by 2020.[3] The incidence of IHD is increasing due to many reasons in South East Asian countries including Pakistan.[3] In 1990, CVD was the most common cause of death and was responsible for 25% of all death in South Asian countries, including Pakistan.[4] The term Acute Coronary Syndrome (ACS) includes ST segment elevation myocardial infarction (STEMI), non ST elevation myocardial infarction (NSTEMI) and unstable angina (UA).[5] NSTEMI is a major contributor to the incidence of ACS.[6]

Over the past decades, the relative incidence of NSTEMI to STEMI increased.[7] In a study from 1975 to 1997[7], the in-hospital mortality for NSTEMI remained the same; however, in recent studies from 1987 to 2006[6], and from 1990 to 2006[8], the in-hospital mortality for NSTEMI declined despite having high mortality risk predictors.

In Pakistan, there is mix picture of the incidence of ACS. In a study[9], the incidence of UA and STEMI was more than NSTEMI with overall in-hospital mortality of 2.5%. In another cross sectional study, the incidence of NSTEMI (55%) was more than UA (28.2%) and STEMI (16.8%).[10] In a cross sectional study of 337 female patients,[11] the frequency of STEMI, NSTEMI and UA was

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reported as 34.1%, 23% and 42.7%, respectively. A 15 years clinical audit of tertiary hospital of Peshawar[12] showed that the incidence of non ST elevation acute coronary syndrome (NSTE-ACS) was more than STEMI; however, the mortality rate remain the same throughout the period of study. The mortality and nonfatal ischemic event depend upon the presence or absence of prognostic variables that are integrated into various risk prediction models.[13] ST segment deviation on presentation electrocardiogram (ECG) in patients with NSTEMI has predictive value for adverse cardiac events in long and short terms.[14,15] The greater the ST segment depression (STSD), the greater the mortality and risk for adverse cardiac events.[16] We conducted this study to determine in-hospital mortality in patients with NSTEMI in relation to ST segment depression.

MATERIALS AND METHODS

This was a cross sectional study on 250 consecutive patients admitted to coronary care unit (CCU) of Hayatabad Medical Complex, Peshawar from March, 2017 to August, 2017. All patients with age greater than 30 years with typical and atypical cardiac chest pain for more than 30 minutes, raised cardiac biomarkers (CK-MB/Troponin I) and STSD ≥0.5mm in ≥2 leads on presenting ECG were recruited in the study. Patients with known past history and/or evidence of ACS, percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG), chronic liver and kidney disease, cerebrovascular accident, thyroid disease, cardiology admission for acute chest pain and left bundle branch block (LBBB) on ECG were excluded from the study. Patients with history of diabetes mellitus with no previous ECG within the past one month is also excluded from the study. Bedside echocardiography (ECHO) was performed and patients with segmental wall motion abnormalities (SWMA) and septal dyssynchrony were excluded from the study. Patients with myocardial wall thickness were also excluded from the study. Detail history and physical examination were undertaken and patients with any other systemic illness that could explain STSD on ECG were excluded.

After eligibility for inclusion into study, patients were segregated into two groups based on magnitude of STSD. ECG lead with maximum STSD is selected for segregation of patients into groups. Group I had patients with STSD ≥0.5mm but <2mm. Patients with STSD ≥2mm constituted group II. Patients remained admitted on guidelines directed medical therapy (GDMT) for 7 days and sent home on 8th day of admission if indicated.

Patients were informed of the purpose of study after approval of the study from Institutional Ethical Review Committee. Patients not willing to participate were also excluded from study.

Statistical analysis was performed through Statistical Package for Social Sciences (SPSS) version 20. Quantitative variables were expressed in the form of mean ± standard deviation (SD) while qualitative variables were presented in form of frequency and percentages. The magnitude of STSD (i.e. group-I and group-II) were stratified among age and gender groups. Chi Square test was applied keeping P-value ≤0.05 as significant.

RESULTS

In this cross sectional study, among the total study subjects (N=250), male were 202 (80.8%) and female were 48 (19.2%). The mean **± SD** age of 56.65±10.86 years (range 32-76 years) [table. 1]. There was no statistically significant difference in mean age of both gender (t=0.003, df=249, p=0.998).

The mean STSD was 1.58±0.52 mm (range 0.5-3 mm). Of the total subjects, 41.6% had STSD <2 mm and 58.4% has STSD ≥2 mm (Table 2). The in-hospital mortality was 6.8% while 93.2% had no in-hospital mortality. The distribution of in-hospital mortality by gender is shown in Figure 3. There was statistically significant association between magnitude of STSD on presentation ECG and in-hospital mortality (χ^2=6.68, df=1, p=0.01). There was linear relationship between STSD and in-hospital mortality.

DISCUSSION

Our results show a linear relationship between magnitude of STSD on admission ECG and in-hospital mortality. Many studies have shown that the magnitude of STSD in NSTEMI is an independent predictor of short and long term mortality. Analyzing the Global Utilization of Streptokinase and Tissue Plasminogen Activator

Table 1: Age distribution of patients (N =250)

Years	Frequency	Percentage
30-40	16	6.4
41-50	64	25.6
51-60	84	33.6
61-70	56	22.4
>70	30	12.0
Total	250	100.0

Table 2: Distribution of Patients by ST Segment Depression in mm

ST Segment Depression in mm	Frequency	Percentage
.50	4	1.6
≥1.00	100	40.0
≥2.00	144	57.6
≥3.00	2	.8
Total	250	100.0

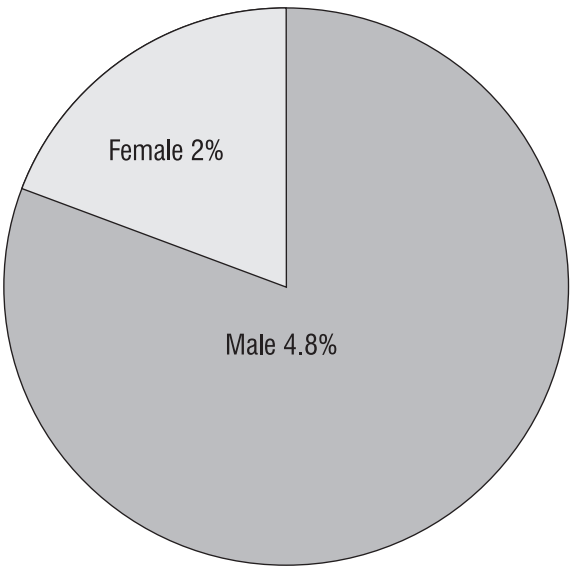

Figure 1: In-Hospital Mortality by Gender

for Occluded Coronary Arteries-IIb (GUSTO-IIb) trial, it was found that the thirty days mortality was linearly and incrementally related to the magnitude in each ECG lead and to the sum of STSD in all ECG leads.[17] These findings are consistent with our study, however, we didn't look for magnitude of sum of STSD in all ECG leads.

Our study has consistent finding for in-hospital mortality of 6% with another study that analyzed in-hospital complications of NSTEMI including death.[18]

Our study is supported by findings of a study that showed STSD as the strongest predictor of mortality.[19] The magnitude of ST segment deviation on admission ECG is not only predictive of mortality but also of other complications in short and long terms.[14,17]

ST segment deviation on admission ECG is one of the seven predictor variables in Thrombolysis In Myocardial Infarction (TIMI) risk score that stratifies patients with NSTEMI into low, intermediate and high risk for further cardiac events, including death.[15]

The NSTEMI score has recently been published to evaluate the risk of in-hospital death in Asian patients admitted with NSTEMI.[20] This score has also incorporated STSD on admission ECG as of the component of the score.

CONCLUSION

ST segment depression on presentation ECG in patients with NSTEMI has prognostic value that has linear relationship with patients' in-hospital and out of hospital mortality.

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