ORIGINAL ARTICLE

ASSOCIATION OF DEGREE OF ST SEGMENT DEPRESSION WITH IN-HOSPITAL MORTALITY IN PATIENTS WITH NON-ST ELEVATION MYOCARDIAL INFARCTION

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Background: Ischemic heart disease is responsible for approximately 1/3 of all global deaths, making it a leading cause of cardiovascular mortality. Non-ST-segment elevation acute coronary syndrome (NSTE-ACS) which is an acute event in spectrum of coronary artery disease is a potentially life-threatening emergency, makes up for the majority of admissions to a cardiac unit with one-year mortality rate of 23.5%. The objective of this study was to determine the association of degree of ST segment depression on hospital mortality in patients presenting with Non-ST segment elevation myocardial infarction (NSTEMI). **Methods:** This descriptive case-series was carried out in the department of Cardiology, Punjab Institute of Cardiology Lahore. Using Non-probability purposive sampling technique, a total of 250 patients of age between 30–75 years of either gender, who reported during the study period, with NSTEMI were inducted in this study. **Results:** In our study, 33.2% (n=83) patients were between 30-50 years and 66.8% (n=167) patients were between 51–75 years of the age. Mean age was 54.64±9.69 years. 43.2% (n=108) patients were male and 56.8% (n=142) were females. Frequency of in-hospital mortality was 4.4% (n=11). Mortality increased with increasing degree of ST segment depression on admission Electrocardiogram (ECG). **Conclusion:** In patients admitted with Non-ST segment elevation myocardial infarction (NSTEMI), degree of ST segment depression on admission ECG predicts In-Hospital mortality.

Keywords: Non-ST segment elevation myocardial infarction (NSTEMI); ST-segment depression; In-hospital mortality

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INTRODUCTION

Ischemic heart disease is now the leading cause of cardiovascular related mortality. Thirty percent of deaths globally are attributed to coronary artery disease. It is predicted that mortality from cardio-vascular diseases would increase from 18.1 million in the year 2010 to 24.2 million in the year 2030.[1] Pakistan bears a heavy burden of coronary artery disease, with a prevalence of approximately 6.25%.[2]

Acute coronary syndrome is defined by symptoms that point towards acute myocardial ischemia. Acute coronary syndrome is classified as Non-ST Elevation myocardial infarction (NSTEMI), ST-Elevation myocardial infarction (STEMI), and unstable angina (UA). Absence of ST elevation with raised cardiac enzymes is termed as NSTEMI. Unstable angina is diagnosed when the cardiac enzymes are not raised.[3] NSTEMI is diagnosed when the myocardial ischemia is severe enough to cause myocardial damage resulting in the release of biomarkers of myocardial infarction into the blood.[4]

Incidence of NSTE-ACS both absolute & relative to STEMI is increasing, most likely due to higher numbers of elder people and increasing number of diabetics.[5]

Non-ST elevation myocardial infarction is a common presentation of ischemic heart disease in emergency room of hospitals.[6] In patients presenting with Acute Coronary Syndrome (ACS), 30–45% have unstable angina (UA), 25–30% have Non-ST Elevation Myocardial Infarction (NSTEMI) & only 20% present with ST- Elevation Myocardial Infarction (STEMI).[7] In patients with NSTEMI, the ECG may show T-wave inversion, ST-segment depression, transient ST-segment elevation, or combination of any of these findings. 30–50% of patients may present with these findings depending on the severity of the event. A new deviation as small as 0.05 mV in the ST-segment is a vital and specific measure of myocardial ischemia and prognosis.[4]

NSTEMI is associated with considerable morbidity in the form of arrhythmias, heart failure, stroke and it has readmission rates of 15% within 30 days of index event mostly due to cardiovascular causes.[8] Although in-hospital mortality rate of NSTEMI was found 5.2%.[9] One-year mortality rate of NSTEMI is much higher than STEMI (23.5% vs 16.4%).[10]

Depression of ST-segment on baseline ECG done on admission is one of the strong and independent predictor of in-hospital mortality in NSTEMI.[11] The research study conducted on 7800 patients showed that there was increasing mortality with increasing amount of depression of ST segment on the standard ECG.[12] Another study which was conducted to see impact of increasing ST-segment on mortality during hospital stay showed a mortality rate of 1.8%, 3.2% and 12.3% with ST-segment depression of <1mm, ST-segment depression ≥1 mm to <2 mm, ST-segment depression ≥2 mm in two or more contiguous ECG leads respectively, while the total in-hospital mortality was 6%.[13] This study was done in patients admitted with NSTEMI to see the association of degree of ST segment depression on in-hospital mortality. Secondly the aim of this study was to find high risk NSTEMI patients who need early intervention & more aggressive treatment thus reducing the mortality.

MATERIAL AND METHODS

This descriptive case series was conducted at the Department of Cardiology, Punjab Institute of Cardiology Lahore. A total of 250 patients of either gender having age of 30–70 years and fulfilling the inclusion criteria were enrolled amongst the admitted cases, using non-probability purposive sampling technique. Patients diagnosed with Non-ST segment Elevation Myocardial Infarction (NSTEMI), i.e., chest pain of more than 10 minutes duration with ECG showing ST-segment depression (ST-segment depression of more than or equal to 0.5mm in two or more consecutive chest or limb leads) plus raised cardiac biomarkers (positive troponin-T) were included in the study. Patients with STEMI (ST elevation myocardial infarction), new onset L.B.B.B (Left Bundle Branch Block) assessed on ECG, LV dysfunction on echocardiography and those patients with other co-morbidities such as Chronic Renal Failure, COPD, Chronic Liver Disease, and Anaemia were excluded from the study.

Extent or degree of ST-Segment depression on standard 12-leads ECG was grouped as:

- Group 1: ST-segment depression of < 1mm in two or more contiguous leads.
- Group 2: ST-segment depression of > 1mm to < 2mm in two or more contiguous leads.
- Group 3: ST-segment depression of ≥ 2mm in two or more contiguous leads.

Patients were followed till their stay at hospital, i.e., 7 post infarction days for assessment of in-hospital mortality.

The data was analysed using SPSS version 20. Data was stratified for diabetes mellitus, hypertension, and extent of ST-segment depression (i.e., group 1, group 2 & group 3), age and gender. Chi-square test was applied after stratification. *P*-value of less than 0.05 was taken as significant.

RESULTS

Age distribution of the patients showed that 33.2% (n=83) were between 30–50 years and 66.8% (n=167) were between 51–75 years of the age. Mean age was 54.64±9.69 years.

Gender distribution of the patients showed that 43.2% (n=108) were male and 56.8 % (n=142) were females. Frequency of in-hospital mortality was recorded in 4.4% (n=11) while 95.6% (n=239) had no mortality. (Table-1) Stratification for frequency of in-hospital mortality with regards to Group-I, II & III was done. Out of 11 cases of in-hospital mortality, 1 was in Group-1 and 10 were in Group-II & III, *p*-value was calculated as 0.001, Out of 11 cases of in-hospital mortality 2 were in Group-II and 9 were in Group-I & III, *p*-value was calculated as 0.002. Out of 11 cases of in-hospital mortality, 3 were in Group-I & II while 8 were in Group- III, *p*-value was calculated as 0.03. (Table-2)

Table-1: Frequency of in-hospital mortality (n=250)

Mortality	No. of patients	%
Yes	11	4.4
No	239	95.6
Total	**250**	**100**

Table-2: Stratification for frequency of in-hospital mortality with regards to group-I, II & III (n=11)

Groups	In-hospital mortality		*p*-value
	Yes	No	
I	1	10	0.001
II & III	10	1	
Groups	**In-hospital mortality**		***p*-value**
	Yes	No	
II	2	9	0.002
I & III	9	2	
Groups	**In-hospital mortality**		***p*-value**
	Yes	No	
III	8	3	0.03
I & II	3	8	

Table-3: Stratification for diabetes mellitus (n=11)

Diabetes mellitus	In-hospital mortality		*p*-value
	Yes	No	
Yes	5	6	0.67
No	6	5	

Table-4: Stratification for hypertension (n=11)

Hypertension	In-hospital mortality		*p*-value
	Yes	No	
Yes	4	7	0.20
No	7	4	

Table-5: Stratification for age (n=11)

Age (in years)	In-hospital mortality		*p*-value
	Yes	No	
30-50	5	78	0.0001
51-70	6	161	

Table-6: Stratification for gender (n=11)

Gender	In-hospital mortality		*p*-value
	Yes	No	
Male	7	101	0.0001
Female	4	138	

DISCUSSION

In our study, frequency of in-hospital mortality (duration of hospital stays up to 7 days since admission) was recorded in 4.4% (n=11). We found agreement of our findings with a study done by MR Khan *et al.* In that study in-hospital mortality was 1.8%, 3.2% and 12.3% with ST-segment depression of <1 mm, ST-segment depression ≥1 mm to <2 mm, ST-segment depression ≥2 mm in two or more contiguous ECG leads respectively, while the total in-hospital mortality was 6%.[13] Stefano Savonitto[14] and others determined whether the extent of myocardial ischemia on the ECG done on admission had independent predictive value for short-term risk stratification of patients with NSTEMI acute coronary syndromes. They concluded that in patients who had NSTEMI, the sum of ST-segment depression in all electrocardiogram leads was a powerful predictor of all-cause mortality at 30 days. Further, this was independent of clinical variables and correlated with the degree and severity of ischemic heart disease. Another study by Nicodet *et al*.[15] found out that in-hospital cardiac mortality was 8.1% in the study they conducted, which is higher than our study.

From the results we also found that younger patients of NSTEMI with diabetes & hypertensions have more in-hospital mortality as compared to elderly patients, similarly there was increased mortality in male patients with NSTEMI as compared to female patients with NSTEMI. These findings need to be supported by further studies in other hospitals. However, we are of the view that our results will open the door for risk stratification of NSTEMI patients and the last but not the least it may help the clinicians /cardiologists to target or specify those high-risk patients for frequent future follow-up and management accordingly.

CONCLUSION

We concluded that degree of ST-segment depression on standard 12 leads admission ECG on is a strong predictor of in-hospital mortality in patients with NSTEMI. Furthermore, in Non-ST elevation myocardial infarction (NSTEMI), increasing degree of ST segment depression on admission ECG is strongly associated with increased in-hospital mortality.

AUTHORS' CONTRIBUTION

MSA: Data collection, study design, data processing. ARJ: Literature search, proof reading. RA, SJ: Data analysis & Write-up

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