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CLINICAL AND ECHOCARDIOGRAPHIC PREDICTORS OF IN-HOSPITAL MORTALITY IN ST ELEVATION MYOCARDIAL INFARCTION IN A TERRITORY CARE CENTER.

Cardiology

Dr. P. Kannan D. M (Cardiology) Professor of Cardiology Govt. Mohan Kumaramangalm Medical College, Salem, Tamilnadu.

Dr. T. Munusamy* D.M (Cardiology) Associate Professor of Cardiology, Govt.Mohan Kumaramangalam Medical College, Salem, Tamilnadu. *Corresponding Author

ABSTRACT

Background: The most important clinical factors of in-hospital mortality in STEMI are killip class, age, Blood pressure and heart rate and diabetes mellitus. In contrast, systemic hypertension with left ventricular hypertrophy has modestly favourable impact our in-hospital mortality in patients with STEMI.

Methods: Patients were included in this study if they fulfilled the following criteria. Patients with Acute STEMI within seven days of MI. Demographic, clinical, diagnostic, management and survival data were obtained and recorded. Age and Sex distribution, risk factor distribution, Hypertension diabetes, dyslipidemia, s moking, family history of premature CAD was identified and recorded.

Results: A total of 705 patients were enrolled and number of patient in survival group 662 and in mortality group 43.Out of 705 patients,322 patients received Thrombolytic therapy(46.2%) among which 282 patients (89.2%) survived and 40 patients (10.8%) died. Thrombolytic therapy was successful (>50% resolution) in 110 patients. Significant 12.23% number of patients who had successful Thrombolysis survived (34.8 %) few deaths (10%) occurred after successful Thrombolysis.

Conclusion: In conclusion, the electrocardiographic characteristics associated with higher in hospital mortality are ST segment resolution <50%, ST depression is in non infarct leads and arrhythmias. Bedside 2 dimensional and Doppler Echo cardiogarphy provides additional prognostic information over clinical and biological parameters that are routinely determined in patients presenting with STEMI.

KEYWORDS

ST Segment Elevation Myocardial Infarction 2D Echo – 2 Dimensional Echo

INTRODUCTION:

Mortality from Acute myocardial Infarction (AMI) is said to be declining. The advent of mobile CCU, increased use of Thrombolysis (including pre hospital Thrombolysis), Intensive coronary care and early interventional procedures have all been highlighted for the decline in morbidity and mortality.

The decline in mortality has been ascribed to a combination of community wide preventive strategies and improved treatment. Recent large scale randomized controlled Thrombolytic trails have reported 30 day mortalities of 6-10% with mortality as low as 2.5% in trails of primary angioplasty. But in actual clinical practice, many patients do not receive optimal treatment including thrombolysis. In addition, many patients are not managed in Coronary care units and many are elderly. Hence, AMI still remains as one of the main causes of morbidity and mortality.

It is an enigma why some patients with AMI succumb to the disease while others survive despite almost similar features and management protocols. Some of the most robust predictions of mortality have been developed in the selected population of patients with ST-segment elevation myocardial infarction treated with fibrinolytic therapy and treated. These models may be relevant to most patients seen in practice. Hence, it is necessary to determine factors that are predictive of death across the entire spectrum of an unselected population of AMI patients and it is an important purpose of this study is to identify findings an early echocardiogram that are associated with mortality after AMI. Our aim of this study to evaluate the clinical and Echocardiographic predictors of in-hospital mortality in acute ST elevation myocardial infarction in unselected patients admitted in Coronary care unit.

MATERIALS AND METHODS:

This was a single centre non-randomized observation and prospective study done between October 2018 to December 2019 at the department of Cardiology, Government Mohan Kumaramangalam Medical College, Salem. All patients admitted with a diagnosis of acute STEMI in coronary care unit (CCU) of our department were evaluated systematically for inclusion into study using the data which includes demographic and diagnostic information. All patients received standard clinical care including monitoring of vital function in a coronary care unit during the initial hospital study. All patients were given chewable Asprin 325mg, clopidogrel 300mg and Atorvastin 80mg. Eligible patients were thrombolysed with Inj.Steptokinase 1.5million units over one hour.

Patients were included in this study if they fulfilled the following criteria- patients with acute STEMI within seven days of MI. Exclusion criteria were STEMI more than 7 days of duration and non ST elevation myocardial infarction patients. Demographic, clinical, diagnostic, management and sex distribution, dyslipidemia, smoking and family history of premature CAD were identified and removed.

Vital signs and killip class findings were collected at the time of hospitals presentation. Death was defined as all-cause mortality during hospitalization patients with Cardiogenic shock were prospectively identified.

STEMI was diagnosed based on following ECG criteria and STEMI was later confirmed by the elevation of Cardiac Enzymes with CK-mB ECG criteria were 1.ST segment elevation of at least 0.1mv in two or more limb leads 2. At least 0.2mv in two or mor Contiguous precordial leads. 3. Presumed new left bundle branch block. Successful reperfusion was defined an >50% ST resolution,, relief of angia and presence of reperfusion arrhythmias.

2D Transthoracic Echo and Tissue Doppler imaging were performed an each patient with 24 hours of admission and repeated before discharge and death or after hemodynamic initially. The echocardiograms were analyzed for qualitative and quantitative assessment. The assessment were performed with Philips ie 33 Echo machine. The quantitative review included of complex evaluation of size and function of each ventricle and all valves in addition to LV regional wall motion assessment LVEF was measured by M- Mode provided Simpson's method along with eye balling. RV function was assessed by TDI. TDI of the mitral annulus was obtained from the apical 4 chamber view, A 1.5mm sample volume was placed sequentially at the lateral and medial mitral annulus.

RESULTS AND DATA ANALYSIS:

Over 12 months period 705 patients were admitted in our institute with a diagnosis of acute STEMI. Their clinical and demographic characteristics are summarized in below Table1.

Table 1: Baseline Characteristic of patients

Characteristics	Survival Group N=662(87.8%)	Mortality Group N=43 (12.23%)	P.Value
Age (Mean)	53	62	0.001

Male	540	46	0.001
Female	122	25	0.001
Smoker	262	21	0.0124
Non-Smoker	400	60	0.125
Dyslipdemia	1%	2.6%	0.316
F/H CAD	12	6	0.157
Hypertension M	18%	11%	0.340
F	32	14%	0.342
Type 2 DM M	17%	28%	0.018
F	36%	64%	0.017
Prior MI M	12	10	0.0471
F	5	3	0.473
Systolic BP (mm Hg)	112(90-140)	92(80-142)	0.162
Diastolic BP(mm Hg)	84(70-120)	70(60-80)	0.253
Heart rate	80(54-112)	114(102-136)	0.012

Total number of patients enrolled - 705
Total number of patients in survival group - 662
Total number of patients in mortality group - 43

Table 2 Table 2: Characteristics of STEMI patients

Characteristics	Survival Group N=662(87.8%)	Mortality Group N=43 (12.23%)	P.Value
MI Location AWMI SK No Sk	164 190	18 24	0.001 0.001
IWMI SK No Sk	77 70	1 1	0.100 0.100
IWMI&RVMI SK No Sk	16 9	3 6	0.012 0.114
ICU, RV and PWMI SK No Sk	19 15	16 10	0.786 0.784
AWMI & IWMI SK No Sk	12 21	3 1	0.36 0.34
Atrial Infarction	1	1	-
Baseline Killip Cases			
I	480	28	0.001
II	150	218	0.001
III	12	18	0.001
IV	-	4	0.001
Time to SK (h)	6	9.8	0.462
Thrombolytic Therapy	321(40.6%)	29(33.1%)	0.001

Most of the patients were males 540 in the survival group but in the mortality group the difference in very narrow (46% vs 25%). The mean age of the patients are 53 and 62 years prevalence of diabetes mellitus and hypertension was higher in females than in males in both group of patients. The prevalence of diabetes mellitus was higher in the mortality group (64 years 26%). In contrast, the prevalence of SHT in mortality group was lower than the survival group (15% vs 30%)

patients with previous MI were significantly was (17%) in survival group and were significant in mortality groups (13%). The average baseline blood pressure was lower in the mortality group (90/70 mmHg) than the survival groups. (112/84 mmHg) Also the heart rate in admission was higher in the mortality group (114 vs 80 bpm).

The most common location of MI was Anterior wall MI in the survival group (57.2%) followed by isolated interior wall MI (25.2%) combination of IWMI, RVMI and PWMI (7.2%) AWMI and IVMI (5.2%) and IVMI and RWMI (4.5%) .The most common location of MI was anterior wall MI in the mortality group (48.2%) followed by combination of IWMI- IWMI, RVMI, PVMI (28%), IWMI and of RVMI (11.6%). Death in isolated inferior wall of MI was uncommon (2.1%) Atrial Infarction was present in the cases of IWMI.

On admission majority of patients in the survival groups (75.2%) and 31% of the mortality group were in killip class I. The remaining patients of the mortality group were in higher Killip class – Class II (48.2%) Class III (22.8%) Class IV (6.9%) None of the patients in survival group was in group IV on admission. The mean time duration between symptom onset and Thrombolytic therapy was six hours in the survival group and 9.8 hours in the mortality group only 41% of the survival group and 33% of mortality group were eligible for Thrombolytic therapy.

Table 3: Demographic and Clinical variables in patients with cardiogenic shock

Characteristics	Survival Group N=662(87.8%)	Mortality Group N=43 (12.23%)	P.Value
Age (Mean)	57	62	0.001
Male	2	23	0.015
Female	3	15	0.001
SHT	1	3	0.178
Disease Mellitus	1	25	0.001
Oliguria	1	35	0.001
Baseline SBP	106	91	0.246
Baseline HR	94	110	0.322
Baseline Killip Class			
I	3	4	0.001
II	2	11	0.001
III	-	17	0.001
IV	-	5	0.001
MI Location AWMI IWMI	 2 -	 21 -	 0.001 -
Inferior at RVMI	1	8	0.036
VT/VF	-	5	0.001
AF	-	1	0.001
CHB	-	11	0.006
Thrombolytic Therapy	2	14	0.006
VSR	1	7	0.001
MR (mod to severe)	1	9	0.001

The incidence of Cardiogenic shock was 6.8% (n=48) of which only 12.4 survival (n=5) and 87.6 died (n=30). The mean age of patients in the Cardiogenic shock group were higher (62 vs 57 years). The baseline mean systolic blood pressure was lower in the mortality group (91 vs 106 mmHg). All patients in the mortality group had taclycardia on admission (average HR=110 bpm) 15.4% (n=5) of the cardiogenic shock group patients were in kilip Calss IV on admission. None of the patients in the survival group had cardiogenic shock on admission.

Electrocardiographic Characteristics:

Out of 705 patients 322 received Thrombolytic therapy (46.2%) among with 282 patients (89.2%) survival and 40 patients (10.8%) died. Thrombolytic therapy was successful in 110 patients (40.1%) significant number of patients who had successful thrombolysis survival (34.8%). The mortality in the failed Thrombolysis patients was higher 11.8% significant ST depression in non-infarction zone was found in 47.6% of the mortality group and 35.2% of the survival group mobitz type I second degree block was present in 1.8% of the survival group. But the incidence of type II second degree AV Block was higher in the mortality group (4.4%). Then the survival group (0.32%) New onset of LBBB was twice common in the mortality group (2.2% vs 1.1%)

Table-4 Electrocardiographic Variables M-Mode

Characteristics	Survival Group N=662(87.8%)	Mortality Group N=43 (12.23%)	P.Value
ST Resolution <50%	162	22	0.036
Thrombolytic resolution >50%	107	6	0.001
ST depression	35.2	47.6	0.001
VT/VF	9	14	0.374
AF	2	1	0.562
LBBB	6	3	0.146
RBBB	50	14	0.001
RBBB & LAFB	16	6	0.042
RBBB & LPFB	1	3	0.501

Table 5: Echocardiographic Variables – 2D Echo

2D Echo	Survival Group N=662(87.8%)	Mortality Group N=43 (12.23%)	P.Value
LVEDV (MI)	114 ± 40	124 ± 48	0.009
LVESV(MI)	81 ± 38	87 ± 36	0.015
EF(modified simpson)	46.4 ± 8.4	30.6 ± 7.2	0.004

The LV dimension and volume were higher in the mortality groups LVEDD 5.9 ± 0.4 vs 5.1 ± 0.7 cm/LVESD 5 ± 0.5 vs 3.7 ± 0.6. The EDV and ESV values were increased proportionately LVEDV 124± 48 vs 114± 40 ml LVESV 89 ± 3.6 the mean LVEF was 30.6± 7.2 in the mortality group and 46.4 ± 8.4 in the survival group Mean LV ejection fraction was higher in the survival group (EF 46.6 ± 8.2) vs 30.4 ± 7.4 by Teicholtz method also The Doppler Echo indices showed significant difference between the two groups Mitral inflow E/A region ≥ 2.0 was present in 91.5% (n=82) of the mortality group-majority of patients in the survival groups(91%) had mitral declaration time (DT) of >140 ms where as DT of <140 ms was associated with increased mortality (35% vs 9%) In Hospital events and Mortality

In hospital complication was high in the mortality group of the cardiac events, asystole occurred only in the mortality group (9% n=9) other major cardiac events were cardiogenic shock (46.1% vs 0.5%) VT/VF (14.2% vs 1.2%) CHB (12.9 vs 2.2) pulmonary edema (9.2 vs 1%) VSR (8.2%) re infarction (3.6 vs 1%) and pericarditis (7.2% vs 1.8). The major non cardiac events were CVA (1.2% n=4) and acute renal failure (1.4 vs 0.7%).

DISCUSSION

The principal aim of our study was to find the clinical and echocardiographic predictors of in-hospital mortality in ST elevation myocardial infarction. In this study, mortality rate during hospitalization with acute STEMI was 12.6%. Though, this is considerably higher than what has been reported from previous randomized clinical trails. This discrepancy is due to selective bias in the inclusion criteria of the randomized clinical trails which selectively excluded criteria high risk group of patients such as elderly.

In the randomized trails on fibrinolysis for STEMI, the reported mortality ranged from 4% to 8%. However, in non-randomized trails, especially in the registry data the reported mortality is usually higher. In a study published in the Scotland, The Care fatality following AMI was 22.2% in a group of 11,778 patients. In the MITRA and MIR registration data from harmony, the overall mortality was 15%.

The higher mortality observed in our patients can have several reasons. Firstly most of our patients received only Thrombolytic Therapy and primary percutenous coronary angioplasty was not done. Mostly, our hospital being a territory care center, these could be a referral bias in the enrollment of patients. Patients who are sicker than may be referred from primary and secondary level hospitals to our institution. However, the higher mortality compared well with observational dot from RC west.

Males predominated females by 3:1 ratio in the incidence of STEMI (74.2% 24.8%) Women had higher prevalence of hypertension, diabetes mellitus and higher in hospital mortality than men (25.4% v 9.8% P<0.001). The demographic characteristics and mortality rate in females in this study match the report from Trappolinier al[2]. In their study, the overall mortality rate during hospitalization was 24.6% for women and 13.4% for men. Women were significantly older than men, had higher prevalence of hypertension, diabetes mellitus and Thrombolytic Therapy was prescribed less often in them. In the MONILA project[4] also diabetes mellitus was more common in women and they had higher in hospital mortality (21.4% v 13.1%)

Diabetes mellitus had higher mortality rate (31%) than non diabetes mellitus (14.8%). The in-hospital mortality in patients above 75 year of age was 33.4%. In the study by Ruiz-Bailen et al[6], the mortality was 17.3% patients between more than age of 80 years or age of75-84 years and 25.8% inpatients. Family history of pre mature CAD and dyslidemia were not associated with significantly higher mortality <P value (0.156 and 0.316) proir MI carried poor outcome this could be due to the fact that older patients or those with prior institution may have an inadequate compensatory hyperkinesis response of the uninvolved myocardium.

The most common MI location was anterior wall MI in the survival and mortality group. Although isolated IWMI was the next common group death occurred only in two patients (2.4%) patients with inferior MI who also had RV myocardial involvement were associated with increased risk of death, shock and arrhythmias. The increased risk is related to the presence of RV myocardial involvement itself rather than the extent of LV myocardial damage.

On analysis from the collaborative organization for Rheothra Evaluation (CORE) trail showed lower proportion of males with RV myocardial involvement (72.4%) than those without RV myocardial involvement (80.4%) or anterior MI (79.1%) (P = 0.001). There was also an significant difference in the distribution of kilip Class among the three groups with a greater proportion of patient with anterior MI and RV myocardial involvement in killip Class 3 and 4 than patients without RV myocardial involvement. Patients with RV myocardial involvement had significantly lower systolic blood pressure (123 mg hg) compared with patient without RVmyocardial involvement (129.9 mm Hg) or anterior MI (134.4 monthly) (P=0.001)

In this study Combination of IWMI had higher mortality rate. Involvement of RV myocardium carried poor prognosis and death occurred in one-third (33%) of RVMI cases. This is in contrast to the previous beliefs that IWMI in relatively in innocus with favourable outcome than AWMI. This group of patients had higher rate of in-hospital complication complete heat block, hypotension and cardiogenic shock. The mortality was high which is independent of LV ejection fraction. The electrocardiographic findings of ST segment depression non infarct leads was associated with increased mortality (P<0.001) Conduction abnormalities such as high grade AV block, LBBB and significant blocks were more frequently associated with death. RBBB and LAFB was three times more common in the mortality group (8.6% vs 3.5%) RBBB ed LAFB was rare and three out of the patient died (P<0.001)

Echocardiographic process of regional function were associated with LWEF. A sub study of shock Trail & Michea H. Picard et al[12], showed variables that were positively correlated with LVEF were number of myocardial segments in the remote zone and wall motion score of this zone. Variables that were negatively correlated with LVEF included end diastolic volume, end systolic volume, total wall motion score, index infarct zone wall motion score, and number of infarcted segment, sphericity index and the extent of dysfunction.

The significant echogardiographic predictions of in-hospital mortality were LVEF and severity of MR. Several studies have demonstrated the prognostic importance of clinical and biological data in the risk stratification of patient with acute coronary systome (ACS). Clinical evidence of heart failure in a powerful predictor of worse prognosis in these patients. Omen et al[14] have previously reported that ration of early transmitral flow to early mitral annulus velocities (E^8) is indicates elevated LV end diastolic pressure measured by cardiac catheterisation and associated with poor prognosis. Other investigations have observed a poor outcome in a retrospective cohort of patients with ACS when E/E ratio >15

Advanced diastolic function is associated with an adverse outcome after acute MI with an abbreviated DT being particularly predictive of poor outcome. Higher mitral E/A ratio and shorter declaration times that decline the restrictive pattern indicates an increased risk of adverse events after myocardial infarction. Similarly Temporall et al[16] have also observed as poor outcome in 571 patients enrolled in the GISSI-3 trail when declaration time is shortened. This study demonstrates that, in the acute setting, elevated E/E^1 correlates wall with traditional transmitral Doppler evidence of elevated LV filling pressure but is a more powerful prognostic indicator.

CONCLUSION:

This single clinic descriptive study shows that though our results are comparable to the Western data there is a need to bring down this mortality rate. The most important clinical prognostic factors of in-hospital mortality are killip class, age, blood pressure and heart rate, diabetes mellitus and prior MI. In contrast systemic hypertension with left ventricular, hypertrophy has modestly favorable impact in-hospital mortality in patients with STEMI. The electrocardiagraphic characteristics associated with higher in-hospital mortality are ST segment resolution <50%, ST depression in non-inferior leads and arrhythmias. Besides of 2-dimensional and Doppler echocardiography provides additional prognostic information over clinical and biological parameters that are routinely determined in patients presenting with STEMI.

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