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A comparative study between STEMI and NSTEMI diagnosed patients and its association with Cardiac markers

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Abstract
Background: Prior detection of cardiac cases allow cost effective, better triage and well timed management of these patients. Study was conducted to evaluate the prognostic significance of plasma adiponectin, troponin I in a group of patients with ST segment elevation myocardial infarction and non-ST-segment elevation myocardial infarction. These parameters were also compared with other predictors like Troponin I and CK-MB.
Methods: This study was based on the 72 patients with AMI of whom 42 had a diagnosis of STEMI, and 32 had NSTEMI. Duration of study was June to December 2017. Patients having chest pain that was indicative of myocardial infarction within first 12 hours after the onset of symptoms were included in the study. Adiponectin, troponin I were estimated using ELISA method. Level of CK-MB was measured by Auto analyser using standard kit of siemens.
Results: Mean age of patients with STEMI in males was (62.5yrs) and in females (58.5 yrs) and with NSTEMI age in males was (61.5yrs) and in females (57 yrs). Higher proportion NSTEMI/UA cases in comparison to STEMI cases had hypertension, diabetes mellitus and had been females. 3.05% of NSTEMI/UA cases died during hospital treatment and females had higher mortality risk (4.5%). It was observed that the level of adiponectin and CKMB was elevated in patients with STEMI than patients with NSTEMI and significant difference was observed ($p<0.05$). Level of TnI was increased in patients with NSTEMI as compared to patients with STEMI but significant difference was not seen.
Conclusion: The rate of ACS (especially that of STEMI) remains high. Male patients with ACS have higher incidence of STEMI than NSTEMI/UA. However, the markers of STEMI are increased level of adiponectin and the markers of NSTEMI are troponin I and CKMB.

Keywords: Cardiac markers, STEMI, NSTEMI, Adiponectin

Introduction
Coronary artery disease (CAD) is the leading cause of mortality and morbidity in the world and acute coronary syndromes (ACS), which encompass unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI), are the commonest causes of mortality in patients with CAD[1]. Cardiovascular disease (CVD) is estimated to be the leading cause of death and loss of disability adjusted life years. Non-ST segment elevation myocardial infarction (NSTEMI) incidence is observed in about two thirds of patients and it is mainly due to necrosis of myocardium with release of biochemical markers Troponin T or I and creatine kinase-MB (CK- MB)[2]. Cardiac troponins T and I are used to find out myocardial injury with symptoms associated with ischemia. It is proposed that these troponins are better markers as compared to CK-MB for the detection of myocardial necrosis[3]. In STEMI there is an elevation of creatine kinase MB fraction, troponin I or T above the cut off levels. The prevalence of CAD and the incidence of ACS also are very high among Indians. India has the highest burden of ACS in the world. CREATE registry, the largest data from Indian patients with ACS, has shown that the pattern of ACS among Indians is much different from that of the Western populations.The situation in India is more alarming. Reddy reported that mortality from CVD was projected to decline in developed countries from 1970 to 2015 while it was projected to almost double in the developing countries[4].

Several conventional and non-conventional risk factors have been implicated for CAD. The major conventional risk factors include hypertension, diabetes, smoking, hyperlipidemia and obesity. Very few studies in India have evaluated the correlation with ST elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI) along with its association so this was the significance of the study. Our study is an attempt to reappraise the demographic profile and to compare the cardiac markers among STEMI and NSTEMI patients.

Materials and Methodology

Study design : The study was conducted at People's College of Medical Sciences and associated group of hospitals Bhopal during the period from July 2017 to June 2018. Detailed data of all the cases who were admitted in the Department of Medicine were taken. We obtained 72 patients including 50 males and 22 females. This clearly shows that coronary syndromes are male preponderance. All these cases are divided into two groups i.e. STEMI and NSTEMI. Third group ofnon-cardiac cases were included as control which contain 144 persons.

Sampling technique - Purposive sampling technique

Methodology - Those cases with proven non-cardiac chest pain and those who were discharged before completion of the treatment for any reasons were excluded from the analysis. The cases were grouped into two; viz. those presented with STEMI and those presented with NSTEMI, for analysis. Twice a week (preferably Monday and Thursday were taken for data recording from registers. Cases of chest pain/ discomfort with elevation of ST segment in electrocardiographic (ECG) leads/ presumed new onset left bundle branch block in ECG were categorized as STEMI. The baseline clinical characteristics analyzed in each group were the age, gender, hypertension (blood pressure > 140/90 mm Hg and/ or those already taking treatment for hypertension), diabetes mellitus (fasting blood glucose >126 mg/dL and/or postprandial blood glucose >200 mg/dL and those who were on treatment for diabetes mellitus), dyslipidemia (cholesterol >190 mg/dL and/or triglycerides >200 mg/dL), smoking status, duration of chest pain before hospitalization, time of occurrence of the ACS, clinical course in the hospital, the mean duration of hospital stay and complications related to the ACS and its treatment and cardiac markers adiponectin, CKMB, troponin -I. So, out of 72 patients, 42 belonged to STEMI (males=32, females=10) while 30 belonged to NSTEMI (males= 20, females =10). Adiponectin and troponin-I was done by ELISA while CKMB was done by Auto analyser.

Statistical analysis- Statistical analysis was performed using the software SPSS (trail version 22.0) for Windows. Categorical variables were compared by chi square test and the continuous variables are presented as mean (+/- SD) and were compared by unpaired t test. Odd's ratios were calculated and presented wherever necessary. A probability value of <0.05 was considered statistically significant.

Results

Table 1: Baseline description of study participants with STEMI (N=42)

Variables	Males (N=32)(76%)	Females (N=10) (24%)	Total (N=42)(100%)	p-value
Mean age (years)	62.5	58.5	61	<0.05*
Duration of symptoms				
Not known	4	1	5	0.31
0-6 hrs	21	7	28	<0.05*
7-12 hrs	4	2	6	0.06
13-24 hrs	2	0	2	0.11
>24 hrs	1	0	1	0.13
h/o hypertension	21	7	28	<0.05*
h/o diabetes	14	3	17	0.07
Dyslipidemia	17	7	24	<0.05*
Smoking	17	0	0	-
On treatment	32	10	42	<0.05*
Aspirins	25	7	32	0.11
Beta blockers	24	24	24	24
ACE/ARBs Statins	30	10	40	<0.05*
Family history Yes	28	7	35	<0.05*
No	04	3	07	0.14

***P*<0.05 is considered statistically significant**

Table 1 shows the baseline comparison between males and females having STEMI as seen acute coronary syndrome are more prone for males (76%) with mean age in males was (62.5yrs) and in females (58.5 yrs). Most of the patients came within 0-6 hrs after symptom and it was found to statistically significant in both males and females. Similarly, participants with morbid condition shows a significant association. The most common treatment occupied by the participants was aspirin followed by statins and both drugs have showed significant association with gender (p<0.05), family history seen in 35 patients and it was significant (p<0.05).

Table 2: Baselinedescription of study participants with NSTEMI (N=30)

Variables	Males (N=20) (67%)	Females (N=10) (33%)	Total (N=30) (100%)	p-value
Mean age (years)	61.5	57	59	<0.05*
Duration of symptoms				
Not known	2	3	5	0.11
0-6 hrs	13	7	20	<0.05*
7-12 hrs	1	0	1	0.08
13-24 hrs	2	0	2	0.10
>24 hrs	2	0	2	0.22
h/o hypertension	17	7	24	<0.05*
h/o diabetes	11	1	12	0.09
Dyslipidemia	18	2	20	<0.05*
Smoking	15	2	17	<0.05*
On treatment				
Aspirins	20	10	30	<0.05*
Beta blockers	11	3	14	0.19
ACE/ARBs	16	6	22	0.27
Statins	20	10	30	<0.05*
Family history				
Yes	18	8	26	<0.05*
No	02	02	04	0.19

***P*<0.05 is considered statistically significant**

Table 2 shows the baseline comparison between males and females having NSTEMI as seen acute coronary syndrome are more prone for males (67%) with mean age in males was (61.5yrs) and in females (57 yrs). Most of the patients came within 0-6 hrs after symptom and it was found to statistically significant in both males and females (p<0.05). Similarly, participants with morbid conditions (hypertension, dyslipidemia but not diabetes) shows a significant association. The most common treatment occupied by the participants was aspirin followed by statins all the participants with NSTEMI had taken both the drugs and have showed significant association with gender (p<0.05), family history seen in 26 patients and it was significant (p<0.05).

Table 3: Baseline description of control (non-cardiac cases)(N=144)

Variables	Males (N=96) (76%)	Females (N=48) (24%)	Total (N=144) (100%)	p-value
Mean age (years)	60.5	57.5	61	<0.05
Duration of symptoms				
Not known	80	42	122	0.11
0-6 hrs	10	4	14	<0.05
7-12 hrs	5	2	7	0.09
13-24 hrs	1	0	1	0.17
>24 hrs	0	0	0	0.21
h/o hypertension	31	17	48	<0.09
h/o diabetes	40	20	60	0.04*
Dyslipidemia	45	25	70	<0.19
Smoking	41	3	44	-
On treatment				
Aspirins	0	0	0	-
Beta blockers	52	40	92	0.01*
ACE/ARBs	21	16	37	0.19
Statins	56	31	87	<0.05*
Family history				
Yes	47	17	64	<0.05*
No	49	27	76	0.11

***P*<0.05 is considered statistically significant**

Table 3 shows the baseline comparison between males and females who are normal. Most of the patients were not knowing any symptoms and it was found to statistically not significant in both males and females. Similarly, participants with morbid condition shows a significant association with diabetes. The most common treatment occupied by the participants was statins followed by beta blockers and statins both drugs have showed significant association with gender (p<0.05), family history seen in 64 patients and it was significant (p<0.05).

Table 3: Comparison of clinical characteristics and cardiac markers among patients with STEMI, NSTEMI and Healthy patients (N=72)

Variables	STEMI (%)	NSTEMI (%)	Healthy patients (%)	p-value
Males	32 (76)	20 (67)	96 (76)	<0.05*
Females	10 (24)	10 (33)	44(24)	<0.05*
Adiponectin (high)	37 (88)	27 (90)	12 (6)	<0.05*
CKMB (high)	32 ((76)	21 (70)	8 (4)	<0.05*
Troponin-I (high)	41 (98)	30 (100)	10 (5)	<0.05*
Morbid conditions*	69	56	178 (86)	0.19

***P*<0.05 is considered statistically significant**

Table 3 depicts clinical parameters as well as association of cardiac markers on patients with STEMI, NSTEMI and healthy patients as previously seen males and females are significantly related but morbid conditions like hypertension, diabetes and dyslipidemias are not significantly related (p>0.05). In terms of cardiac markers in patients with STEMI, high levels of adiponectin are seen in 88% of patients, high levels of CKMB were seen 76% and Troponin-I seen in 98% patients as high level. This concludes that these cardiac markers are significantly related to acute coronary syndrome (p<0.05). In NSTEMI adiponectin levels seen high in 90% of patients, 70% in CKMB and 100% in Troponin-I and all are significantly related with NSTEMI. Few normal patients had high levels of markers but there effect have been hindered by STEMI patients.

Table 4: Variation in the markers of disease in patients with STEMI, NSTEMI and Healthy patients

Markers	STEMI	NSTEMI	Control (non-cardiac cases)
Adiponectin (µg/ml)	13.21±6.14*	9.67±3.21	6.21±1.10
CKMB (u/l)	121.34±6.78*	109.87±9.91	99±2.34
Troponin-I (ng/ml)	1.21±0.91	4.21±1.21	0.60±0.11

***P*<0.05 is considered statistically significant**

Table 4 shows variation in cardiac markers in patients and non-cardiac cases. It was observed that the level of adiponectin and CKMB was elevated in patients with STEMI than patients with NSTEMI and significant difference was observed (p<0.05). Level of TnI was increased in patients with NSTEMI as compared to patients with STEMI but significant difference was not seen.

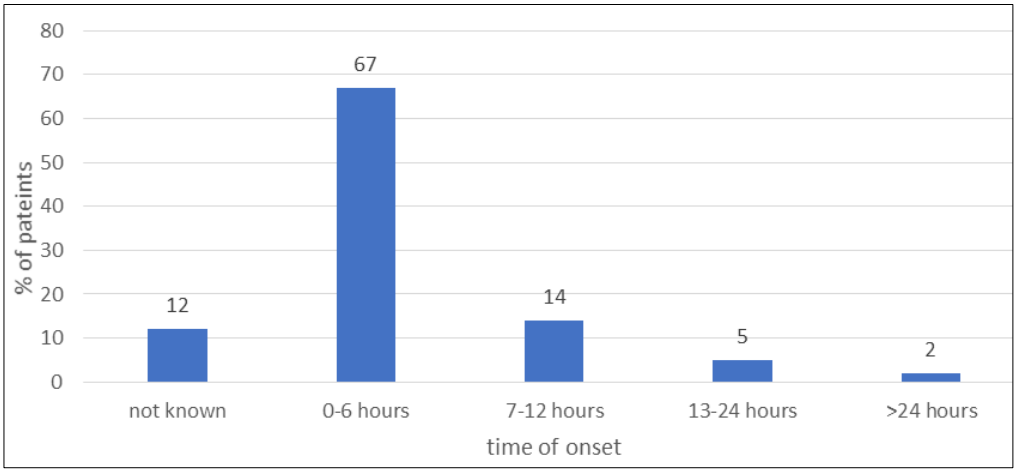

Fig 1: Cardiac events among patients with STEMI

Figure 1 shows time of onset of cardiac events with percentage of patients with event at that time as seen the most common time for cardiac event was found to be 0-6 hours seen in 67% of patients, followed by 7-12 hours in 14% this can be since patient of diabetes had silent attacks of MI in that case they report late.

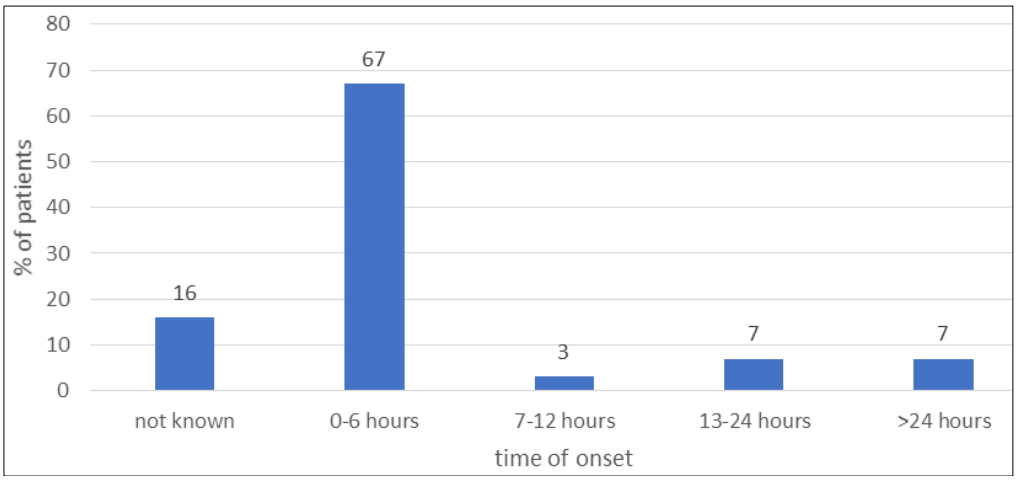

Fig 2: Cardiac events among patients with NSTEMI

Figure 2 shows time of onset of cardiac events with percentage of patients of NSTEMI with event at that time as seen, the most common time for cardiac event was found to be 0-6 hours seen in 67% of patients, followed by 13-24 and >24 hours in 7% this can be since patients of unstable angina had symptoms in late hours as a result they present themselves late for treatment.

Discussion

This study was done for the period of 6 months in which 72 patients have been reported for acute coronary syndrome. (42 for STEMI and 30 for NSTEMI) with males are more affected in both STEMI and NSTEMI. In a study conducted by Misiriya *et al*[5] of the 1865 cases of ACS that qualified the inclusion criteria, 56% had STEMI and 44% had NSTEMI/UA. Mean age of presentation of STEMI cases was 59 years and that of NSTEMI/ UA was 58.5 years. Higher mean age at presentation was noticed among females in both categories (69 yrs and 67 yrs respectively). About 69% of STEMI cases received thrombolytic therapy. Maximum number (36%) of STEMI cases occurred between 9 am and 6 pm. 11.97% of STEMI cases died during treatment and ventricular pump failure was the commonest cause of death (41.6%). Females, cases not receiving thrombolysis and those with inferior wall infarctions, higher Killip class at admission, diabetes mellitus and age more than 75 years, had higher mortality rates. Higher proportion NSTEMI/UA cases in comparison to STEMI cases had hypertension (43% vs. 29.02%), diabetes mellitus (41.05% vs. 23.95%) and had been females (34.96% vs. 21%). 3.05% of NSTEMI/UA cases died during hospital treatment and females had higher mortality risk (4.5%). The mean age at presentation of patients with STEMI was 59 years in this study, which is comparable to observations of CREATE registry[6] and another study from South India, but there was a marked difference in the mean age at presentation among the female patients. The mean duration of symptoms before hospitalization among the patients admitted with STEMI was much lower than that was observed in other Indian studies and is like the trends observed in the Western studies[7, 8, 9].

Male preponderance was observed in the patients with STEMI at all age groups and the sex ratios observed in both the younger and older age groups were comparable to the sex ratios observed in another series reported from North India.[10] Higher proportions of STEMI cases in our study, when compared to those from CREATE registry, 12 received thrombolytic therapy (68.9% vs. 58.5%), beta blockers (80.5% vs. 57.5%), lipid lowering drugs (72.4% vs. 50.8%) and ACE inhibitors or angiotensin II blocking agents (66.8% vs. 60.5%) whereas the proportion of cases that received anticoagulants was less (64.7% vs. 78.6%) and the use of antiplatelet agents was similar in both the groups.The proportion of NSTEMI/UA among ACS cases in our study was slightly higher than that observed in the CREATE registry 12 (44% vs. 39.4%) but the mean age of cases at presentation was[6] received beta blockers (77.6% vs. 61.9%), lipid lowering drugs (71.3% vs. 53.9%) and ACE inhibitors or angiotensin II blocking agents (67.2% vs. 51.2%) whereas the proportion of cases that received anticoagulants was less (71.1% vs. 85.5%) and the use of antiplatelet agents was similar in both the group

In a similar study conducted by gupta*et al*[12] the mean age of presentation was 58.32±11.24 years which is comparable to the data from the CREATE7 Registry (mean age 57.5±12.1 years). The mean age was higher than that reported in South Asian cohort (53 years) of the INTERHEART study and was lower than in the Western countries and other regions (mean age is 63 8 9 10 11 years). McKeigue *et al*. [13] andJoshi *et al*[14] in their respective studies observed that South.

In terms of cardiac markers in terms of cardiac markers in patients with STEMI, high levels of adiponectin are seen in 88% of patients, high levels of CKMB were seen 76% and Troponin-I seen in 98% patients as high level. This concludes that these cardiac markers are significantly related to acute coronary syndrome ($p<0.05$). In NSTEMI adiponectin levels seen high in 90% of patients, 70% in CKMB and 100% in Troponin-I and all are significantly related with NSTEMI. Studies conducted by Balarajan *et al*[15], Enas *et al*[16] showed similar results as present study.

Conclusion

The rate of ACS (especially that of STEMI) remains high. The peek incidence of STEMI occurs between 0-6 hours. Male patients with ACS have higher incidence of STEMI than NSTEMI/UA. The low mean duration of symptoms before hospitalization observed in this study may be related to the better health awareness and the better access to the transportation systems among the population of Bhopal which have can reflect their socio-economic status. Prior detection of cardiac cases allow cost-effective & better triage and well timed management of these patients. Larger multicentric studies are required in the present topic which would help device preventive strategies focusing on cardiac markers in relation to target population.

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Conflict of Interest– None declared

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