A Study of ST-Elevation Acute Myocardial Infarction (STEMI) in Youngs

INTRODUCTION
Ischemic heart disease is emerging as a cause of morbidity and mortality, in developed industrialized world and for several decades it is an increasing cause of the same even in developing nations like India. Previously it was the disease of elderly having history of hypertension, long standing diabetes, atherosclerotic vascular disease, obesity etc. Myocardial infarction among the young is somewhat preventable and treatable as emergence of risk factors is partially or totally reversible among this population subgroup. So, studying the risk factors to prevent this life threatening disease and complications to add to our knowledge the ways to prevent and manage them is the aim of this study.

Myocardial infarction is one of the most severe forms of ischemic heart disease, especially in acute settings. Consequences of MI are from arrhythmias and myocardial pump failure to cardiogenic shock and sudden cardiac death. Previously it was the disease of elderly having history of hypertension, long standing diabetes, atherosclerotic vascular disease, obesity etc. But at present incidence and prevalence is increasing among the young adults due to prevalence of smoking, early onset of risk factors like diabetes hypertension and atherosclerotic vascular disease in addition of obesity, sedentary life style etc. and is amongst the leading causes of morbidity and mortality even in young people.

Increased incidence if myocardial infarction among the young poses a significant burden over one’s own life, family, society and nation as it is the most active, working subpopulation as well as carrying the burden of people in extremes of age as well as whole society.

Myocardial infarction among the young is somewhat preventable and treatable as emergence of risk factors is partially or totally reversible among this population subgroup.

Identifying and studying the etiology and risk factors of myocardial infarction among the young population may throw more light on this new emerging threat and make us more aggressive in attempting to primordially, primarily and secondarily prevent this debilitating disease in socially, economically, sexually, physically and mentally active subpopulation to serve and protect the individual, family, society as well as nation from this disability and handicap.

The patterns of clinical features as well as complications are more precise in this subgroup and though complications are commoner they are more tractable, treatable and preventable. So early treatment and monitoring prevents mortality and decreases morbidity.

So, studying the risk factors to prevent this life threatening disease and complications to add to our knowledge the ways to prevent and manage them is the aim of this study.

Aims & Objectives:
1. To study the risk factors of acute STEMI in young patients <40 yrs.
2. To study the pattern of clinical presentation of young patients <40 yrs., presented with acute STEMI.
3. To study the profile of different complications in young patients <40 yrs., presented with acute STEMI.

MATERIAL AND METHODS
The present study includes 50 confirmed cases of ST elevation myocardial infarction in adult patients up to 40yrs of age during the period of May, 2007 to Feb. 2010

Inclusion Criteria
1. All patients having acute STEMI, who are up to 40yrs of age.
2. Cases satisfying the following parameters for MI were included in the study, according to ACC/AHA guidelines of diagnosis of AMI:
   • Characteristic chest pain
   • ST elevation >0.1mV in any two consecutive leads
   • Cardiac biomarkers (CK-MB, cTnI)

Evaluation
Evaluation of patient fulfilling the criteria done in the following way:
   • Clinical symptoms (chest pain, dyspnoea, diaphoresis etc.)
Signs like vitals (pulse, BP measurement) & systemic examination

Investigations Done
The laboratory investigations carried out included:
1. Complete blood count
2. RBS, RFT, LFT, Urine (routine, micro.)
3. Fasting lipid profile
4. Chest X-ray
5. 12 lead ECG
6. Cardiac biomarkers (CK-MB, cTnI)
7. 2D-echocardiography with colour Doppler
8. hsCRP
9. ANA
10. APLA & ACLA
11. Serum Homocysteine level
12. Serum Fibrinogen level
13. Coronary angiography

Treatment
All patients who present within 12 hrs of symptom onset and hyperacute changes on ECG were given reperfusion therapy in form of either thrombolysis or primary PCI in addition to antithrombotics, nitrates, beta-blockers, ACEI and statins (except the patient with confirmed aortic dissection on CT aortogram). Electrical defibrillation, transvenous pacing were done when needed in several patients.

Complications
Complications in form of pump failure (LV dysfunction, CHF, cardiogenic shock); arrhythmias (ventricular tachyarrhythmias, supraventricular tachyarrhythmias, AV blocks, intraventricular conduction disturbances); mechanical complications (VFWR, VSR, acute MR, LV aneurysm); LV mural thrombus; post MI syndrome etc. have been noted and studied.

Prognosis
Prognosis in form of survival & mortality within the duration of hospital stay, 1 month & 1 year had been evaluated.

RESULTS
The present study includes clinical evaluation of 50 young adult patients (<40yrs), hospitalized and discharged or expired; diagnosed as having acute STEMI during the period of May 2007 to February 2010.

Patients with <40 yrs of age with clinical diagnosis constituted about 4.0% of total admission in hospital during study period.

| Age(yrs) | No. of patients | Percentage (%) |
|---------|----------------|----------------|
| <20     | 1              | 2              |
| 20-30   | 4              | 8              |
| 30-40   | 45             | 90             |

Table-1 Incidence of MI in relation to age distribution

Table-1 illustrates that maximum no. of patients were observed in age group of 30-40 yrs. Due to accumulation of smoking related risk of coronary events and atherosclerosis.

| Sex     | No. of patients | Percentage (%) |
|---------|----------------|----------------|
| Male    | 48             | 96             |
| Female  | 2              | 4              |

Table-2 Incidence of MI in relation to Sex distribution

Table-2 reveals that out of 100, 96 were males and 4 were females due to more prevalence of smoking in males in India.

Most (98%) of the young patients (<40yrs) presented with typical chest pain.

| Time since onset of symptoms | No. of patients | Percentage (%) |
|------------------------------|----------------|----------------|
| <30 min                      | 5              | 10             |

Table-3 Distribution of time of presentation since onset of symptoms

Most of the patients (48%) present between 2 to 6 hrs, while 40% before that and 12% after that. Among them 10% were presented within 30 minutes of symptom onset and 6% after 1 day.

Table-4 Clinical symptoms on presentation

Typical chest pain (98%), dyspnoea (30%) and perspiration and diaphoresis (46%) were common clinical features.

Incidence was high among the patients having hypertension (18%), diabetes (8%) and history of ischemic heart disease (6%).

Incidence is high among the patients with smoking (78%), obesity (20%) and type A personality (26%).

Distribution of Clinical Signs
There is 22% of patients were presented with tachycardia and 4 % of those with bradycardia, while the remaining 74% had normal heart rate.

32% were having hypertension at the time of presentation and 6% had hypotension, while the remaining 62% were normotensive at the time of admission. 30% of the patients had signs of heart failure in form of raised JVP, S3, crepitations etc.

Table-5 Clinical signs on presentation

Most (96%) of patients were presented within hyperacute phase.
Among complications, highest rate of complications was due to arrhythmias (12%), heart failure (Killip grade 2 or more) (12%) and cardiogenic shock (6%). One patient developed bleeding complication in form of hematemesis consequent to thrombolysis. One patient had neurological complication in form of hypoxic ischemic encephalopathy due to circulatory failure.

Most of the patients develop complications early, i.e. 62% within 1 hr and 31% within 1 to 6 hrs of presentation, while incidence of the same after 1 day is significantly low.

The incidence of recurrence was 6% within 2 yrs follow-up, with most case occurring within 1 year.

**DISCUSSION**

Higher prevalence in males which is comparable to previous studies like Hoit et al Thrombophilia study Kyoto Risk Study. Male: female ratio in incidence goes on decreasing as age advances as per cumulative analysis of the study.

In Hoit et al. Male gender (92%), smoking (82%) and family history of IHD (42%) were strongly associated with young STEMI. In Thrombophilia study also the Male gender (92%), smoking (85%) and hypercholesterolemia (76%) found to be associated with young STEMI.

Younger patients with MI have no significant predilection for any region of myocardium as revealed in different studies which is comparable to Hoit et al and Gregorio Caimi at el. There is no variation in pattern of involvement of different regions of myocardium in younger patients from the middle aged and older ones which is also reflected in Hoit et al. Different signs of heart failure are present in 14% on chest x-ray and 46% on echocardiography while those are 44% and 65% respectively in other studies. Evidence of heart failure on chest x-ray like cardiomegaly and pulmonary oedema and findings of decreased EF in echocardiography are lesser in younger age group with MI as compared to middle aged and older patients with MI in previous studies. (Hoit et al)

Younger patients with MI develop complications early, i.e. 62% within 1 hr and 31% within 1 to 6 hrs of presentation, while incidence of the same after 1 day is significantly low.

Table-8 suggests higher incidence of MI with normal coronary and single vessel disease in contrast to lesser incidence of multi-vessel disease. Most patients were having single vessel disease in present as well as previous studies.

Table-9 shows that electrical and mechanical complications have lesser incidence in young patients in present study as compared to that in middle aged and older patients with MI in previous studies. Chances of extension of infarct as well as reinfarction are almost same in younger patients in previous studies. Chances of extension of infarct as well as reinfarction are almost same in younger patients in previous studies. (Hoit et el Thrombophilia study Kyoto Risk Study).

### Table-6 Metabolic derangements

| Risk Marker                  | No. of patients | Percentage (%) |
|------------------------------|-----------------|----------------|
| LDL>100mg/dl                 | 37              | 74             |
| hsCRP>3mg/dl                 | 50              | 100            |
| S. Homocysteine              | 49              | 98             |
| S. Creatinine                | 1               | 2              |
| ACLA & APLA>15mg/dl          | 1               | 2              |
| Hyperfibrinogenemia (>240 mg/dl) | 43           | 86             |

### Table-7 Risk markers in young STEMI

The Table-7 shows that incidence of raised hsCRP, hyperhomocysteinemia, raised LDL & hyperfibrinogenemia are higher (100%, 98% & 74%, 86% respectively) in those patients who suffer from MI in relatively younger age (<40yrs).

10% of the patients had significant pulmonary oedema on chest X-ray. All patients had some regional wall motion abnormality but 46% developed significant left ventricular dysfunction (EF<40%).

### Table-8 Coronary involvement on CAG

Table-8 suggests higher incidence of MI with normal coronary and single vessel disease in contrast to lesser incidence of multi-vessel disease. Most patients were having single vessel disease in present as well as previous studies.

Table-9 shows that electrical and mechanical complications have lesser incidence in young patients in present study as compared to that in middle aged and older patients with MI in previous studies. Chances of extension of infarct as well as reinfarction are almost same in younger patients in present study and middle aged and older individuals in previous study.

### Table-8 Findings on Cardiac catheterization

Amongst the young patients, on coronary angiography; the incidence of single vessel disease is highest (78%) while that of triple vessel disease is low (2%). CAG has not been done in one patient as 2D-echocardiography and CT-aortogram were suggestive of aortic dissection from root to the origin of left subclavian artery. In addition CAG has not been done in a patient who died of cardiac arrest immediately after admission.

### Table-9 Complication

| Complication | Young patients in present study (%) | Middle aged Hoit et al (%) | Older patients on Hoit et al (%) | Kyoto Risk Study (%) |
|--------------|------------------------------------|---------------------------|--------------------------------|----------------------|
| Arrhythmias  | 16                                 | 33                        | 28                             | -                    |
| CHB          | 2                                  | 6                         | 10                             | -                    |
| Heart failure| 12                                 | 54                        | 71                             | -                    |
| Cardiogenic shock | 6           | 3                         | 5                              | -                    |
| MR           | 0                                  | -                         | -                              | 2                   |
| VSR          | 0                                  | -                         | -                              | -                   |
| VPWR         | 0                                  | -                         | -                              | -                   |
Table 9 - Complications in young & old

Younger patients with MI have lesser short term and long term mortality in present study as compared to that in middle aged and older patients in previous studies. (Hoit, Kyoto, PRIAMHO II Study)

CONCLUSIONS

AMI constituted about 4.0% of total adult young patients <40 years. Maximum incidence of MI was found in the age group of 30-40 years. The incidence is significantly higher among males as compared with females with male: female ratio 24:1 in patients<40 years. This is due to higher prevalence of smoking in males in India. Incidence is high among the patients with smoking (78%), obesity (20%) and type A personality (26%). So, education regarding smoking cessation and deaddiction therapy regarding the same may help in reducing the incidence of MI in young patients <40 years. This suggests that absolutely normal clinical examination does not rule out AMI. Incidence of recurrence is highest within first 2 months (66.66%). So, regular follow-up and adherence to secondary prophylaxis is essential.

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