

A Clinical Study of Acute ST Elevation Myocardial Infarction in Young Indian Adults

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Abstract: Coronary artery disease occurs 5-10 years earlier than the Europeans in Asian Indians. Up to 12% of the cardiovascular diseases in India occur in the young adults which contribute to about 1/4th of the total CVD related mortality which shows the need for proper studying of this group and urgent action on preventable factors.

Keywords: STEMI in young adults, STEMI in young Indians, STEMI in Indians, Coronary artery disease in young adults, CAD in Indians.

1. Aim of the Study

- 1) To study the clinical profile of young adults presenting with acute ST elevating myocardial infarction aged 35 years and below
- 2) To Study the conventional risk factor profile in these patients.

- 2) Patients presenting with NSTEMI, unstable angina, chronic stable angina were excluded.
- 3) STEMI patients presenting more than 3 days were excluded.
- 4) Patients who refused to give consent.

2. Study Design

Prospective observational study.

3. Study Duration

The study was done during the period of January 2014 to January 2016.

4. Materials and Methods

This study was done in the departments of Cardiology and Critical care, Apollo health city, hyderabad. Study group consisted of 71 patients admitted to the emergency room and ICU s with acute STEMI.

Inclusion Criteria:

- 1) Age less than or equal to 35 years.
- 2) Acute STEMI diagnosed by ECG criteria:
 - a) ST elevation at the J point in two contiguous leads which is more than or equal to 0.1mV in limb leads and 0.2 mV in chest leads.
 - b) New onset left Bundle Branch Block.

Exclusion Criteria:

- 1) Age more than 35 years.

5. Study Protocol

- 1) All the patients were admitted in Critical Care and Cardiology ICU, Apollo health city, Hyderabad was taken on arrival for every patient. Written and informed consent was taken from all the patients. Detailed history was obtained and thorough physical examination done on every patient with special reference to age, sex, presenting complaint, window period, reasons for delay in presenting where there is delay, Hypertension, diabetes, smoking, alcohol intake. Anthropometric data like body mass index, waist to hip ratio were collected. Serum fasting lipid profile was done within first 48 hrs of admission, fasting blood sugar, serum creatinine, complete blood picture, ESR, WBC count were done in all the patients. Echocardiographic examination was done in all the patients. Coronary angiogram was done in possible cases.
- 2) Window period was defined as the time between onset of the complaint and presentation to the hospital.
- 3) Systemic hypertension was considered to be present if patients were known hypertensives prior to admission or if detected to be having blood pressure of more than 140/90 mmHg with average being taken from 2 separate recordings during hospital stay.
- 4) On the basis of fasting blood glucose levels of more than 126mg/dl or with known diabetic patients already on antidiabetic medication were labelled as Diabetes mellitus patients.

- 5) Both active and former smokers were labelled as smokers. Significant alcoholism was taken as >80ml/day in males and >40ml/day in females.
- 6) A positive family history of premature coronary artery disease was said to be present in presence of a first degree relative who had documented CAD below the age of 55yrs in males and 65 yrs in females.
- 7) Cut off values for waist circumference measured at the level of umbilicus for diagnosing abdominal obesity is more than 90cm in men and 80cm in women. Body Mass Index was measured using Quetelet's formula (weight in Kg/height in m²). Cut off value for BMI above normal and overweight is 23 and obesity is 25. (Asia pacific guidelines of WHO).
- 8) Patients are defined as having low HDL if <40mg/dl in males and <50mg/dl in females, high LDL if above >100mg/dl, high TH>150mg/dl.
- 9) Significant alcoholism was defined as 80ml/day in males, 40ml/day in females.
- 10) Patients were classified based on KILLIPS and KIMBALL clinical classification of acute STEMI, as CLASS I –clear lung fields and S3, CLASS II –crackles in lungs, S3 gallop, elevated JVP, CLASS III- presence of frank pulmonary edema, CLASS IV- patient I shock.
- 11) Lead ECG was taken using Philips machine. Echocardiogram was done by experts with GE Machine LOGIQ 5 PRO with 2-5 MHz transducer as per ASE guidelines. Coronary angiography was performed by standard technique in possible cases and the patients were defined as those having either single vessel disease, double vessel disease, triple vessel disease or normal coronaries.

6. Statistical Analysis

Data was entered in EXCEL spread sheet. Categorical data was presented as actual number and percentage. Continuous data was presented as mean and standard deviation.

7. Observations, Results and Data Analysis

Percentage Distribution of Age and Sex:

Table 1

AGE(years)	No. of patients (Total =71)	Percentage (Total = 100%)
21-25	5	7.04
26-30	13	18.32
30-35	53	74.64

Table 2

Sex	No. of patients	Percentage
Male	66	92.95%
Female	5	7.05%
Total	71	100%

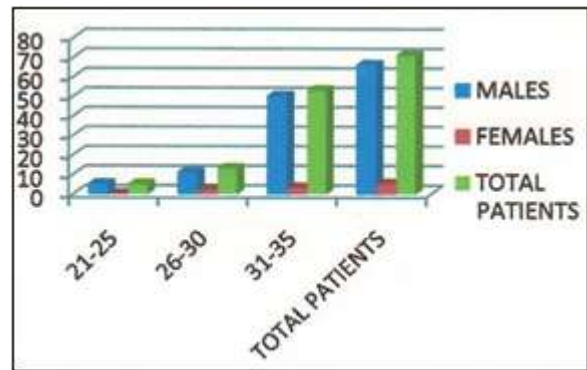


Illustration 1

In the present study 71 patients were studied out of which 66(92.95%) were males and 5(7.05%) were females. Majority of the patients 53(74.64%) were among the 31 – 35 year age group followed by 26-30 yr age group 13(18.31%) and least no. Of patients in 21 – 25 yr age group 5(7.04%). The mean age of onset was 32.66 yrs. Mean age in males and females was 32.62 yrs and 33yrs respectively. Youngest person observed was of 23 yrs age and oldest person was of 35 yrs.

Table 3: Percentage Distribution of Presenting Symptom

Presenting Symptom	No. Of Patients
Typical anginal pain	57(80.4%)
Atypical anginal pain	6(8.4%)
Only shortness of breath	4(5.6%)
Upper backache	4(5.6%)
TOTAL	71(100%)

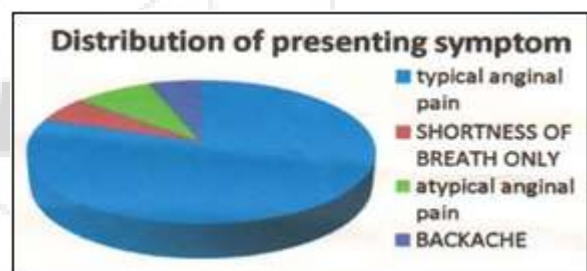


Illustration 2: Distribution of presenting symptom

Majority (up to 80.4%) of the patients presented with typical retrosternal, squeezing type of chest pain associated with autonomic symptoms, next common complaint is atypical angina pain in the form of burning sensation in the epigastrium (8.4%). 4 patients presented with only shortness of breath and remaining 4 presented with only upper backache.

Table 4: Percentage Distribution of Patients in Relation to Window Period

Window Period	No. of Patients	Percentage
Less than or equal to 6hr	50	70.42%
6-12 hr	5	7.04%
More than 12 hr	16	22.52%
Total	71	100%

Majority of the patients i.e., 77.46% presented within 12 hr which is the maximum period where some benefit could be achieved with thrombolysis. Out of them 70.42 % presented within 6 hr of WP. But a large percentage i.e., up to 22.52%

presented more than 12 hr where thrombolysis to not have much benefit.

Table 5: Distribution of the Factors Involved in Patients Presenting beyond 12HRS

Reasons for WP >12hr	No. of patients	Percentage
Delay in referral	8	50%
Large transport time	5	31%
Ignorance	2	13%
others	1	6%
TOTAL	16	100%

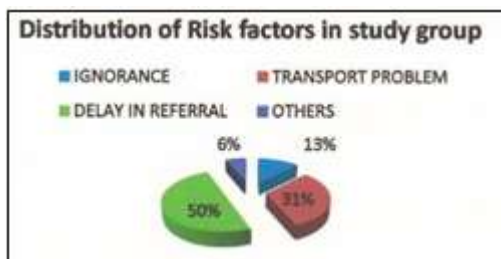


Illustration 3: Distribution of factors involved in patients presenting beyond 12 hours

Delay in referral to the tertiary centre was a major factor accounting to 50% of the patients who presented beyond 12 hr. 2nd common reason being increase in transport time due to various reasons(31%) followed by Ignorance and neglect on the part of patient(13%). Other reasons like family and personal problems accounted for 6%.

Table 6: Distribution of Patients According to Body Mass Index

Body mass index	Males %	Females %	Total No. %
<18.5(underweight)	6 9.1%	-	6 8.5%
18.5-23(normal)	20 30.3%	4 80%	24 33.8%
23-27.5(overweight)	31 47%	1 20%	32 45%
>27.5(obese)	9 13.6%	-	9 12.7%
TOTAL	66 100%	5 100%	71 100%

Mean BMI of the study group is 23.83(+/-3.46) which is above the cut off value(23) for normal range. Majority of the study group i.e., 57.7% of the total patients fall above the normal range of BMI for an Indian adult. In males the percentage above normal BMI is 60.6%. Most of the females i.e, 80% of the group were of normal BMI. Interestingly 9.1% of the male patients were underweight. Percentage of patients with abdominal obesity among male group was 63.6% while in females it was 20%. Only 1 out of 5 patients in female group had abdominal obesity.

Table 7: Distribution of the risk factors among study group

DISTRIBUTION OF THE RISK FACTORS AMONG STUDY GROUP

RISK FACTOR	No. Of patients	Percentage
Smoking	49	69 %
Low HDL group	43	60.5 %
Overweight/ obesity	41	57.7 %
High Triglycerides group	34	47.9 %
Alcohol	32	45 %
Hypertension	29	40.8 %
High LDL group	25	35.2 %
Diabetes	14	19.7 %
Family history	7	9 %

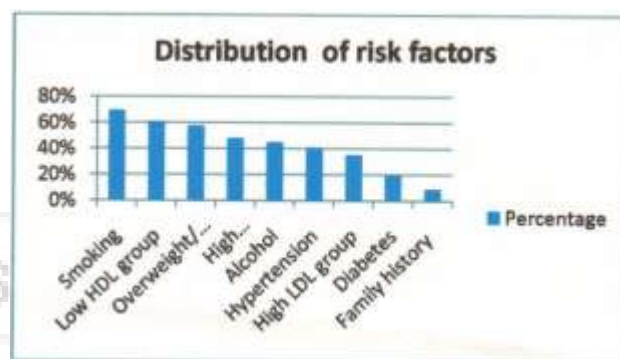


Illustration 4: Distribution of risk factors among study group

Most common conventional risk factor observed in the study group was smoking (69%) followed by low HDL (60.5%), overweight/obesity (57.7%), high TG (47.9%), alcohol (45%), high LDL (35.2%). The percentage of hypertension, diabetes and family history of premature CAD was present in 40.8%, 19.7% and 9% respectively.

Percentage Distribution of Patients In Relation To Type Of Myocardial Infarction

Majority of the patients presented with Anterior ST elevation MI(66.2%). Next common was inferior STEMI (28.2%) followed by high lateral STEMI (2.8%), anterior + inferior STEMI (2.8%).

Table 8: Percentage distribution of types of myocardial infarction

TYPE OF MI	No. of patients	Percentage
Anterior STEMI	47	66.2 %
Inferior STEMI	20	28.2 %
Anterior and inferior STEMI	2	2.8 %
High lateral STEMI	2	2.8 %
TOTAL	71	100 %

Table 9: Distribution of patients in various risk factor groups in relation to Killips class

DISTRIBUTION OF PATIENTS WITH VARIOUS RISK FACTORS IN RELATION TO KILLIPS and KIMBALL CLASSIFICATION FOR HEMODYNAMIC ASSESSMENT

KILLIPS CLASS	n(%)	DM n(%)	HTN n(%)	SM n(%)	ALC. n(%)	F.H. n(%)	Ow/Ob n(%)	Low HDL n(%)	High TG n(%)	High LDL n(%)
I	61 (85.9%)	21(95.5%)	26 (89.7%)	41(83.7%)	29(90.6%)	5(71.4%)	36(87.8%)	40(93%)	30(90.9%)	23(92%)
II	5 (7.04%)	1(4.5%)	3(10.3%)	3(6.1%)	3(9.4%)	2(28.6%)	4(9.8%)	2(4.7%)	2(6.1%)	2(8%)
III	2(2.8%)	-	-	2(4.1%)	-	-	1(2.4%)	1(2.3%)	1(3%)	-
IV	3(4.2%)	-	-	3(6.1%)	-	-	-	-	-	-
TOTAL	71	22	29	49	32	7	41	43	33	25

DM=diabetes mellitus, HTN=hypertension, SM=smokers, Ow/Ob= overweight and obese patients, F.H. =family history of premature CAD, HDL= high density lipoproteins, TG= triglycerides, LDL=low density lipoproteins, n=no. Of patients.

Angiographic Profile of the Study Group in Relation to Risk Factors

Table 10: Angiographic profile of the study group in relation to risk factors

CAG	n	DM n(%)	HTN n(%)	SM n(%)	ALC n(%)	F.H. n(%)	Ow/Ob n(%)	Low HDL n(%)	High TG n(%)	High LD n(%)
SINGLE VESSEL DISEASE	34(65.4%)	12(70.6%)	13(62%)	25(71.5%)	15(75%)	4(80%)	19(65.6%)	18(64.2%)	12 (60%)	10(77%)
N.CORONARIES	7(13.4%)	4(23.5%)	4(19%)	4(11.4%)	2(10%)	1(20%)	5(17.2%)	5(17.9%)	3(15%)	2(15.4%)
DOUBLE VESSEL DISEASE	8(15.4%)	1(5.9%)	4(19%)	4(11.4%)	3(15%)	-	5(17.2%)	5(17.9%)	4(20%)	1(7.6%)
TRIPLE VESSEL DISEASE	3(5.8%)	-	-	2(5.7%)	-	-	-	-	1(5%)	-
TOTAL	52	17	21	35	20	5	29	28	20	13

Most common coronary artery disease on angiogram among the study group is single vessel disease accounting for 65.4 % followed by double vessel disease 15.4 %, normal epicardial coronaries 13.4 %, triple vessel disease 5.8%. In all the risk factor groups majority of the patients(DM-70.6%,HTN-62%,SMOKING-71.5%, ALCOHOL-75%, FAMILY Hx-80%, Overweight-65.6%, low HDL-64.2%,high TG-60%,high LDL-77%) had single vessel disease. 2 smokers and 1 patient with high TG levels had TVD..

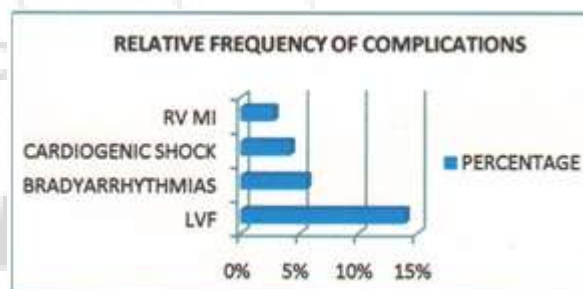
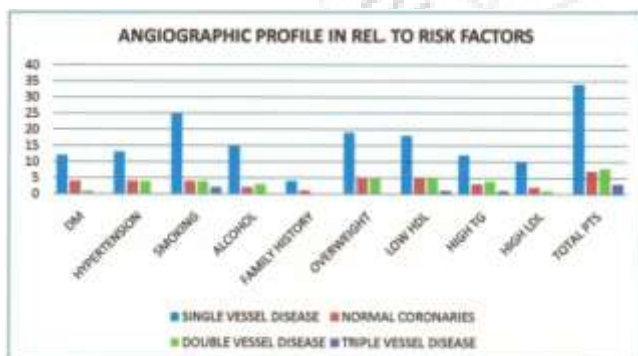


Illustration 6: Percentage of complications in the study group



DISTRIBUTION OF COMPLICATIONS IN THE STUDY GROUP

Illustration 5: Angiographic profile of the study group in relation to risk factors

Table 11

Complication	No. of patients	Percentage
Left ventricular failure	10	14%
Cardiogenic shock	3	4.2%
Right ventricular MI	2	2.8%
Brady arrhythmia	4	5.6%

Most frequent complication observed among the study group was left ventricular failure (14%) followed by Brady arrhythmias (5.6%). 3 patients developed complete heart block. 3 patients presented in cardiogenic shock. Pure RV MI occurred in 2 patients.

Outcome

Death occurred in 2 patients (2.8%). Both of them presented in killips class IV and expired on the 1st day of admission.

8. Discussion

Most MI registries internationally shows 2-6% prevalence of MI in young adults below 40yrs. Even though multiples studies by CHEN et al (CHEST 95), KLEIN et al (JACC 87), FOURNIER et al (CLINICAL CARDIOLOGY 96) showed good prognosis in young adults with MI, JASON H. COLE et al (JACC 2003) showed that at the end of 15 years there was 30% mortality contributing to overall poor prognosis. This study was done in the back ground of considerable burden on the society due to MI in the young age group. We have taken the upper age limit as 35yrs to

study the clinical and risk factor profile in younger age group than with previous studies where the upper limit was 40-45yrs.

Table 12: Comparison of our study group with some western studies

COMPARISON WITH WESTERN STUDIES		
Parameter	Cole et al	Our study
Mean age of males	36	32.62
Mean age of females	35	33
Smokers	65%	69%
Family hx of CAD	60-70%	9%
Diabetes mellitus	10%	19.7%
Average EF	55%	56.1%
Single vessel disease	58%	65.4%

When compared to study done by Cole et al, our study showed younger age group both in males and females. Percentage of smokers in our study was slightly higher. Family history of premature CAD was substantially lower in our study which was 9% when compared to 60 – 70% in the study by Cole. Percentage of Diabetics and those with single vessel disease was higher in our study. Average EF was comparable in both groups.

When compared with percentage of smokers among studies by HOIT et al (CIRCULATION), ZIMMERMAN et al (JACC'95), WEINBERGER et al (CLINICAL CARDIOLOGY) which was 76-90%, smokers in study was 69%. Percentage of diabetics in the study done by KLEIN et al (JACC 2003) was 15-20% which was comparable with 19.7% in our study.

Table 13: Comparison of our study group with other Indian and Asian studies

COMPARISON WITH INDIAN , OTHER ASIAN STUDIES					
PARAMETER	USHA KAUL et al(AIIMS)	DWIVEDI et al, SHARMA et al,2000	Md. SIDDIQUE et al(BSSMU J 2010)	AHMED et al (Pakistan J. Of medicine)	OUR STUDY
Smokers	76.2%	61.42%	70%	79%	69%
Hypertension	32.5%	51.42%	38%	35%	40.8%
Diabetes	5%	7.14%	34%	31%	19.7%
Family history	28.7%	42.8%	34%		9%
overweight		72%			45%
obesity		35.7%			12.7%
Under weight		14%			9.1%
Male to female ratio		4:1	4:1	7:1	13:1
Low HDL		37.8%			60.5%
High TG		44.7%			47.9%
Single v.disease	33.7%				65.38%
Double v.disease	26.7%				15.38%
Triple v. disease	40%				5.76%

Percentage of smokers in our study group was 69% which was lesser than other studies except Dwivedi et al. Hypertensives were more than in other studies except Dwivedi et al. Diabetics were more than in other north Indian study groups i.e., by Usha et al and Dwivedi et al but less than the Pakistan and Bangladesh studies. Family history of CAD is much lower in our study when compared to other studies. Both the overweight and obese people were less in our study when studies from Pakistan and Bangladesh. Single vessel disease was almost double than the percentage in Usha kaul et al study while double and triple vessel disease were less common. Triple vessel disease was almost 1/8th of prevalence in Usha et al study.

9. Conclusion

This study suggests that young adults with Acute STEMI were predominantly males. Most common presenting complaint was typical angina chest pain. Most common factor for delayed window period and not getting thrombolysis was Delay in referral form local practitioners. This shows the need for proper training of local practitioners. Smoking was the most common risk factor among the study group followed by abdominal obesity and Hypertension. Family history was much less common. Majority of the patients presented with Anterior STEMI. Most of them presented with Normal hemodynamic i.e., killips class I. Single vessel Disease was the commonest finding on Angiogram. Most common complication among the study group was left ventricular failure.

10. Study Limitations

- In a study of this nature, there is potential for selection bias (referral bias and institutional bias).
- Cardiac markers could not be done in this study.
- Role of diet, emotional factors, newer risk factors were not evaluated.
- Long term follow up should be evaluated in young patients with STEMI.

11. Competing Interests

The authors declare that there is no conflicting interest

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