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YOUNG MYOCARDIAL INFARCTION- RISK FACTORS AND ANGIOGRAPHIC PROFILE

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ABSTRACT

Background: The prevalence of coronary artery disease has been increasing among young adults especially in Indian subcontinent. This study was done to assess the risk factors and to study the angiographic profile of young patients(age<40years) presented with myocardial infarction in a tertiary care hospital. **Materials and methods:** 108 consecutive young patients presenting with acute ST elevation myocardial infarction were included in study. Their risk factors for coronary artery disease and pattern of coronary artery stenosis on angiography were noted. **Results:** Out of 108 patients 91(84%) were males. Mean age was 35.12 ± 4.2 years. 83(76.9%) were smokers, 20(18.5%) patients have hypertension, 24(24.2%) have diabetes, 15(13.9%) patients have positive family history and 9(8.3%) has obesity. Anterior wall myocardial infarction present in majority of patients 71(71.3%), followed by inferior wall myocardial infarction in 21(19.4%), posterior wall myocardial infarction in 3(2.8%) patients. Majority of patients 58(53.7%) has moderate LV dysfunction, 40(37%) patients has mild LV dysfunction, 2(1.9%) has severe LV dysfunction and 8(7.4%) has fair LV dysfunction. On angiography 93(86%) patients has SVD(single vessel disease), 8(7%) patients has DVD(double vessel disease), 7(7%) patients had TVD(triple vessel disease). Among single vessel disease LAD(left anterior descending artery) is most commonly involved in 72(77.4%) of patients. PCI(percutaneous coronary artery intervention) was done in 81(74%) patients, POBA(plain old balloon angioplasty) was done in 8(7%) patients and 20(19%) patients were treated medically with no mortality. **Conclusion:** Majority of young MI patients were in 30-40 years age group with predominant males. Smoking is the major risk factor. On angiography, single vessel disease is the most common finding with LAD being involved in most of cases with high thrombus burden.

Key words: Young myocardial infarction, coronary artery disease

Introduction:

Although there is a decline in mortality for cardiovascular diseases worldwide, there was a consensus that the rate of coronary vascular disease has been increasing among young adults which causes burden to the society due to loss of productive years from these young individuals. The rate of early onset myocardial infarctions (MI) has increased from 27% to 32% in the last 20 years (1). Coronary Artery Disease (CAD) in young individuals i.e., before 45 years has a relatively bad prognosis when compared to adults and 4% to 8% of acute myocardial infarctions occur in this age cohort (2). The recurrence rates are high in this age

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group and these recurrences are mainly due to non-obstructive lesions which progress rapidly in these patients (3). The presence of unhealthy habits like smoking, sedentary life style and early occurrence of traditional risk factors like diabetes and hypertension were contributing to this trend. Understanding the biology of this disease in young adults is required for its prevention.

The prevalence of type 2 Diabetes Mellitus (DM) and hypertension (HTN) has been increasing among young adults. Genetic factors also play a role in premature atherosclerosis in young adults and studies shows that genetic risk scores are required beside traditional risk scores to identify the sub clinical atherosclerosis in these patients (1). By enhancing the prediction of CAD beyond traditional risk factors at early age by polygenic risk scores, primary prevention can be started early in these young patients (4). Aggressive primordial and primary prevention is needed in these individuals by following the ABCDE approach stated in 2019, ACA guidelines (5). In the young MI registry, many patients are candidates for statin therapy before the occurrence of index event (6). Determination of the atherosclerosis in these young individuals can be done by CT coronary angiography before occurrence of acute event as studies shows the high calcium score in relatively young individuals below 40 years (7). Intensification of therapy after the primary event is required to prevent the recurrence in these patients (8).

Study done by Bhardwaj, *et al* is an Indian study where they found that young myocardial infarctions occur predominantly in males with mean age of 35.94 ± 4.89 years with smoking as predominant risk factor (9). Pandya, et al. study is another Indian study on young myocardial infraction showed that anterior wall myocardial infarction is the most common presentation (10). Shah et al. stated that majority of these young patients has mild to moderate LV dysfunction on presentation and most of them have single vessel disease with LAD (left anterior descending artery) being most common culprit vessel (11). Ambroziak et al. showed that these young MI patients have significant family history of premature atherosclerotic disease (12). The south Asian ethnicity is a major risk factor for the early onset of coronary heart disease in young adults. There are fewer studies from this part of world on young adults with myocardial infarction. So, the main aim of the present study is to describe the risk factors and angiographic profile of these young myocardial infarction patients from Indian sub-continent.

Materials and Methods:

This was a prospective observational study conducted from June 2021 to May 2022 in Ramesh hospitals, Vijayawada. Clearance obtained from institutional Ethics committee. Informed consent obtained from all patients.

Inclusion criteria:

Patients presenting with acute myocardial infarction with ST elevation STEMI (ST elevation myocardial infarction) with age < 40 years irrespective of gender were included

Exclusion criteria:

Patients with STEMI, age > 40 years, patients presenting with non-ST elevation MI, patients with previous history of PCI or CABG, patients presenting with stent thrombosis or with coronary artery dissection were excluded.

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

STEMI was diagnosed by using universal definition of myocardial infarction as a patient presenting with chest pain with raised troponin value above 99th of upper limit with any ST elevation of > 2mm in two consecutive leads or new onset LBBB in ECG or pathological Q waves in ECG or new onset wall motion abnormality in ECHO.

Thus, a total of 108 patients were included who were satisfying the inclusion and exclusion criteria. After noting all demographic details and relevant history, a complete clinical examination was done in all patients. Routine blood investigations, troponin, ECG and echo was done in all patients. Risk factors focused were mainly diabetes, hypertension, smoking, obesity.

Diabetes was defined as the patient having past history of diabetes or being treated as diabetic or now with fasting glucose > 126 mg/dl, post prandial 2 hours' glucose > 200 mg/dl or with Glycated HbA1c > 7.0%. Hypertension was defined as the patient having past history of hypertension or being treated as hypertensive patient or newly diagnosed hypertensive with three reading > 140/90 mmHg. Patient was defined as an active smoker if he has history of smoking within one month of current admission. Positive family history was defined as patient's first degree relative having premature atherosclerotic cardiovascular disease or sudden cardiac death. BMI was calculated using Broca's formula and patient is defined as obese if his BMI is > 30 kg/m^2.

Type of myocardial infarction was localized by ECG and ECHO. LV function was calculated for each by using Simpson's method on ECHO and patients categorized as having fair LV function if EF > 50%, mild LV dysfunction if EF between 45-50%, moderate LV dysfunction if EF 30-45% and severe LV dysfunction if EF < 30%.

In all patients treatment for acute myocardial was instituted as per latest guidelines. All patients were subjected to coronary angiogram preferably from radial route.
On angiogram, the presence of stenosis, the culprit lesion and degree of thrombus were noted. Significant stenosis was defined as stenosis > 70% of luminal area in any of epicardial coronaries. Depending on number of vessels involved disease was defined as SVD (single vessel disease), double vessel disease (DVD), triple vessel disease (TVD). Huge thrombus was defined as thrombus dimension > 2 vessel diameter.

Primary percutaneous transluminal angioplasty was done in majority of patients, decision taken by the interventional cardiologist performing coronary angiography. Few patients underwent plain balloon angioplasty. Depending on clinical situation and angiographic features like thrombus burden, few patients had intracoronary thrombolysis and are on medical management. Any MACE or mortality were noted.

Statistical analysis:

Categorical variables were expressed in percentages and proportion whereas continuous variables were expressed in mean with standard deviation.

Results :

Out of 108 patients 91(84%) were males. Mean age was 35.12 ± 4.2 years. 83(76.9%) were smokers, 20(18.5%) patients have HTN, 24(24.2%) have DM, 15(13.9%) patients have positive family history and 9(8.3%) has obesity according to Table 1. Figure 1 shows the type of MI in young adults in bar diagram. Anterior wall MI present in majority of patients

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71(71.3%), followed by inferior wall MI in 21(19.4%), posterior wall MI in 3(2.8%) patients. Angiographic features of young MI patients was shown in Table 2. Majority of patients 58(53.7%) has moderate LV dysfunction, 40(37%) patients has mild LV dysfunction, 2(1.9%) has severe LV dysfunction and 8(7.4%) has fair LV dysfunction. On angiography 93(86%) patients has SVD, 8(7%) patients has DVD, 7(7%) patients had TVD. Among single vessel disease LAD is most commonly involved in 72(77.4%) of patients. PCI was done in 81(74%) patients, POBA was done in 8(7%) patients and 20(19%) patients were treated medically with no mortality.(Figure 2)

Table 1: The risk factors of MI in young MI patients

Variable	Number (%)	Percent
Age		
< 20 Years	1	0.9%
21 - 30 Years	16	14.8%
31 - 40 Years	91	84.3%
Mean age in years	**35.12 ± 4.2 years**	
Gender		
Males	91	84%
Females	17	16%
BMI		
Normal	48	44.4%
Overweight	51	47.2%
Obese	09	8.3%
Risk factors		
HTN	20	18.5%
DM	24	24.2%
Smokers	83	76.9%
Positive Family history	15	13.9%

ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

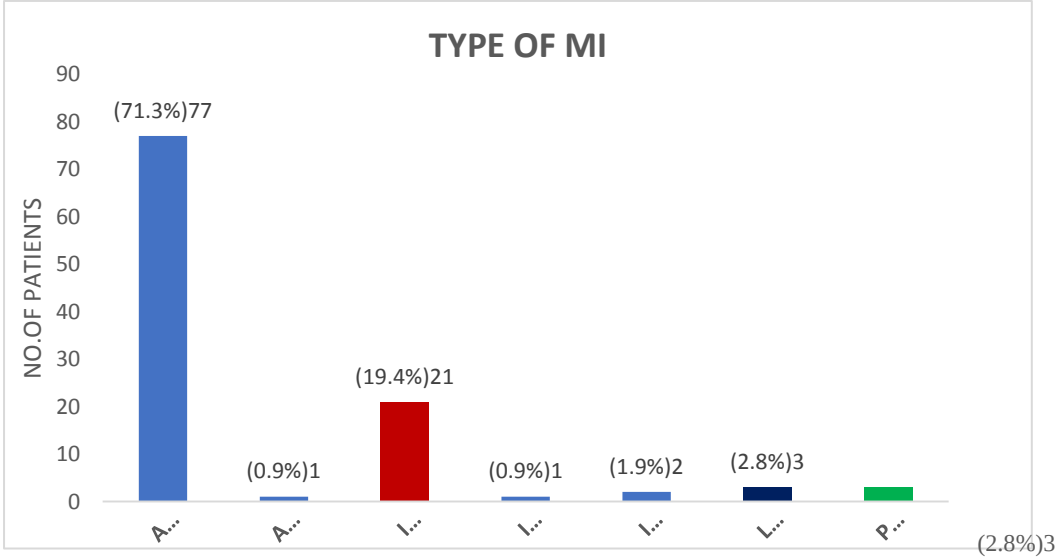
Obesity	09	8.3%

Table 2: Angiographic features of MI patients

Variable	Number	Percentage
I. LV function		
Fair LV function	08	7.4%
Mild LV dysfunction	40	37%
Moderate LV dysfunction	58	53.7%
Severe LV dysfunction	02	1.9%
II. Pattern of coronary involvement		
1.Single vessel disease	**93**	**86%**
A.LAD	72	77.4%
B.RCA	15	16%
C.LCX	04	4.35%
D.Diagonal	02	2.1%
2.Double vessel disease	8	7%
3.Triple vessel disease	7	7%

LAD-Left anterior descending artery, RCA-Right coronary artery, LCX-Left circumflex artery.

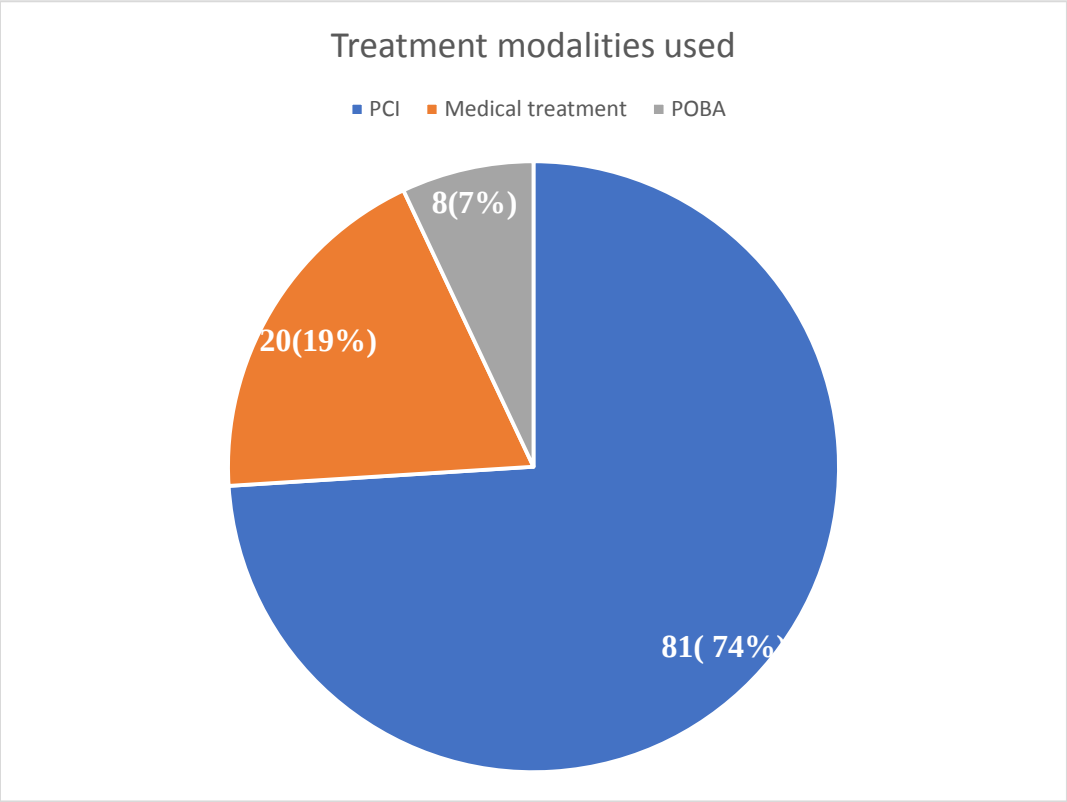
Figure 1: Distribution of type of MI



ISSN: 0975-3583, 0976-2833 VOL 13, ISSUE 05, 2022

AWMI-Anterior wall myocardial infarction, IWMI-Inferior wall myocardial infarction, LWMI-Lateral wall myocardial infarction, PWMI-Posterior wall myocardial infraction

Figure 2: Treatment modality used in Young MI patients.



PCI-Percutaneous coronary artery intervention, POBA-Plain old balloon angioplasty.

Discussion:

The prevalence of young myocardial infarction is common in 31-40 years and male (84%). Bhardwaj, *et al and Pandya etal* found that more than 90 % of young myocardial infarctions occur in males in contrast to our study (9,10). This shows the increasing prevalence of myocardial infarctions in young women. Shah et al. found that 88.2% were males among the young MI patients, similar to ours (11). The mean age in our study was 35.12±4.2 years. Bhardwaj, *et al* found that mean as 35.94±4.89 years similar to our study (9). The mean age of patients was 38.4±4.7years in study by Pandya, et al. and most age group was between 36-40 years similar to our study (10). Shah et al. found that Mean age was 46.7 ± 5.7 years because they have included age below 55 years as young MI patients (11).

Among the risk factors smoking present in 83(76%) of the patients in present study. Bhardwaj, *et al* found that smoking present in 73 (58.8%) of their patients (9). Pandya, et al. have 193(64.3%) of smokers among young MI patients (10) whereas Shah et al. has 75 (63.0%) smokers in their study (11). Ambroziak et al. found that prevalence of smoking in young MIs was 203 (86.4%) (12). So, similar to previous studies smoking is the predominant risk factor among patients presenting with myocardial infarction in early age. The traditional risk factors like diabetes and hypertension were present in only 24(24.2%) and 20(18.5%) patients respectively. Pandya, et al. has 21.3% diabetics and 16% smokers in their study

similar to the present study (10). Bhardwaj, *et al* found diabetes in 8.06% patients whereas hypertension in 44.35% of patients (9). Shah et al. found diabetes in 23.5% and hypertension in 49.6%(11). Ambroziak et al. found diabetes in 15.9% and hypertension in 55.2%(12). The high prevalence of hypertension in these studies as age cut off in these studies was 50 years in contrast to 40 years in our study. Overall the prevalence of traditional risk factors like diabetes and hypertension were less in young MI patients compared to elderly patients.

The family history of ischemic heart disease was present in 15(13.9%) in present study. In Bhardwaj, *et al* study 17.7% has family history for ischemic heart disease (9) whereas in Pandya, et al. study only 4% has family history (10). This is contrast to past studies like Shah et al. where 42% has significant family history (11). Similarly, Ambroziak et al. found higher percentage of patients having significant positive family history for ischemic heart disease when compared to present study (12). The difference can be explained as these studies has taken 2^{nd} and 3^{rd} degree family history also whereas in our we have taken only first degree history only.

BMI > 30 kg/m^2 was found in only 9(8.3%) of patients in our study. In Bhardwaj, *et al* study 4.03% were obese (9). Pandya, et al. study 18.3% has BMI > $25kg/m^2$(10), whereas mean BMI in Shah et al. and Ambroziak et al. was 29.0+/- 5.0 and 28.6+/- 4.4 respectively (11.12). This shows that Indian young MI patients has less BMI when compared with others.

Anterior wall myocardial infarction is the commonest presentation among young MIs in our study with 77(71.3%) in comparable with Pandya, et al. in which 181(60.3%) patients had anterior wall myocardial infarction (10). Similar findings noted in study by Bhardwaj, *et al* (9). 58(53.7%) patients had moderate LV dysfunction on presentation in our study. In Pandya, et al. study majority of patients present with mild to moderate LV dysfunction (10). In Shah, et al. study 47.8% patients present with mild to moderate LV dysfunction (11).

On angiography 93(96%) have single vessel disease(SVD) and, 7% has double vessel disease(DVD) and triple vessel disease(TVD) each. In Bhardwaj, *et al* SVD present in 51.35%, DVD in 27.3%, TVD in 6.3% (9). In Pandya, et al. study (46%) had (SVD), and only 1% had (TVD)(10). In contrast to our study 50% patients had multi vessel disease in study by Shah, et al (11). LAD is the culprit vessel in 77.4% of patients having SVD in present study. 62.4% had culprit lesion in LAD in study by Bhardwaj, *et al (9).* LAD involved in 45.3 % of patients in Pandya, et al. study (10). So, our study results are in comparable to most of the previous studies regarding angiographic profile of young MI patients with SVD disease being most common and LAD being the most commonly involved vessel.

Out of 108 patients 81(74%) underwent treatment with primary percutaneous transluminal coronary angioplasty. This number is high when compared to 16.7% in study by Pandya, et al. study (10).

The mortality rate in present study was zero in comparable with low mortality rate (1.6%) in study by Bhardwaj, *et al* (9) and only one death in study by Pandya, et al. (10).

Similarly, Shah, et al reported no mortality (11).

Conclusions:

Incidence of young MI is increasing in prevalence. Majority of patients present in the 30-40 age group with predominant males. Smoking is the major risk factor with lesser incidence of traditional risk factors like diabetes and hypertension and family history. Indian patients with young MI are less obese when compared to others. AWMI is the commonest presentation with majority of patients having mild to moderate LV dysfunction. SVD is most common pattern of coronary involvement with LAD being commonly involved with high thrombus burden. Most of the patients underwent primary percutaneous angioplasty with nil mortality.

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