

Original Research Article

Conventional risk factors and angiographic profile of young patients with ST-segment elevation myocardial infarction in comparison with older patients

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ABSTRACT

Background: Globally, cardiovascular diseases (CVDs) remain the leading cause of death and have a substantial influence on public health. It has been shown that ischemic heart disease accounts for a larger proportion of deaths among South Asians. Risk factors and angiographic profile differ significantly in young people compared to older patients. The aim of this study was to compare conventional risk factors and angiographic profile between young and older patients with ST-segment elevation myocardial infarction.

Methods: This comparative study was conducted at the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet, from October 2022 to February 2025.

Results: Regarding risk factors for STEMI, Smoking was the most common and significant risk factor in group I patients compared to group II patients (80%vs 62.7%). Compared with group I, group II patients had a significantly higher prevalence of hypertension(28%vs14.7%) and diabetes mellitus (34.7%vs 20.0%). In this study, the mean gensini score of the group I patients were less (27.22±21.20) compared with group II (41.52±30.80). Majority of the patients in group I had significant single vessel disease compared to group II (30.7%vs10.7%) (p<0.05). Patient with group II had statistically significant triple vessel disease than group I (40%vs13.3%) (p<0.05).

Conclusions: Smoking is an important risk factor for development of ST elevation myocardial infarction in young patients, compared to older patients, where diabetes and hypertension were more significant. Young patients mostly present with SVD compared to older patients where multivessel disease were significantly higher.

Keywords: Conventional risk factors, Coronary artery disease, Gensini score, STEMI, Vessel score

INTRODUCTION

Cardiovascular diseases (CVDs) continue to be the most prevalent causes of mortality globally, exerting significant impacts on public health and resulting in considerable financial burdens on healthcare systems.¹ It is a global health concern that is affecting developed as well as developing countries.² Compared to patients from other

Asian ethnic groups, South Asians have been reported to have a higher proportionate mortality rate from ischemic heart disease.³

In Bangladesh, Acute Coronary Syndrome (ACS) is the predominant manifestation of Coronary Artery Disease (CAD), constituting 45% of all instances of cardiac hospitalization.⁴ Acute myocardial infarction (AMI)

includes both non-ST-segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI). There exists considerable variation among young patients with ST-elevation myocardial infarction (STEMI) in relation to risk factors, clinical presentation, and prognosis when compared to older people.⁵ The term "young" can be operationally defined as anyone within the age range of 18 to 40 years.⁶ To define Older age >40 years used by some studies.^{5,7} Coronary artery disease (CAD) exhibits a lower prevalence among individuals under the age of 40, affecting approximately 6-10% of this population.⁸ Evidence suggests that the prevalence of STEMI in young patients ranges from 2% to 10%.⁹ The findings of a comprehensive review and meta-analysis in Bangladesh indicate that the prevalence of ST-elevation myocardial infarction (STEMI) is 5%.¹⁰

The etiology of ST-segment elevation myocardial infarction (STEMI) in young individuals appears to exhibit significant variations compared to older patients. These variations can be classified into three primary categories. 1) Atherosclerotic coronary artery disease refers to the pathological condition characterized by the accumulation of plaque within the coronary arteries; 2) Non-atherosclerotic ischemic heart disease refers to a condition characterized by reduced blood flow to the heart muscle due to causes other than the buildup of fatty plaques in the arteries; 3) The presence of a hypercoagulable condition. The genetic profile of an individual, in conjunction with other predisposing variables, plays a significant role in establishing a favorable condition for the early onset of atherosclerosis and myocardial infarction.¹¹ It is common for young individuals with myocardial infarction (MI) to exhibit degraded plaques that are distinguished by eccentricity and infiltration by lymphocytes.^{12,13}

In the older population, the development of sensitive thin-cap fibroatheromas, which can result in plaque rupture and myocardial infarction, is mostly attributed to the mechanisms of inflammation and intraplaque hemorrhage.¹⁴ As with young MI patients, the presence of plaque erosions has significant therapeutic implications. In a small clinical study of acute MI patients with evidence of plaque erosion, a stentless, intensive antithrombotic approach resulted in significant or complete thrombus resolution and freedom from adverse cardiac events after 4 years of follow-up.¹⁵

Atherosclerosis is the predominant etiological factor contributing to the development of CHD in both young individuals and the elderly, constituting approximately 80% of myocardial infarctions. It is important to evaluate additional factors that may contribute to the condition, such as the anomalous origin of the coronary artery, embolic coronary disease, blood coagulation problems, coronary spasm resulting from illicit drug consumption (particularly cocaine and amphetamines), radiotherapy administered for chest tumors, as well as arterial trauma or inflammation.¹⁶

Risk factor profiles as well as clinical and angiographic characteristics are different between young and old STEMI patients.⁸ The issue of early atherosclerosis is becoming more prevalent due to rapid civilization and the increase conventional risk factors for CAD. Conventional risk factors associated with coronary artery disease (CAD) include smoking, diabetes mellitus, hypertension, dyslipidemia, obesity, and positive family history.¹⁷

The objective of this study was to compare conventional risk factors and angiographic profile between young and older patients with ST-segment elevation myocardial infarction.

METHODS

This comparative study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet, over two and a half (2.5) years from October 2022 to February 2025. The study population comprised all patients with ST-segment elevation myocardial infarction (STEMI) admitted to the Department of Cardiology during the study period. A total of 150 patients were enrolled, comprising 75 young patients aged 18-40 years (Group I) and 75 older patients aged >40 years (Group II), who fulfilled the predefined enrollment criteria. Convenient sampling was adopted. Patients admitted with STEMI who underwent coronary angiography were included, while those with a past history of ACS, previous PCI or CABG, valvular or congenital heart disease, cardiomyopathy, myocarditis, aortic dissection, vasculitis, severe liver or kidney disease, pregnancy, severe anemia, hypercoagulable state, drug abuse, or new-onset LBBB were excluded.

After obtaining written informed consent, demographic and anthropometric data, including age, sex, height, weight, BMI, and waist circumference, were recorded. Information regarding conventional CAD risk factors, including smoking, hypertension, diabetes mellitus, dyslipidemia, obesity, and family history of CAD, was obtained from history and previous medical records. Resting 12-lead ECG, troponin I, complete blood count, ESR, random plasma glucose, serum creatinine, serum lipid profile, baseline echocardiography, and other relevant investigations were performed as clinically indicated. Coronary angiography was performed during the index hospitalization using the Judkins technique with Iopamidol contrast through femoral artery access under fluoroscopic guidance. All angiograms were evaluated by two experienced cardiologists. Angiographic severity was assessed using vessel score and Gensini score. Significant CAD was defined as $\geq 70\%$ stenosis in any major coronary artery or $\geq 50\%$ stenosis in the left main coronary artery. Data were analyzed using SPSS version 25. Qualitative variables were expressed as frequency and percentage and compared using the chi-square test, while quantitative variables were expressed as mean $\pm$ SD and analyzed using the independent-samples t-test. Multivariate logistic regression was performed to identify predictors of severe

CAD, defined as a Gensini score >36. A p-value <0.05 was considered statistically significant. Ethical approval was obtained from the ethical committee of Sylhet MAG Osmani Medical College, and confidentiality of participant information was maintained.

RESULTS

This was a comparative study conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital for a period October 2022 to february 2025. The main objective was to compare conventional risk factors and angiographic profile of young patients with ST-segment elevation myocardial infarction with older patients. A total 150 (75 young and 75 older) patients with ST-segment elevation myocardial infarction were selected.

Figure 1 demonstrated that, majority of patients were male in group I and II, which were 86.7% and 85.3% respectively. The difference was statistically not significant(p=0.814) between the two group.

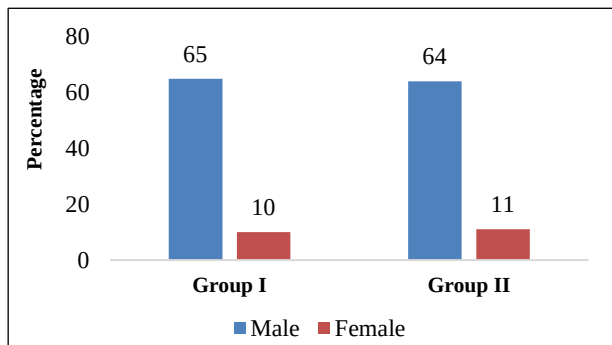


Figure 1: Distribution of patients by gender (n=150).

Table 1 demonstrated that, a greater number of patients were smoker in group I (80.0%) than group II (62.7%) and the differences was statistically significant(p<0.05).

Table 1: Distribution of patients by smoking status (n=150).

Smoking habit	Group I n=75, N (%)	Group II n=75, N (%)	P value
Smoker	60 (80.0)	47 (62.7)	0.019**
Non-smoker	15 (20.0)	28 (37.3)	

*Chi-square (χ^2) test was employed to analyze the data; Data were expressed as number, (%); Here Group I ≤ 40 years; Group II >40years; **Highly significant

Table 2 demonstrated that, A significantly higher percentage of diabetes was observed in the group II compared to group I.

Table 2: Distribution of patients by diabetes (n=150).

Variables	Group I (n=75), N (%)	Group II (n=75), N (%)	P value
Diabetic	15 (20.0)	26 (34.7)	0.044**
Non-diabetic	60 (80.0)	49 (65.3)	

*Chi-square (χ^2) test was employed to analyze the data; Data were expressed as number, (%); Here Group I ≤ 40 years; Group II >40years; **Highly significant

A comparison of the study patients Risk factors and age shown in Table 3, with the exception of hypertension, DM, obesity, gensini score, nearly all other risk variable listed above were marginally higher in group I than group II. Smoking, diabetes, hypertension, gensini score attained statistical significance (p<0.05) (Table 3).

Table 3: Comparison of risk factors between two age groups (n=150).

Factors	Group I (n=75), N (%)	Group II (n=75), N (%)	P value
Gender			
Male	65 (86.7)	64 (85.3)	^a 0.814
Female	10 (13.3)	11 (14.7)	
Smoking habit	60 (80.0)	47 (62.7)	^a 0.019*
Diabetes mellitus	15 (20.0)	26 (34.7)	^a 0.044*
Hypertension	11 (14.7)	21 (28.0)	^a 0.046*
Obesity (BMI>25kg/m²)	23 (30.7)	30 (40.0)	^a 0.232
Family history of CAD	24 (32.0)	17 (22.7)	^a 0.200
Dyslipidemia	64 (85.3)	68 (90.7)	^a 0.315
Number of vessel (multiple)	30 (40.0)	56 (74.7)	^a <0.001
	Mean $\pm$ SD	Mean $\pm$ SD	
BMI	23.89 $\pm$ 2.08	24.73 $\pm$ 2.22	^b 0.018
Total cholesterol (mg/dl)	191.63 $\pm$ 39.85	189.45 $\pm$ 36.10	^b 0.727
HDL Cholesterol (mg/dl)	41.47 $\pm$ 9.37	39.83 $\pm$ 8.75	^b 0.270
LDL Cholesterol (mg/dl)	104.36 $\pm$ 26.34	102.16 $\pm$ 23.07	^b 0.587
Triglyceride (mg/dl)	207.85 $\pm$ 55.59	204.84 $\pm$ 63.19	^b 0.757
Gensini score	27.22 $\pm$ 21.20	41.52 $\pm$ 30.80	^b 0.001***

^aChi-Square test and ^bunpaired t test was done; Group I ≤ 40 year; Group II >40years; ***Highly significant

The Table 4 compares vessel score between two groups. Among 150 patients, older patients (>40years) have significantly higher rates of triple vessel disease (40.0%vs13.3%, $p<0.05$), while younger patients have more likely single vessel disease (30.7% vs 10.7%, $p<0.05$).

Table 5 showed the multivariate logistic regression analysis of the determinants likely to be associated with severe CAD in patients age ≥ 40 .

Table 4: Comparison of angiographic findings between two age groups by vessel score (n=150).

Variables	Group I, N (%)	Group II, N (%)	P value
No CAD	22 (29.3)	11 (14.7)	0.030*
SVD	23 (30.7)	8 (10.7)	0.002*
DVD	20 (26.7)	26 (34.7)	0.288
TVD	10 (13.3)	30 (40.0)	0.001*

Chi-Square test was done; Group I ≤ 40 years; Group II >40 years; *-Significant.

Table 5: Multivariate logistic regression analysis of the determinants of severity of CAD (age ≥ 40) (n=150).

Risk factors	Standardized Regression Coefficient (β)	S.E.	OR	95% CI of OR	P value
Diabetes mellitus	0.304	0.499	1.355	0.51 - 3.60	0.543
Hypertension	0.006	0.559	1.006	0.33 - 3.00	0.992
Smoking habit	1.693	0.476	5.435	2.13 - 13.81	0.000*
obesity	0.175	0.089	1.192	1.00 - 1.41	0.048*
Vessel (multiple)	1.537	0.476	4.652	1.83 - 11.82	0.001*
Gesini score	0.011	0.009	1.011	0.99 - 1.02	0.234

N= Total number of subjects; Smoking habit, BMI and multiple vessels were found significant independent predictors of severe CAD (Age ≥ 40); *-Significant

DISCUSSION

This comparative study was carried out at the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet. Total 150 patients of STEMI were enrolled into the study. Among them 75 young and 75 older patients were selected. The primary goal of the study was to determine and compare conventional risk factors and angiographic profile in ST-segment elevation myocardial infarction between young and older patients.

In this study, the mean age of the young patients was 27.22 ± 21.20 years and older patients were 41.52 ± 30.80 and the result was statistically significant. The age distribution of this study is almost similar with Khadkikar et al, who included young and older patients with coronary artery disease.¹⁸ In their study, the mean age of young patients were 33.56 years and the mean age in older group were 55.39 years. But Adhikari et al conducted a study on 495 ST elevation myocardial infarction patients. The mean age of the patients was 56.9 ± 12.4 years.¹⁹

In this study, male with ST elevation myocardial infarction were more frequently suffered than female. About 86.7% of the patients in young were male compared to older patients (85.3%). Our result was similar to Khadkikar et al.¹⁸ Men are more likely than women to suffer from STEMI, according to multiple studies. This finding could be the result of a confluence of biological, lifestyle, and behavioral variables that raise men's cardiovascular risk.^{20,21} Khan et al, conducted a study with ST elevated MI and non-ST elevated MI patients. In both group, male was predominant.⁸ Moreover, smoking as a risk factor for CAD is uncommon among female in our country, this explains the male predominance. About 94.30% male were

suffered from ST elevated MI and 86.20% were suffered from non-ST elevated MI. Yildirim et al, observed out of 539 patients 416 (77.2%) were male.²²

Findings from the study showed that, majority (80.0%) of the young patients were smoker compared to older patients. The result was significant. Numerous studies confirm to the fact that smoking poses a significant risk for STEMI.^{5,23,24} All of these study, smoker were more affected with ST elevated MI. Bhat et al, witnessed that, 37.88% young CAD Subjects were smoker compared to 12.12% smoker non-CAD controls.²⁵

According to present study, 28.0% older patients with ST elevated MI were hypertensive compared to young (14.7%) and the findings was significant. Our findings were consistent with. Alexander et al, where 28.3% of older patients were hypertensive and 14.2% young patients were hypertensive.²⁶ This could be due to increasing age, the prevalence of hypertension increases.²⁷

According to present study most of the young patients were non-diabetic (80.0%) compared with older patients (65.3%). The result of this finding was significant. Alexander et al, Khadkikar et al, Matsis et al also observed similar findings in their study.^{18,26,28} In their study, non-diabetic young and older patients were 86.8% vs 70.3%; 90.7% vs 51.5%; 86.6% vs 79% respectively. Majority of the patients (40.0%) in older age in present study were obese compared to young patients (30.7%). Our findings were completely opposite to Matsis et al.²⁸ In their study, about 50% young patients were obese and 36.6% older patients were obese.

Dyslipidemia was present in majority of older patients (90.7%) compared to young (85.3%) in our study and the

result was not significant. Murat observed dyslipidemia were more prevalent in young patient (34.5%) compared to older (16.6%), which is completely opposite to our study.²⁹ In their study Callachan, Alsheikh-Ali and Wallis observed that approximately less than 10% young patients had dyslipidemia.²⁴ Adhikari et al studied ST- segment elevation myocardial infarction patients and observed that both male and female were suffering from dyslipidemia.¹⁹

Regression analysis revealed smoking habit, obesity and multivessel disease were significant independent predictors of severe CAD. Studies show that a key predictor of severe CAD is male gender. Compared to females, men often experience a higher prevalence and severity of CAD.²¹ According to Duan et al, HTN has a major role in the development and severity of coronary artery lesions.³⁰

According to Yan et al, one of the main risk factors and an independent predictor of severe CAD is smoking.²⁰ Smokers have a higher risk of developing serious and extensive coronary artery disease. According to Adhikari et al., the most prevalent risk factors were smoking (57.8%), dyslipidaemia (45.5%), and hypertension (65%) in STEMI patients.¹⁹ In STEMI, Alexander et al, found smoking was the most prevalent risk factor in younger patients with myocardial infarction (MI) used it substantially more frequently than older patients.²⁶ In young individuals, smoking was a common (61.0%) cause of STEMI, according to Callachan, Alsheikh-Ali and Wallis.²⁴

Limitations

This study has few limitations. A small number of female patients were found. This is a single centered study. The sample size was not large enough to generalize the findings. The sample was taken conveniently, which could have an impact on the study's findings. Although Family history of CAD is a well-established risk factor for STEMI, it was not found to be statistically significant in our study.

CONCLUSION

In conclusion, young and old STEMI patients differ significantly in risk factors and angiographic profile. Smoking is an important risk factor for development of ST-elevation myocardial infarction in young patients, compared to older patients, where diabetes and hypertension were more significant. Analysis of the angiographic pattern revealed that, there was a preponderance of single vessel disease among young and triple vessel disease among older patients.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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