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First Acute Myocardial Infarction (AMI) in the Very Young Versus Older Population: A Clinical and Prognostic Comparison

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Abstract

Background:
South Asians, including Bangladeshis, experience AMI at younger age, yet local comparative data are limited.

Objective:
This study aimed to compare the very young (≤30 years) versus older (≥50 years) patients presenting with their first AMI.

Methods:
This cross-sectional comparative study was conducted at Dhaka Medical College and Hospital from July 2022 to December 2023, including 160 first-AMI patients, very young (n=80) and older (n=80), diagnosed by the Fourth Universal Definition (2018).

Results:
Mean age was 26.4±2.8 vs 61.7±7.4 years; male predominance was higher in the very young (87.5% vs 75.0%, p=0.048). Very young patients had more smoking (57.5% vs 30.0%, p<0.001) and family history (42.5% vs 20.0%, p=0.003), while older patients had more hypertension, diabetes, and dyslipidaemia (all p<0.05). STEMI, higher LVEF, and single-vessel disease were more frequent in the very young, whereas triple-vessel disease was more common in older patients. Older patients had longer stays and higher heart failure, shock, and mortality (all p<0.05).

Conclusion:
Very young first-AMI patients showed a smoking-dominant, single-vessel pattern with better in-hospital outcomes; older patients had cardiometabolic risk clustering, multivessel disease, and worse prognosis.

Keywords: Acute Myocardial Infarction, Young-Adults, Coronary Artery Disease, and Cardiovascular Risk Factors

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Introduction:

Ischaemic heart disease (IHD) remains the leading cause of death worldwide, contributing heavily to cardiovascular mortality and disability-adjusted life-years despite major gains in primary prevention and reperfusion therapy.[1] The Global Burden of Disease (GBD) 2019 analysis highlights that population ageing, rapid urbanization, and continued exposure to modifiable risks, particularly tobacco use, hypertension, dyslipidaemia, diabetes, and obesity, are sustaining the global IHD burden.[1] South Asia has undergone a rapid epidemiological transition, with non-communicable diseases now dominating mortality profiles; IHD and stroke are central to this shift.[2] In Bangladesh, GBD 2019 estimates similarly rank stroke and IHD among the top causes of death and disability, with high blood pressure, elevated fasting plasma glucose, and smoking identified as leading attributable risks.[2]

A consistent and clinically important feature of South Asian cardiovascular epidemiology is the earlier occurrence of myocardial infarction (MI), often 5–10 years younger than in many other regions, reflecting early clustering of metabolic and lifestyle risks such as central obesity, insulin resistance, dyslipidaemia, and smoking.[3,4] Against this background, acute MI in “very young” adults, commonly defined as MI occurring at or before 40–45 years, has emerged as a distinct subgroup of interest.[5,6] Although very young patients constitute a minority of overall MI admissions, multiple

datasets suggest a rising absolute number of cases in settings where tobacco exposure, sedentary behaviour, and dietary westernisation are increasing.[5,6] Prior studies describe very young MI patients as predominantly male, frequently smokers, and more likely to report a family history of premature coronary artery disease; they often present with ST-segment elevation MI (STEMI), single-vessel coronary disease, and comparatively preserved left ventricular function.[5,7] Registry evidence, including the Partners YOUNG-MI Registry, further shows that most very young patients have at least one modifiable risk factors, and that non-traditional contributors, including substance use and inflammatory conditions, may also play a role.[7] In contrast, older MI populations typically have a higher burden of cardiometabolic comorbidity and more complex, multivessel coronary disease, which can translate into worse short-term outcomes.[8] Importantly, even when early outcomes appear favourable in very young patients, long-term risks of recurrent events and mortality remain meaningful.[7-9]

In Bangladesh, available reports in younger MI cohorts commonly note male predominance, high smoking and dyslipidaemia prevalence, frequent anterior wall STEMI, and notable in-hospital complications, including arrhythmias and left ventricular failure.[10,11] However, much of the local literature is either limited to young-only cohorts or unstratified MI samples, leaving a shortage of direct, within-setting comparisons between very young and older patients.[10,11] Clarifying age-specific differences in risk factor patterns, presentation, angiographic disease burden, ventricular function, and in-hospital outcomes are particularly relevant in Bangladesh, where premature MI carries substantial loss of productive life-years and may require tailored secondary prevention. Therefore, this study aimed to compare demographic characteristics, cardiovascular risk profiles, clinical and angiographic features, and in-hospital outcomes between very young (≤30 years) and older (≥50 years) patients presenting with first acute myocardial infarction (AMI).

Methods:

This cross-sectional comparative study was conducted in the Department of Cardiology, Dhaka Medical College and Hospital, Dhaka, Bangladesh, from July 2022 to December 2023. A total of 160 consecutive patients with first acute myocardial infarction (AMI) were enrolled and stratified by age into a very young group (≤30 years, n=80) and an older group (≥50 years, n=80). First AMI was diagnosed using the Fourth Universal Definition of Myocardial Infarction (2018)[12] requiring a rise and/or fall of cardiac troponin with at least one value above the 99th percentile upper reference limit plus electrocardiographic and/or imaging evidence of ischaemia. Adults (≥18 years) presenting within 24 hours of symptom onset and providing informed consent were included. Exclusion criteria were prior MI or revascularization, significant valvular or congenital heart disease, advanced hepatic or renal dysfunction (creatinine >2.0 mg/dL), chronic inflammatory or autoimmune disease, and incomplete records. Data were collected using a structured proforma via interview, bedside assessment, and chart review, covering demographics, risk factors, clinical presentation, laboratory results, echocardiography, angiography, treatments, complications, and in-hospital mortality. SPSS v26 was used; t-test and Chi-square/Fisher's exact tests compared groups, and multivariable logistic regression identified independent predictors, with $p<0.05$ considered significant.

Results:

Across 160 first-AMI patients, very young (≤30 years, n=80) and older (≥50 years, n=80) groups differed meaningfully in baseline profile, presentation, disease burden, and outcomes. Very young patients were predominantly male (87.5% vs 75.0%, p=0.048) and presented more often with STEMI (78.8% vs 63.8%, p=0.041), shorter symptom-to-hospital time (5.4±2.1 vs 7.2±3.4 hours, p=0.002), fewer signs of congestion (Killip ≥ II: 22.5% vs 47.5%, p=0.002), and lower systolic blood pressure at admission (118±16 vs 128±18 mmHg, p=0.001) (Table-I)

Risk factor patterns diverged: very young patients had higher smoking (57.5% vs 30.0%, p<0.001) and family history of CAD (42.5% vs 20.0%, p=0.003), whereas older patients had markedly higher hypertension (72.5%), diabetes (65.0%), and dyslipidaemia (70.0%) (all p≤0.014) (Table-II). Biochemically, older patients showed higher fasting glucose (134±39 vs 108±26 mg/dL, p<0.001) and creatinine (1.35±0.29 vs 1.02±0.18 mg/dL, p<0.001), while very young patients had slightly higher HDL-C (39±8 vs 36±7 mg/dL,

p=0.019) and higher hemoglobin (13.8±1.4 vs 12.6±1.7 g/dL, p<0.001) (Table-III).
Echocardiography and angiography demonstrated higher LVEF in the very young (47.5±8.9% vs 42.6±9.8%, p=0.001) with more single-vessel disease (47.5% vs 23.8%, p=0.002), while older patients more often had triple-vessel disease (42.5% vs 21.3%, p=0.005) (Table-IV).
Outcomes favored the very young, with shorter stay (4.8±1.6 vs 6.2±2.1 days, p<0.001) and lower heart failure, shock, mortality, and composite adverse events (all p≤0.029); independent predictors included age ≥50, hypertension, diabetes, LVEF <40%, and multivessel disease (Table-V).

Table-I: Baseline characteristics and clinical presentation at admission (N=160)

Variables	Very Young (n=80) no. (%)	Older (n=80) no. (%)	Total (N=160) no. (%)	p-value
Age (years), mean±SD	26.4±2.8	61.7±7.4	44.1±16.5	<0.001
Male sex	70(87.5)	60(75.0)	130(81.3)	0.048
Urban residence	55(68.8)	46(57.5)	101(63.1)	0.148
BMI (kg/m^2), mean±SD	25.8±3.2	26.4±3.8	26.1±3.5	0.242
Socioeconomic status (middle+high)	49(61.3)	44(55.0)	93(58.1)	0.429
STEMI	63(78.8)	51(63.8)	114(71.3)	0.041
NSTEMI	17(21.2)	29(36.2)	46(28.7)	-
Anterior-wall infarction	35(43.8)	28(35.0)	63(39.4)	0.264
Inferior-wall infarction	28(35.0)	33(41.3)	61(38.1)	-
Chest-pain-to-hospital time (h), mean±SD	5.4±2.1	7.2±3.4	-	0.002
Dyspnea	49(61.3)	62(77.5)	111(69.4)	0.033
Killip class ≥ II	18(22.5)	38(47.5)	56(35.0)	0.002
Systolic BP (mmHg), mean±SD	118±16	128±18	-	0.001
Heart rate (bpm), mean±SD	93±14	89±13	-	0.066

Table-II: Cardiovascular risk factors (N=160)

Risk factor	Very Young (n=80) no. (%)	Older (n=80) no. (%)	p-value
Current smoker	46(57.5)	24(30.0)	<0.001
Hypertension	28(35.0)	58(72.5)	<0.001
Diabetes mellitus	20(25.0)	52(65.0)	<0.001
Dyslipidaemia	40(50.0)	56(70.0)	0.014
Family history of CAD	34(42.5)	16(20.0)	0.003
Obesity (BMI ≥25 kg/m^2)	37(46.3)	41(51.3)	0.545
Physical inactivity	49(61.3)	53(66.3)	0.505
Alcohol intake	12(15.0)	9(11.3)	0.491

Table-III: Laboratory and biochemical profile (N=160)

Parameter	Very Young (n=80) mean±SD	Older (n=80) mean±SD	Reference range	p-value
Troponin-I (ng/mL)	9.8±3.7	10.5±4.0	≤0.03	0.243
CK-MB (U/L)	135±54	142±63	≤25	0.471
Fasting glucose (mg/dL)	108±26	134±39	70–110	<0.001
Total cholesterol (mg/dL)	205±42	217±48	<200	0.093
LDL-C (mg/dL)	132±34	142±39	<100	0.071
HDL-C (mg/dL)	39±8	36±7	>40	0.019
Triglycerides (mg/dL)	190±62	176±54	<150	0.164
Serum creatinine (mg/dL)	1.02±0.18	1.35±0.29	0.6–1.3	<0.001
Hemoglobin (g/dL)	13.8±1.4	12.6±1.7	13–17	<0.001

Table-IV: Echocardiography and coronary angiography findings (N=160)

Parameter	Very Young (n=80) no. (%)	Older (n=80) no. (%)	p-value
LVEF (%), mean±SD	47.5±8.9	42.6±9.8	0.001
RWMA present	57(71.3)	62(77.5)	0.359
Single-vessel disease	38(47.5)	19(23.8)	0.002
Double-vessel disease	25(31.3)	27(33.8)	0.745
Triple-vessel disease	17(21.3)	34(42.5)	0.005
Culprit artery LAD	46(57.5)	40(50.0)	0.354
Thrombus noted	19(23.8)	14(17.5)	0.317
TIMI flow grade 3 post-PCI	69(86.3)	60(75.0)	0.077

Table-V: Treatment, in-hospital outcomes, and predictors of adverse events (N=160)

Variable	Very Young (n=80) no. (%)	Older (n=80) no. (%)	p-value
Treatment			
Primary PCI	42(52.5)	31(38.8)	0.092
Thrombolysis	29(36.3)	32(40.0)	0.647
Conservative management	9(11.3)	17(21.3)	0.091
Door-to-balloon time (min), mean±SD	83±22	96±28	0.003
DAPT	80(100)	80(100)	-
Statin	78(97.5)	76(95.0)	0.41
Beta-blocker	73(91.3)	69(86.3)	0.317
ACEI/ARB	70(87.5)	66(82.5)	0.372
In-hospital outcomes			
Hospital stays (days), mean±SD	4.8±1.6	6.2±2.1	<0.001
Heart failure	12(15.0)	28(35.0)	0.005
Arrhythmia	9(11.3)	16(20.0)	0.138
Cardiogenic shock	3(3.8)	11(13.8)	0.028
Reinfarction	2(2.5)	5(6.3)	0.243
In-hospital mortality	2(2.5)	9(11.3)	0.029
Composite adverse event	16(20.0)	37(46.3)	0.001
Multivariable predictors of adverse events			
Age ≥50 years, aOR (95% CI)	2.76(1.31–5.83)	-	0.007
Hypertension, aOR (95% CI)	2.11(1.04–4.29)	-	0.038
Diabetes mellitus, aOR (95% CI)	2.58(1.22–5.44)	-	0.013
LVEF <40%, aOR (95% CI)	3.22(1.45–7.16)	-	0.004
Multivessel disease, aOR (95% CI)	2.85(1.32–6.16)	-	0.008
STEMI presentation, aOR (95% CI)	1.64(0.78–3.42)	-	0.189

Discussion:

The present study demonstrates that first AMI in very young adults (≤30 years) differs meaningfully from AMI in older patients (≥50 years) within the same Bangladeshi tertiary-care setting. Very young patients were predominantly male and had a risk profile dominated by active smoking and a positive family history of premature coronary artery disease, with substantially lower frequencies of hypertension, diabetes, and dyslipidaemia than older patients. This pattern is consistent with the systematic review by Lei and Bin, which reported higher smoking and familial predisposition but lower hypertension and diabetes in younger first-AMI patients compared with older cohorts,[13] and with prior comparative work showing

smoking enrichment in young patients while cardiometabolic risk clusters in older individuals.[14] Local evidence similarly describes young Bangladeshi AMI patients as largely male smokers with notable familial clustering, while traditional metabolic risk factors rise with age,[15,16] supporting a model where modifiable lifestyle exposure interacts with genetic susceptibility to trigger premature events in South Asians.[15-19] In our cohort, older patients showed the expected cardiometabolic gradient, paralleling Bangladeshi series that report markedly higher hypertension and diabetes among older or non-young CAD patients;[20] even though young patients can already exhibit overweight and dyslipidaemia, these tend to be less prominent than in older regional cohorts, as noted by Ahmed et al[18] and Dan et al.[17] Clinically, the predominance of STEMI in the very young group aligns with South Asian reports where younger AMI patients frequently present with STEMI and anterior wall infarction, often related to LAD involvement,[5,16,19,21] and Bangladeshi data in patients ≤30 years also indicate more single-vessel disease and LAD involvement in STEMI than NSTEMI.[22] Our angiographic findings, with more single-vessel disease in the very young and more triple-vessel disease in older patients, mirror patterns across South Asia [21-24] and those described by Malik et al and Tamrakar et al, where younger patients more commonly have focal disease while older patients exhibit diffuse atherosclerosis;[16,19] importantly, the presence of multivessel disease in a meaningful minority of very young patients cautions against framing premature AMI as benign. Outcomes followed the same gradient, with fewer heart failure episodes, cardiogenic shock, and deaths among very young patients, consistent with reports of more favorable in-hospital prognosis in young AMI [5,19,24] and with Bangladeshi comparative findings from Karim et al.[15] Our multivariable model, identifying older age, hypertension, diabetes, reduced LVEF, and multivessel disease as independent predictors of adverse in-hospital events, reinforces that structural myocardial compromise and cardiometabolic burden, rather than age alone, drive early complications.[23,24] Differences from some South Asian series, in which dyslipidaemia and obesity are strongly over-represented even in very young AMI, may reflect regional variation, referral patterns, or under-recognition of subclinical dyslipidaemia in younger adults in our setting;[17,18] nevertheless, the convergent implication is clear, premature AMI in Bangladesh is tightly linked to preventable risk exposures, requiring aggressive tobacco control, early risk screening, and sustained secondary prevention across age groups.[13,15-18]

Limitations:

This single-centre study used a relatively small, non-random sample and captured only in-hospital outcomes, limiting generalizability and precluding assessment of long-term prognosis. In addition, some risk factors were self-reported, so recall and residual confounding biases cannot be entirely excluded.

Conclusion:

In this Bangladeshi cohort, very young first AMI patients were predominantly male and more often smokers. They had more single-vessel disease, better left ventricular function, and more favorable in-hospital outcomes than older patients. Older patients exhibited a heavier burden of hypertension, diabetes, dyslipidemia, and multivessel coronary disease, which translated into higher rates of complications and mortality. These findings highlight the need for aggressive primordial and primary prevention targeting tobacco use and familial risk in younger adults, alongside intensified risk factor control and timely revascularization in older first AMI patients.

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