Original Article

Comparison of Clinical Characteristics and Risk Factor Profile Between Very Young and Older Patients Presenting with First Acute Myocardial Infarction

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Abstract

Introduction: Cardiovascular diseases are the leading global cause of mortality, accounting for 31% of deaths and acute myocardial infarction (AMI) is responsible for 85% of fatalities. Very young patients (≤ 30 years) with first acute MI often exhibit distinct clinical presentations compared to older patients (≥ 50 years). Our objective was to compare and analyze the clinical characteristics and risk factor profiles between very young and older patients presenting with first acute MI.

Methods: This cross-sectional analytical study was conducted on 160 patients with first acute MI in the Department of Cardiology, Dhaka Medical College & Hospital (DMCH), Sir Salimullah Medical College & Mitford Hospital, National Institute of Cardiovascular Diseases (NICVD) and Bangladesh Specialized Hospital (BSH), Dhaka, Bangladesh from July 2022 to December 2023. Among the study subjects, 80 patients were included in the very young (≤ 30 years) group (Group I) and another 80 patients were included in the older (≥ 50 years) group (Group II)The patients/attendants involved were briefed about the study and provided consent forms. A detailed history, thorough physical examination, and risk factor assessment of each patient were carried out.

Results: Among the baseline characteristics there was no statistically significant difference between the two age groups. Symptoms such as chest pain and sweating were significantly more prevalent in the very young group ($p < 0.001$) compared to older group of patients. Certain risk factors like smoking, obesity, dyslipidemia, family history of coronary artery disease (CAD), and substance abuse were significantly more prevalent in very young patients ($p<0.001$). Complications like cardiogenic shock were significantly more common in very young patients ($p=0.008$) and regarding biochemical parameters, significant differences were found in fasting blood sugar, serum sodium, serum troponin-I, C-reactive protein (CRP), lipid profile, serum vitamin-D, and serum homocysteine levels between the two age groups ($p<0.05$). Notably, serum vitamin D levels were significantly lower and serum homocysteine levels were significantly higher in very young patients ($p<0.001$ in both parameters). Multivariate analysis in very young patients showed smoking, dyslipidemia, obesity family history of CAD, substance abuse and CRP level were significant independent predictors of first acute MI occurrence. On the other hand, multivariate analysis in older patients showed diabetes, hypertension and serum vitamin-D level were significant independent predictors of first acute MI occurrence.

Conclusions: Our study revealed significant differences between very young and older patients with first acute MI. Very young patients exhibited more typical clinical features, higher complication rates, and a greater prevalence of certain risk factors such as smoking, obesity, dyslipidemia, family history of CAD, and substance abuse. However, the older group of people had more atypical symptoms with predominant conventional risk factors. Serum vitamin D was significantly lower and serum homocysteine was considerably higher in very young patients.

Keywords: Risk factors, Acute MI, Very Young, Older Group

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Introduction

The most notable features of coronary artery disease (CAD) in the South Asian population are 2-4 fold higher prevalence, incidence, hospitalization, and mortality; and 5-10 fold higher rates of myocardial infarction (MI) and death before the age of 40 years [1]. Bangladeshis are very much prone to developing premature CAD like other South Asians [2]. It constitutes an important problem for the patient and the treating physicians because of the devastating effect of this disease on the more active lifestyle of this sub-group. In addition, these very young patients have different clinical characteristics, risk factor profiles, and prognoses than older patients [3]. Other contributing

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factors like obesity, lack of exercise, dyslipidemia, substance abuse, C-reactive protein (CRP), hyperuricemia, hyperhomocysteinemia, low serum vitamin-D level, and oral contraceptive pill use in very young women have been implicated in the pathogenesis of acute myocardial infarction (AMI) [4,5]. However, acute myocardial infarction has been recognized in the very young age groups more frequently in recent years [6]. But it has been poorly described in this group of people. The cut-off age of 30 has been used in most studies to define very young patients with acute myocardial infarction [7]. It is estimated that less than 2% of all acute MI patients are aged ≤ 30 years [7].

The prevalence of AMI has progressively increased in Bangladesh particularly among the very young (≤ 30 years) urban population in recent years. The very young patients (≤ 30 years) with first acute myocardial infarction are of particular interest considering the disability & mortality. The conventional risk factors for older people did not fully explain the myocardial infarction of very young people in the community. In comparison, men have markedly higher rates of AMI than women. The rate of acute myocardial infarction in women has begun to rise sharply after menopause and become the same for men. The main risk factors for older patients with AMI are diabetes, hypertension, smoking & obesity. Although there are many studies on AMI, few studies have focused on the first acute myocardial infarction in the very young age group of ≤ 30 years. Besides, there is hardly available data in our country regarding very young with first acute myocardial infarction. In this study, we tried to find out the difference in clinical and biochemical characteristics between very young (≤ 30 years) and older (≥ 50 years) AMI patients with first acute MI.

Methods

This cross-sectional analytical study was conducted in the Department of Cardiology of Dhaka Medical College & Hospital. However, some patients were recruited (especially very young) from Sir Salimullah Medical College & Mitford Hospital, National Institute of Cardiovascular Diseases (NICVD), Bangladesh Specialized Hospital (BSH), Dhaka, Bangladesh. The study was conducted from July 2022 to December 2023 and approved by the Ethical Review Committee of DMCH. Patients with first acute myocardial infarction [ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI)] and having ages ≤ 30 years and ≥ 50 years were included in the study by convenient purposive sampling. Patients with a previous history of MI or revascularization [percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG)], congenital or valvular heart disease, known case of chronic kidney disease (CKD)/ Heart failure/ Malignancy/ Gout/ Inflammatory diseases [rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), osteoarthritis (OA)], chronic alcoholism & pregnancy were excluded from the study. Detailed history and thorough physical examination were done and risk factors were noted. Information about age, sex, history of smoking/ smokeless tobacco, substance abuse, dyslipidemias, diabetes mellitus, hypertension, and family history of premature CAD, CKD, heart failure, malignancy, gout, inflammatory diseases (RA, SLE, OA) and previous history of MI / PCI / CABG was obtained through self-report. Patients were classified as obese with body mass index (BMI) ≥25 kg/m2. ECG was recorded and biochemical investigations were undergone. With all aseptic precautions overnight fasting blood sample was drawn by the lab assistant with the subject in the sitting position, with limited use of a tourniquet, and was sent to the laboratory for analysis. Serum uric acid level was determined in mg/dl by the enzymatic kinetic method using uricase and peroxidase. Serum vitamin D level was determined in ng/ml by radioimmunoassay method. Serum homocysteine level was determined in μmol/L by fluorescence polarization immunoassay method. The sample was taken from the patients for other biochemical parameters such as fasting lipid profile, troponin-I, Hb%, CRP, serum creatinine, and serum electrolytes. Left ventricular ejection fraction (LVEF), regional wall motion abnormality (RWMA), and diastolic dysfunction were documented by echocardiography. After analysis of all clinical and biochemical risk factors, the information was recorded properly in the performed data collection sheet. After compiling data from all patients, statistical analysis was done.

Results

A total of 160 patients were studied & divided into two groups according to the exclusion & inclusion criteria. Among the study subjects, 80 patients were included in the very young (≤ 30 years) group (Group I) and another 80 patients were included in the older (≥ 50 years) group (Group II). In Group I, there were 57 male and 23 female patients. In contrast, 65 were male and 15 were female patients in Group II (Figure 1). In both groups, male gender was predominant. There was no statistically significant difference in gender distribution between the two age groups ($p = 0.137$). Chest pain and sweating were the most prevalent symptoms in Group I. Conversely, shortness of breath (SOB), epigastric pain, vomiting, and syncope were the most prevalent symptoms in Group II (Table 1). Group-I patients had a higher prevalence of smoking, dyslipidemia, obesity, family history of CAD, and substance abuse. Conversely, hypertension and diabetes mellitus (DM) were more prevalent in Group II (Table 2). The median systolic blood pressure (SBP) and diastolic blood pressure (DBP) were significantly higher in Group II compared to Group I. Other parameters of clinical examination findings had no

statistical significance between the two age groups (Table 3). Cardiogenic shock was significantly more prevalent in Group I compared to Group II, while VF was exclusively observed in Group I. Other complications were similarly present in both groups (Table 4). Fasting blood sugar (FBS), serum sodium, troponin-I, CRP, total cholesterol (TC), triglycerides (TG), high density lipoprotein-cholesterol (HDL-C), and low density lipoprotein-cholesterol (LDL-C) all showed statistically significant differences between the two age groups (Table 5). Group I patients showed lower serum vitamin-D levels and higher serum homocysteine levels compared to Group II patients. Serum uric acid levels had no statistically significant difference between the two age groups (Table 6). Group II patients exhibited a higher prevalence of anterior MI compared to Group I patients. STEMI was more prevalent in Group I and conversely, NSTEMI was more prevalent in Group II and other electrocardiography (ECG) changes had no statistically significant difference between the two groups (Table 7). The median LVEF was significantly higher in Group I compared to Group II. Additionally, a greater proportion of Group II patients exhibited good left ventricular (LV) systolic function compared to the Group I patients (Table 8). Univariate logistic regression analysis showed that smoking, dyslipidemia, obesity, family history of CAD, substance abuse and serum CRP level were statistically significant risk factors for first acute MI occurrence in Group-I patients, whereas DM, hypertension and serum vitamin-D levels were statistically significant risk factors for first acute MI occurrence in Group-II patients (Table 9 & Table 10). The multivariate model included all variables with a p-value <0.05 and odds ratio (OR) >1 in the univariate analysis. Smoking, dyslipidemia, obesity, family history of CAD, substance abuse and serum CRP level were significant independent predictors of first acute MI occurrence in Group-I patients. Conversely, DM, hypertension and serum vitamin-D level were significant independent predictors of first acute MI occurrence in Group-II patients (Table 11).

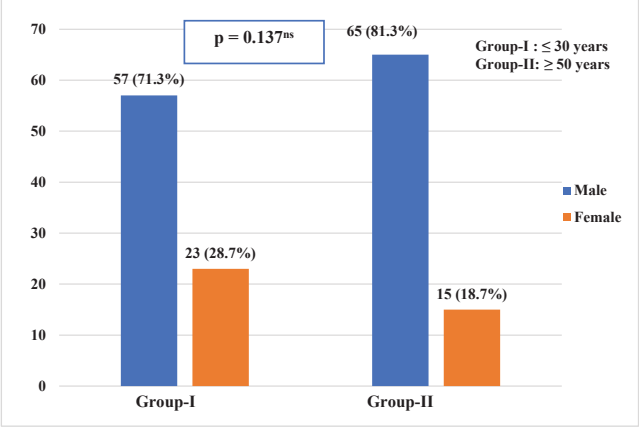


Figure-1: Bar diagram showing comparison of gender distribution between two age groups (n=160)

Table 1: Comparison of presenting symptoms between two age groups (n=160)

Variables	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Frequency (%)	Frequency (%)	
Chest pain	76 (95)	59 (73.8)	<0.001[s]
Sweating	64 (80)	40 (50)	<0.001[s]
Shortness of breath	11 (13.8)	36 (45)	<0.001[s]
Palpitation	9 (11.3)	10 (12.5)	0.807[ns]
Epigastric pain	7 (8.8)	21 (26.3)	0.004[s]
Syncope	3 (3.8)	10 (12.5)	0.043[s]
Nausea/vomiting	1 (1.3)	21 (26.3)	<0.001[s]

Group I= ≤ 30 years, Group II= ≥ 50 years
p-values were obtained by the Chi-Square test
MI: myocardial infarction; s: significant; ns: not significant.

Table 2: Comparison of risk factors between two age groups (n=160)

Variables	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Frequency (%)	Frequency (%)	
Smoking	60 (75)	35 (43.8)	<0.001[s]
Diabetes mellitus	27 (33.8)	42 (52.5)	0.017[s]
Hypertension	38 (47.5)	60 (75)	<0.001[s]
Dy slipidemia	58 (72.5)	41 (51.3)	0.006[s]
Obesity	30 (37.5)	15 (18.8)	0.008[s]
Family H/O CAD	37 (46.3)	16 (20)	<0.001[s]
Smokeless tobacco	5 (6.3)	11 (13.8)	0.114[ns]
Substance abuse	11 (13.8)	2 (2.5)	<0.001[s]

Group I= ≤ 30 years, Group II= ≥ 50 years; p-values were obtained by the Chi-Square test
MI: myocardial infarction; s: significant; ns: not significant; H/O: history of; CAD: coronary artery disease.

Table 3: Comparison of clinical examination findings between two age groups (n=160)

Variables	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Frequency (%)	Frequency (%)	
Raised JVP	9 (11.3)	16 (20)	[c]0.127[ns]
Oedema	1 (1.3)	6 (7.5)	[f]0.117[ns]
S3	9 (11.3)	7 (8.80	[c]0.598[ns]
Lung crepitations	8 (10)	7 (8.8)	[c]0.786[ns]
	Median	Median	
Radial Pulse (bpm)	76	74	[u]0.536[ns]
RR (breaths/minute)	16	16	[u]0.229[ns]
SBP (mmHg)	130	160	[u]0.004[s]
DBP (mmHg)	80	95	[u]0.029[s]

Group I= ≤ 30 years, Group II= ≥ 50 years p-values were obtained by the Chi-Square test (c), fisher exact test (f), and Mann-Whitney U test
MI: myocardial infarction; s: significant; ns: not significant; JVP: jugular venous pressure; RR: respiratory rate; SBP: systolic blood pressure; DBP: diastolic blood pressure.

Table 4: Comparison of complications between two age groups (n=160)

Variables	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Frequency (%)	Frequency (%)	
Acute LVF	8 (10)	7 (8.8)	$^{c}0.786^{ns}$
Cardiogenic shock	13 (16.3)	3 (3.8)	$^{c}0.008^{s}$
Tachyarrhythmia	9 (11.3)	6 (7.5)	$^{c}0.401^{ns}$
VT	6 (7.5)	6 (7.5)	
VF	3 (3.8)	0 (0)	
Bradyarrhythmia	14 (17.5)	11 (13.8)	$^{c}0.536^{ns}$
1st degree AV block	2 (2.5)	3 (3.8)	
2nd degree AV block	1 (1.3)	2 (2.5)	
CHB	8 (10)	3 (3.8)	
BBB	3 (3.8)	3 (3.8)	

Group I= ≤ 30 years, Group II= ≥ 50 years; p-values were obtained by the Chi-Square test (c); MI: myocardial infarction; s: significant; ns: not significant; LVF: left ventricular failure; VT: ventricular tachycardia; VF: ventricular fibrillation; AV: atrio-ventricular; CHB: complete heart block; BBB: bundle branch block.

Table 5: Comparison of biochemical parameters between two age groups (n=160)

Variables (unit)	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Mean±SD	Mean±SD	
Hemoglobin (gm/dl)	14.42±0.98	14.35±0.83	$^{t}0.634^{ns}$
FBS (mmol/L)	6.32±2.27	8.20±3.29	$^{t<}0.001^{s}$
S. creatinine (mg/dl)	1.04±0.24	1.09±0.25	$^{t}0.214^{ns}$
Na^{+} (mmol/L)	138.45±3.06	136.97±3.70	$^{t}0.007^{s}$
K^{+} (mmol/L)	4.10±0.38	4.11±0.38	$^{t}0.960^{ns}$
Cl^{-} (mmol/L)	100.57±3.22	101.22±2.56	$^{t}0.160^{ns}$
	Median	Median	
Troponin-I (ng/ml)	8.63	6.80	$^{u<}0.001^{s}$
CRP (mg/l)	53	38	$^{u<}0.001^{s}$
TC (mg/dl)	194	184	$^{u<}0.001^{s}$
TG (mg/dl)	186	146	$^{u<}0.001^{s}$
HDL-C (mg/dl)	35	42	$^{u<}0.001^{s}$
LDL-C (mg/dl)	146	113	$^{u<}0.001^{s}$

Group I= ≤ 30 years, Group II= ≥ 50 years; p-values were obtained by the independent student t-test & Mann-Whitney u-test; MI: myocardial infarction; s: significant; ns: not significant; FBS: fasting blood sugar; CRP: C-reactive protein; TC: total cholesterol; TG: triglycerides: HDL-C: high density lipoprotein-cholesterol: LDL-C: low density lipoprotein-cholesterol.

Table 6: Comparison of emerging biochemical risk factors between two age groups (n=160)

Variables (unit)	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Median	Median	
Serum vit-D (ng/ml)	16	28	$^{u<}0.001^{s}$
Serum uric acid (mg/dl)	6.30	5.85	$^{u}0.651^{ns}$
S. homocysteine (µmol/L)	8.30	7.15	$^{u}0.001^{s}$

Group I= ≤ 30 years, Group II= ≥ 50 years; p-values were obtained by Mann Whitney u test; MI: myocardial infarction; s: significant; ns: not significant.

Table 7: Comparison of types of first acute MI, location of infarction, and other ECG changes between two age groups (n=160)

Variables	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Frequency (%)	Frequency (%)	
AMI type			
STEMI	49 (61.3)	37 (46.3)	$^{c}0.057^{ns}$
NSTEMI	31 (38.8)	43 (53.8)	$^{c}0.057^{ns}$
Location of infarction			
Anterior	4 (5)	15 (18.8)	$^{c}0.007^{s}$
Inferior	23 (28.8)	21 (26.3)	$^{c}0.723^{ns}$
Lateral	0 (0)	2 (2.5)	$^{f}0.497^{ns}$
ST depression	45 (56.3)	47 (58.8)	$^{c}0.749^{ns}$
T-inversion	72 (90)	68 (85)	$^{c}0.339^{ns}$
Pathological Q	48 (60)	36 (45)	$^{c}0.057^{ns}$
Tachyarrhythmia	7 (8.8)	4 (5)	$^{c}0.349^{ns}$
AV block	5 (6.3)	5 (6.3)	$^{c>}0.99^{ns}$
BBB	3 (3.8)	3 (3.8)	$^{f>}0.99^{ns}$

Group I= ≤ 30 years, Group II= ≥ 50 years; p-values were obtained by chi-square test (c) and Fisher exact test (f);

MI: myocardial infarction; s: significant; ns: not significant; ECG: electrocardiography; AMI: acute myocardial infarction; STEMI: ST-segment elevation myocardial infarction; NSTEMI: non-ST-segment elevation myocardial infarction; AV: atrio-ventricular; BBB: bundle branch block.

Table 8: Comparison of echocardiographic findings between two age groups (n=160)

Variables	Groups of first Acute MI patients (n=160)		p-value
	Group-I (n = 80)	Group-II (n = 80)	
	Median	Median	
LVIDd (mm)	42	42	$^{u}0.182^{ns}$
LVIDs (mm)	28	28	$^{u}0.705^{ns}$
LVEF (%)	47	43	$^{u}0.046^{s}$
LV systolic function	Frequency (%)	Frequency (%)	
Good (EF ≥50%)	4 (5)	16 (20)	
Mild LVSD (EF 40-49%)	62 (77.5)	48 (60)	$^{c}0.023^{s}$
Moderate LVSD (EF 30-39%)	8 (10)	11 (13.8)	
Severe LVSD (EF < 30%)	6 (7.5)	5 (6.3)	

Group I= ≤ 30 years, Group II= ≥ 50 years
p-values were obtained by chi-square test (c) and Mann Whitney u test;

MI: myocardial infarction; s: significant; ns: not significant; LVIDd: left ventricular internal diameter end-diastole; LVIDs: left ventricular internal diameter end-systole; LV: left ventricular; EF: ejection fraction; LVSD: left ventricular systolic dysfunction.

Table 9: Univariate logistic regression analysis in Group-I patients (n=80)

Variables	p-value	OR	95% CI	
			Lower	Upper
Smoking	<0.001	3.857	0.508	1.970
Diabetes mellitus	0.017	0.461	0.243	4.107
Dyslipidaemia	0.006	2.508	0.770	1.299
Hypertension	<0.001	0.302	0.154	6.479
Obesity	0.009	2.600	0.791	1.264
Family H/O CAD	0.001	3.442	0.586	1.358
Substance abuse	0.007	6.142	1.387	7.198
CRP	<0.001	1.073	0.904	0.961
Serum uric acid	0.157	0.965	0.986	1.090
Serum vitamin-D	<0.001	0.918	1.049	1.131
Serum homocysteine	0.214	1.018	0.955	1.010

OR: Odds ratio; CI: Confidence interval; H/O: history of; CAD: coronary artery disease; CRP: C-reactive protein; Group-I: ≤ 30 years.

Table 10: Univariate logistic regression analysis in Group-II patients (n=80)

Variables	p-value	OR	95% CI	
			Lower	Upper
Smoking	<0.001	0.259	0.132	0.508
Diabetes mellitus	0.017	2.170	1.146	4.107
Dyslipidaemia	0.006	0.399	0.207	0.770
Hypertension	<0.001	3.316	1.697	6.479
Obesity	0.009	0.385	0.187	0.791
Family H/O CAD	0.001	0.291	0.144	0.586
Substance abuse	0.007	0.680	0.628	1.495
CRP	<0.001	0.932	0.904	0.961
Serum uric acid	0.157	1.037	0.986	1.090
Serum vitamin D	<0.001	1.089	1.049	1.131
Serum homocysteine	0.214	0.982	0.955	1.010

OR: Odds ratio; CI: Confidence interval; H/O: history of; CAD: coronary artery disease; CRP: C- reactive protein; Group-II: ≥ 50 years.

Table 11: Multivariate logistic regression analysis in both age groups

Group-I				
Variables	p-value	OR	95% CI	
			Lower	Upper
Smoking	<0.001	12.000	3.948	36.479
Dyslipidemia	<0.001	8.885	2.913	27.100
Obesity	<0.001	21.889	5.622	85.216
Family H/O CAD	<0.001	17.694	5.302	59.050
Substance abuse	<0.001	4.337	0.984	6.187
CRP	<0.001	1.077	1.036	1.120
Group-II				
Diabetes mellitus	<0.001	12.686	3.523	45.684
Hypertension	<0.001	26.619	6.875	103.071
Serum vitamin D	<0.001	1.111	1.060	1.164

OR: Odds ratio: CI: Confidence interval: H/O: history of; CAD: coronary artery disease;
CRP: C- reactive protein; Group-I: ≤ 30 years; Group-II: ≥ 50 years.

Discussion

In this study, there were 57 (71.3%) male patients and 23 (28.7%) female patients in the very young group. In contrast, 65 (81.3%) male patients and 15 (18.7%) female patients were in the older group. However, the statistical difference was not significant (p=0.137). Chest pain (95%) and sweating (80%) were predominant in the very young (≤ 30 years) group. Conversely, in the older (≥ 50 years) group, chest pain (73.8%) and SOB (45%) were predominant. Nausea/ vomiting (26%), epigastric pain (26.3%) and syncope (12.5%) were significantly higher in the older group than in the very young group. Statistical analysis revealed significant differences in all of these symptoms ($p < 0.05$), indicating distinct clinical profiles by age.

Notably, cardiogenic shock was significantly more prevalent in the very young group compared to the older group (16.3% vs. 3.8%, $p = 0.008$), while ventricular fibrillation (VF) was exclusively observed in the very young group (33.3%). However, other complications such as acute LVF, tachyarrhythmia, bradyarrhythmia, and cardiac arrest showed no statistically significant differences between the two age groups ($p>0.05$). Some relevant studies conducted in India showed that the incidence rate of cardiogenic shock varies from 0.2% [8] to 36.9% [9]. According to several Bangladeshi studies, very young patients with CAD had a prevalence of cardiogenic shock ranging from 0.8% [10,11]. Notably, smoking emerges as a prominent risk factor, with a significantly higher prevalence in the very young group compared to the older group (75% vs. 43.8%, $p<0.001$), highlighting its robust association with very young patients of first AMI. Smokers among Nepalese patients were found in 58.6% [12] to 80.8% [13] of the study population. Similarly, up to 77.4% [14] of Bangladeshi patients and 14.3% [15] to 64.7% [16] of Pakistani patients were

smokers. However, some previous studies also identified the use of smokeless tobacco consumption as a risk factor for acute MI with a frequency ranging from 0.35 [17] to 60.6% [18]. According to an additional Indian study, 93.8% of the patients smoked or used smokeless tobacco [19].

Additionally, diabetes mellitus and hypertension exhibited significantly higher frequencies in the older group compared to the very young group, underscoring their importance as traditional cardiovascular risk factors in older individuals experiencing their first AMI ($p < 0.05$). Research conducted in Pakistan and Bangladesh revealed that over 50% of patients had diabetes, which is the greatest prevalence [20,21]. According to Bhardwaj et al., diabetes mellitus was present in up to 80.6% of young Indian patients with CAD [22].

Another study revealed that hypertension prevalence in older patients ranged from 8.85 [23] to 80.0% [20]. Some studies found that the percentage of hypertension in older Nepalese patients ranged from 27.8% [24] to 57.5% [25]. Likewise, older patients from Pakistan had a prevalence of hypertension ranging from 10.2% [15] to 75.0% [21]. Additionally, several research from Bangladesh indicated a prevalence range for hypertension in older patients was from 14.0% [26] to 80.0% [20], while studies from India revealed that 8.8% [23] to 44.7% [26] of young patients with CAD had hypertension.

Dyslipidemias, obesity, and a family history of CAD had a higher frequency in the very young group compared to the older group ($p < 0.05$). Many other studies found that 2.5% to 97.3% of very young CAD patients had dyslipidemias [27,28]. In Bangladesh, dyslipidemia was present in 11.9% [10] to 97.3% [29] of young patients. And according to an Indian study, 88.3% of Indian younger patients had dyslipidemias [23].

Many other relevant studies found that 1.7% [30] to 97.1% [31] of young South Asian patients with CAD had a high BMI (~23 kg/m2). Two studies found that the proportion of high BMI patients in Nepal was roughly 13.3% [32] and 25.0% [25] respectively. Younger patients from Pakistan and Bangladesh were found to have high BMIs ranging from 15.6% [33]to 97.1% [31] and 60.7% [34], respectively. Younger patients with CAD, up to 60% had positive family histories [20].

The prevalence of young CAD patients with a positive family history was conducted in Nepal and it varied from 2.9% [12] to 31.6% [35]. In Pakistani and Bangladeshi populations, the prevalences of a positive family history of CAD were 60.0% [20] and 57.1% [21] respectively. A study by Wadhkar et al. [9] revealed the lowest prevalence of a family history of CAD in India (6.0%), whereas a study by Sinha et al. [36] reported a frequency of 46.8%. Conversely, chewing tobacco demonstrated a higher prevalence in the older group, although not statistically significant ($p = 0.114$), suggesting a less definitive association with AMI compared to other risk factors.

Noteworthy differences observed between the two age groups for several parameters were: Fasting blood sugar, serum sodium, serum troponin-I, C-reactive protein, total cholesterol, triglycerides, HDL-C, LDL-C, serum vitamin-D, and serum homocysteine, all displaying statistically significant differences ($p<0.05$). Conversely, parameters such as hemoglobin, serum creatinine, serum potassium & chloride, and serum uric acid did not exhibit significant age-related disparities ($p> 0.05$). Dahal et al. identified an elevated high sensitivity C-reactive protein (hs-CRP) level prevalence of 89.5% among patients [35]. A study by Sherpa et al. found that 43.3% of patients had elevated CRP levels (>6 mg/L) [37]. However, elevated hs-CRP levels were observed in only 7.5% of study participants, according to an Indian study [38].

According to a Bangladeshi study most of the adolescent patients with CAD had hyperhomocysteinemia [39]. Serum vitamin D was significantly lower in the very young group compared to the older group (78.7% vs 41.3%, $p<0.05$). A study conducted in the Department of Cardiology, Dhaka Medical College & Hospital (DMCH) showed that serum vitamin-D deficiency was associated with increased incidence of acute MI in young age patients (≤ 40 years) and the prevalence of low serum vitamin-D was 86.7% [40]. Multivariate logistic regression analysis in very young patients showed smoking, dyslipidemias, obesity, family history of CAD, substance abuse and serum CRP levels were significant independent predictors of first acute MI occurrence. On the other hand, Multivariate logistic regression analysis in older patients showed DM, hypertension, and serum vitamin-D levels were the most powerful independent predictors of first acute MI occurrence.

This study might indicate that the atypical presentation of acute MI should be noticed very carefully in older groups of patients. As the very younger group of patients are more vulnerable to developing serious complications, so special attention should be given to them. Identification of risk factors is a must for very young patients with first acute MI for primary and secondary prevention and the prevention of loss of potential lives.

Limitations of the study

This was a single-center study. The sampling method was purposive, so there was a risk of selection bias. The study was focused on selected biochemical risk factors. The outcome of the first acute myocardial infarction in the two age groups was not evaluated due to a lack of long-term follow-up.

Conclusion

This study evaluated that there was a significant difference in clinical presentations and risk factor profiles between

very young (≤ 30 years) and older (≥ 50 years) patients with first acute MI. Very young patients presented with more typical symptoms, higher complication rates, and distinct risk factor profiles. Conversely, older patients had more atypical presentation with less complications rate. The findings of this study approved that smoking, dyslipidemia, obesity, family history of CAD, substance abuse, and serum CRP level were statistically significant risk factors in very young (≤ 30 years) patients of first acute myocardial infarction. Conversely, DM, hypertension, and serum vitamin-D levels were statistically significant risk factors for first acute MI occurrence in older (≥ 50 years) patients. These findings underscore the importance of targeted risk factor management and intervention in very young individuals to mitigate their risk of first AMI. Further large-scale multicenter study is recommended to evaluate the role of emerging risk factors for acute myocardial infarction.

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