



AGE-RELATED DIFFERENCES IN THE CLINICAL PROFILE AND OUTCOMES OF ACUTE CORONARY SYNDROME

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Abstract:

The most common presentation of coronary artery disease (CAD) is acute coronary syndrome (ACS). The clinical profile of young patients with CAD can differ significantly from that of older patients. Our study aimed to assess the clinicoangiographic profile and In-hospital outcomes of patients presenting with acute coronary syndrome (ACS) to our centre. This study was a single-centre retrospective study. We analysed the medical records of the patients presenting with acute coronary syndrome (ACS) to our hospital for two years between 01.01.2022 and 01.01.2024. Obesity, smoking, family history of premature coronary artery disease (CAD), and substance abuse were common risk factors of acute coronary syndrome (ACS) in younger populations. Hypertension and diabetes mellitus were the most common risk factors in older patients. Anterior wall myocardial infarction was the most common presentation of ACS in young patients. The most common CAD pattern on coronary angiography was single-vessel disease (SVD). The outcomes of younger patients were better.

Keywords: Acute coronary syndrome, PCI, Substance abuse, Young MI

Introduction

The most common presentation of coronary artery disease (CAD) is acute coronary syndrome (ACS) [1]. In patients less than 45 years old, it is relatively rare [2]. Indian patients develop symptomatic CAD a decade earlier than the Western population. The clinicoangiographic profile of young patients with CAD can differ significantly from that of older patients [3]. The most common cause of ACS in young patients is still coronary atherosclerosis and plaque rupture [4]. There are other rare causes viz, atheroembolism, substance abuse, hypercoagulable states, vasospasm, spontaneous coronary artery dissection (SCAD), autoimmune disorders, and coronary artery vasculitis [4]. Substance abuse is an important cause of ACS in our clinical practice. Cocaine and amphetamine abuse are recognized causes of ACS [5,6]. One retrospective analysis showed cocaine and/or marijuana use to be present in 10% of patients with myocardial infarction (MI) at age ≤ 50 years [7]. Further, these patients had worse all-cause and cardiovascular mortality [7]. Another retrospective study showed that 17% of the patients under the age of 50 years presenting as MI had a history of substance abuse with opiates, cannabis, and cocaine [8]. Our aim in this study was to assess the clinicoangiographic profile and outcomes of patients presenting with ACS to our centre.

Materials and methods

This study is a single-centre retrospective study. We analysed the medical records of the patients presenting with acute coronary syndrome (ACS) to our hospital for two years between 01.06.2020 and 01.06.2022. We assessed the clinicoangiographic profile and In-hospital outcomes in our patient cohort.

Definitions:

Acute myocardial infarction was defined as per the fourth universal definition of myocardial infarction [9]. ECG diagnosis of ST-elevation myocardial infarction (STEMI) was made in the presence of new ST elevation ≥ 0.1 mV at the J point in two contiguous leads, except for V2 and V3, where ≥ 0.2 mV in men ≥ 40 years, ≥ 0.25 mV in men < 40 years, and ≥ 0.15 mV in women were used as the cut-off values. New-onset left bundle branch block (LBBB), and LBBB with clinical evidence of myocardial ischemia in the presence of positive Sgarbossa criteria were considered STEMI equivalents. STEMI was further broadly classified into anterior wall STEMI and Inferior wall STEMI based on the electrocardiographic findings. Non-ST-Elevation Acute Coronary Syndrome (NSTEMI) includes non-ST-elevation myocardial infarction (NSTEMI) and unstable angina and was defined as per the American Heart Association (AHA) 2014 definition [10]. Family history of premature CAD was defined as a history of CAD in a first-degree relative with males < 55 years and females < 65 years. Patient management, including coronary angiography and percutaneous coronary intervention (PCI), was performed in accordance with established guidelines. Manual thrombosuction and use of glycoprotein IIb/IIIa inhibitors were at the discretion of the operator. Door-to-balloon time was defined as the time between hospital admission and lesion crossing with a predilatation balloon, manual thrombus aspiration catheter, or stent. Angiographic success was defined as a reduction of target stenosis to $< 20\%$ with the restoration of TIMI 3 flow. Major adverse cardiovascular events (MACE) included cardiac death, repeat revascularization, and stroke. Stent thrombosis was defined as per the standard definition. Major bleeding was defined as Type 3 or 5 bleeding according to the definition of the Bleeding Academic Research Consortium (BARC).

Results:**Baseline characteristics:**

Table 1 shows the baseline characteristics of our patient population. 185 (71.2%) patients were male. Overall, hypertension was the most common risk factor in 182 (70%) patients, followed by smoking, diabetes mellitus, dyslipidemia, and obesity. Comparison between young patients (≤ 45 years) and older patients (> 45 years) showed that obesity, smoking, family history of CAD, and history of substance abuse were more common in young patients compared to older patients. In comparison, hypertension and diabetes mellitus were more common in older patients. 7 (18.4%) young ACS patients had a history of substance abuse, whereas only 2 (0.8%) older patients had a history of substance abuse.

Parameter	General population n (%)	Age ≤ 45 years n (%)	Age > 45 years n (%)	P value
Male	185 (71.2%)	27 (71.1%)	158 (71.2%)	1.0
Females	75 (28.8%)	11 (28.9%)	64 (28.8%)	1.0
Age (years)	61 $\pm$ 27	34 $\pm$ 10	68 $\pm$ 21	-
Obesity	65 (25%)	15 (39.5%)	50 (22.5%)	0.04
Hypertension	182 (70%)	14 (36.8%)	168 (75.7%)	<0.001
Diabetes mellitus	91 (35%)	6 (15.8%)	85 (38.3%)	0.009
Smoker	117 (45%)	30 (78.9%)	87 (39.2%)	<0.001
History of substance abuse	9 (3.5%)	7 (18.4%)	2 (0.8%)	<0.001
Family history of CAD	42 (16.2%)	12 (31.6%)	30 (13.5%)	0.009
Dyslipidemia	78 (30%)	8 (21.1%)	70 (31.5%)	0.25
Prior MI	26 (10%)	1 (2.6%)	25 (11.3%)	0.14
Prior PCI	29 (11.2%)	1 (2.6%)	28 (12.6%)	0.09
Prior CABG	5 (1.9%)	0 (0%)	5 (2.3%)	1.0
Stroke	7 (2.7%)	0 (0%)	7 (3.2%)	0.59
CKD	8 (3.1%)	0 (0%)	8 (3.6%)	0.61
LVEF	37 $\pm$ 19	34 $\pm$ 11	39 $\pm$ 13	-

Table 1 shows the baseline characteristics of our patient population. Note that Obesity, smoking, family history of CAD, and history of substance abuse were more common in young patients, while hypertension and diabetes mellitus were more common in older patients. CAD: coronary artery disease; MI: myocardial infarction; PCI: percutaneous coronary intervention; CABG: coronary artery bypass grafting; CKD: chronic kidney disease.

Clinical presentation:

Overall, Anterior wall myocardial infarction was the most common presentation in 91 (35%) patients, followed by Inferior wall myocardial infarction in 78 (30%), NSTEMI in 52 (20%), and unstable angina in 39 (15%) patients. Younger patients (≤ 45 years) were more likely to have STEMI with Anterior wall myocardial infarction in 50% and Inferior wall myocardial infarction in 44.7% of patients. NSTEMI and unstable angina were more common in older patients (> 45 years).

Angiographic profile:

Radial access was used in 221 (85%) patients. The most common culprit vessel was the left anterior descending artery or diagonal (LAD/diagonal) in 143 (55%) patients, followed by the right coronary artery (RCA) in 75 (28.8%), left circumflex or an obtuse marginal (LCX/OM) in 34 (13.1%) and left main coronary artery (LMCA) in 8 (3.1%) patients (Table 2)

Procedural characteristics:

Percutaneous coronary intervention (PCI) was done using a 6F guide catheter in 255 (98.1%) patients. Direct stenting was done in 65 (25%) patients. Overall, 234 (90%) patients underwent stenting, while 26 (10%) patients underwent plain old balloon angioplasty (POBA) only. POBA was done in patients with diffusely diseased culprit vessels deemed inappropriate for stenting. Thrombus aspiration was done in 104 (40%) patients. It was done more in younger patients compared to older patients ($p=0.048$). The reason for thrombus aspiration being done more frequently in younger patients is the higher incidence of STEMI with higher thrombus grades in this subgroup. GpIIb/IIIa infusion was given in 84 (32.3%) patients. Younger patients received GpIIb/IIIa infusion more frequently ($p=0.002$). Intra-aortic balloon pump (IABP) was used as mechanical circulatory support in 10 (3.8%) (Table 2).

Parameter		General population n (%)	Age ≤ 45 years n (%)	Age > 45 years n (%)	P value
Access	Radial access	221 (85%)	34 (89.5%)	187 (84.2%)	0.62
	Femoral access	39 (15%)	4 (10.5%)	35 (15.8%)	0.62
Culprit vessel	Left main	8 (3.1%)	0 (0%)	8 (3.6%)	-
	LAD/diagonal	143 (55%)	22 (57.9%)	121 (54.5%)	>0.05
	LCX/OM	34 (13.1%)	6 (15.8%)	28 (12.6%)	>0.05
	RCA	75 (28.8%)	10 (26.3%)	65 (29.3%)	>0.05
Catheter diameter	6F	255 (98.1%)	37 (97.4%)	218 (98.2%)	0.55
	7F	5 (1.9%)	1 (2.6%)	4 (1.8%)	0.55
Details of PCI	Stenting	234 (90%)	34 (89.5%)	200 (90.1%)	1.0
	POBA	26 (10%)	4 (10.5%)	22 (9.9%)	1.0
	Thrombosuction	104 (40%)	21 (55.3%)	83 (37.4%)	0.048
	Direct stenting	65 (25%)	13 (34.2%)	52 (23.4%)	0.16
	Postdilatation	208 (80%)	29 (76.3%)	179 (80.6%)	0.51
	GpIIb/IIIa infusion	84 (32.3%)	21 (55.3%)	63 (28.4%)	0.002
	Procedure duration	65.21 $\pm$ 12.93	66.21 $\pm$ 12.92	63.64 $\pm$ 13.31	0.27
	Fluoroscopy time	23.59 $\pm$ 5.32	23.18 $\pm$ 4.74	24.09 $\pm$ 6.12	0.38
	Door to balloon time	75.62 $\pm$ 35.23	73.45 $\pm$ 18.05	79.33 $\pm$ 58.05	0.53
Number of stents	01	156 (60%)	26 (68.4%)	130 (58.6%)	0.29
	02	104 (40%)	92 (41.4%)	12 (31.6%)	0.29
Type of stents	Drug-eluting stents (DES)	234 (90%)	34 (89.5%)	200 (90.1%)	-
MCS	IABP	10 (3.8%)	1 (2.6%)	9 (4.1%)	-

Table 2 shows the angiographic profile and procedural characteristics of our patient population. Note that younger patients (≤ 45 years) were treated with thrombosuction and GpIIb/IIIa infusion more frequently compared to older (> 45 years) patients. Older (> 45 years) patients required mechanical circulatory support (IABP) more frequently. LAD: left anterior descending artery; LCX: left circumflex; OM: obtuse marginal; RCA: right coronary artery; POBA: plain old balloon angioplasty. MCS: mechanical circulatory support; IABP: intra-aortic balloon pump.

CAD pattern:

Table 3 shows the CAD pattern in our patient population. Single vessel disease (SVD) was more common in young patients compared to old patients.

Parameter	General population n (%)	Age ≤ 45 years n (%)	Age > 45 years n (%)	P value
SVD	153 (58.9%)	32 (84.2%)	121 (54.5%)	<0.05
DVD	51 (19.6%)	3 (7.9%)	48 (21.6%)	>0.05
TVD	56 (21.5%)	3 (7.9%)	53 (23.9%)	>0.05

Table 3 shows CAD pattern in our patient population. SVD: single vessel disease; DVD: double vessel disease; TVD: triple vessel disease.

In-hospital Outcomes:

Table 4 shows In-hospital outcomes in our patient population. Angiographic success was achieved in 237 (91.2%) patients. MACE rate, mortality, reinfarction, stroke, stent thrombosis, and major bleeding were numerically higher in older patients.

Parameter	General population	Age ≤ 45 years	Age > 45 years	P value
Angiographic success	237 (91.2%)	35 (92.1%)	202 (91%)	1.0
MACE	13 (5%)	1 (2.6%)	12 (5.4%)	0.70
Death	5 (1.9%)	0 (0%)	5 (2.3%)	1.0
Reinfarction	5 (1.9%)	0 (0%)	5 (2.3%)	1.0
Stroke	3 (1.2%)	0 (0%)	3 (1.4%)	1.0
Stent thrombosis	5 (1.9%)	0 (0%)	5 (2.3%)	1.0
Major bleeding	3 (1.2%)	0 (0%)	3 (1.4%)	1.0

Table 4 shows the In-hospital outcomes of our patient population. Note that younger patients have numerically lower MACE rates, death, reinfarction, stroke, stent thrombosis, and major bleeding. MACE: major adverse cardiovascular events.

Discussion

Our study includes a total of 260 patients, of which 38 (14.6%) were young (≤ 45 years). We found that obesity, smoking, family history of CAD, and history of substance abuse were more common in younger patients compared to older patients. The prevalence of various CAD risk factors is described in Table 1. Obesity is observed in 15 (39.5%) young patients, and it is present in 50 (22.5%) older patients. Hence obesity at a younger age was a strong risk factor for ACS at young age in our study. This is consistent with other studies done from the Indian subcontinent [11,12]. Hypertension and diabetes mellitus were more common in older patients. Family history of premature CAD was present in 12 (31.6%) young patients, and it was present in 30 (13.5%) of older patients. This is consistent with a few other Indian studies showing a prevalence ranging from 30 to 47%. [11,13]. 30 (78.9%) young patients were smokers, and 87 (39.2%) older patients were smokers. Smoking is a strong risk factor for CAD and is associated with higher mortality [14]. The mean LVEF in our study was $37 \pm 19\%$ (Table 2). Anterior wall myocardial infarction and Inferior wall infarction were more common

in younger patients, and NSTEMI and unstable angina were more common in older patients. This is consistent with other studies as well [11,12,15]. All of our patients underwent coronary angiography. Young patients had single vessel disease (SVD) more frequently compared to older patients. DVD and TVD were low in younger patients, consistent with other studies [11,13,15,16]. LAD was the most common culprit artery. One patient who was young had a spontaneous coronary artery dissection as a cause for NSTEMI. He was treated by PCI with DES. Thrombosuction use and GpIIb/IIIa infusion were used more frequently in younger patients. This is due to the higher prevalence of high-grade thrombus in younger patients and STEMI presentation. Overall, 5 (1.9%) patients died with a MACE rate of 5%. In-hospital outcomes were better in younger compared to older patients.

Limitations

It was a retrospective single-centre study with no long-term outcome data. There was a small number of younger patients, and the data cannot be extrapolated to the whole community. Quantitative coronary angiography (QCA) and Intravascular imaging were not used in our study.

Conclusion

Obesity, smoking, family history of premature CAD and substance abuse are risk factors of ACS in younger population whereas hypertension and diabetes mellitus remain the most common risk factors in older patients. AWMi is the most common presentation of ACS in young patients and SVD is the most common CAD pattern on angiography. Younger patients have better In-hospital outcomes compared to older patients.

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