

Research Article

ANGIOGRAPHIC STUDY IN YOUNG ADULTS WITH ACUTE CORONARY SYNDROME : A SINGLE - CENTER EXPERIENCE

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ABSTRACT

Background: Etiology and risk factors of the acute coronary syndrome (ACS) in young patients were analyzed in this study. Coronary angiography findings and interventions were discussed. **Methods:** This retrospective observational study included patients aged 45 or below defined as young patients. They presented with ACS at Chitwan Medical College- Teaching Hospital and underwent coronary angiogram (CAG) from August 2019 till August 2022. Demographic profiling and results of coronary angiogram to define etiology, risk factors and the extent and severity of disease were recorded. **Results:** A total of 112 patients below the age of 45 who underwent CAG for ACS were studied. Approximately three-fourth of the patients (85, 75.9%) were males. STEMI was the frequent-most type of ACS (84.8%). Smoking was the most prevalent traditional risk factor (34.8%). LAD was the frequent most vessel involved (66.1%), followed by RCA (50.0%). A majority of the patients (67, 59.8%) had SVD. Family history of CAD was found to be significantly associated with Multivessel disease (38.6%), compared to patients with SVD (9%). Diabetes mellitus and HTN were found to be more prevalent in patients with Multivessel disease, but were not significantly different from SVD group. **Conclusion:** Smoking is the most important risk factor in young groups contributing to ACS. LAD was the most commonly involved coronary artery. The single-vessel disease is predominantly involved. Patients with family history of CAD are more likely to get MVD. Other etiology or risk factors contributing to ACS in young patients were male genders and genetic predominance. ACS if not treated timely can contribute to mortality too.

Keywords: Acute Coronary Syndrome, Coronary Angiogram, young MI.

INTRODUCTION

Although coronary heart disease (CHD) primarily occurs in patients over the age of 40, younger men and women can be affected. Most studies have used an age cut-off of 40 to 45 years to define "young" patients with CHD or acute myocardial infarction (MI).¹ Fortunately, its incidence is not that common in patients younger than 45 years. Most studies show that only about 3% of all CAD cases occur in this age range.² The disease carries significant morbidity, psychological effects, and financial constraints for the young person and their family. The protection offered by young age has been slowly taken away by the increased prevalence of risk factors for CHD in adolescents such as smoking, obesity, and lack of physical activity. Cigarette smoking has been the single factor most strongly associated with CAD in young adults. Kannel *et al.*, found in patients included in the Framingham Heart Study, the relative risk for CAD was about three times higher in smokers aged 35 to 44, compared to nonsmokers.^{3,4} Diabetes and hyperlipidemia are also frequently present in young CAD patients. Whereas the importance of these factors in the pathogenesis of CAD and their powerful relationship to rapid disease progression is well documented, their importance in this population is not characterized in detail.⁵ Young women with CAD comprise an especially interesting group given the protective effect of estrogen, but which factors are predictive in this distinctly unusual cohort is poorly understood.² The cardiovascular risk factors, the extent of coronary artery disease, and the clinical outcome after ACS might be different from those of older patients.⁶ There is less suspicion of MI in young adults as it is wrongly considered musculoskeletal pain or acid peptic disease. Due to this, these patients often miss the golden hour period of myocardial savagetime.⁷

METHODS

This retrospective observational study included patients aged 45 or below who presented with ACS at Chitwan Medical College-Teaching Hospital and underwent coronary angiogram (CAG) from August 2019 till August 2022. Results of selective coronary angiography in multiple (≥ 2) views performed by standard technique to define both the extent and severity of disease were recorded. Significant CAD was defined as at least a 70% reduction in the diameter of major epicardial coronary arteries i.e., left anterior descending (LAD), left circumflex (LCx), ramus intermedius (RI) or right coronary artery (RCA), and their branches; or at least 50% luminal narrowing of the left main coronary artery (LMCA). Patients were classified as having a single-vessel disease (SVD), double-vessel disease (DVD), or triple-vessel disease (TVD) accordingly. The presence of significant CAD in LMCA was classified as a left main disease (LMD). Conventional risk factors such as the presence of diabetes, hypertension, obesity, smoking, dyslipidemia, and a family history of CAD were noted from the patient's records. Data were entered into a spreadsheet (Microsoft Excel) and analyzed using Statistical Package for the Social Science (SPSS) software. The results were reported as mean \pm standard deviation for the quantitative variables and percentages for the categorical variables. Clinical presentation factors were demonstrated in tabular form using frequencies and percentages.

RESULTS

A total of 112 patients that underwent CAG for different types of ACS were included in the study. The mean age of the study population was 40.0 \pm 4.6 years (Range: 25 – 45 years). Just over half (63, 56.3%) of the patients were between the age of 41-45 years, whereas

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7 patients (6.3%) were less than 30 years. [Fig 1] Approximately three-fourth of the patients (85, 75.9%) were males.

STEMI was the frequent-most type of ACS (84.8%). [Table 1] There was 1 patient with STEMI and complete heart block (CHB).

Variables	Summary statistic
Age (years), mean ± SD	
Overall	40.0 ± 4.6
Male	39.7 ± 4.7
Female	40.9 ± 3.9
Age category (years), n (%)	
25 – 30 y	7 (6.3)
31 – 35 y	8 (7.1)
36 – 40 y	34 (30.4)
41 – 45 y	63 (56.3)
Gender, n (%)	
Male	85 (75.9)
Female	27 (24.1)
Type of ACS, n (%)	
STEMI	96 (85.7)
NSTEMI	9 (8.0)
UA	7 (6.3)

Smoking was the most prevalent traditional risk factor (34.8%), followed by HTN (25.9%). Diabetes mellitus was present in 16.1%. [Table 2]

Traditional risk factors	Frequency (%)
Current smoking	39 (34.8)
Hypertension	29 (25.9)
Family history of CAD	23 (20.5)
Dyslipidemia	20 (17.9)
Diabetes mellitus	18 (16.1)

LAD was the frequent most vessel involved (66.1%), followed by RCA (50.0%). One patient had left main disease. A majority of the patients (67, 59.8%) had SVD, whereas TVD was observed in 19 (17.0%) patients. As expected, LAD followed by RCA were the commonest culprit vessels. Balloon angioplasty (POBA) was required in 1 patient. The mortality rate was 1.8%. [Table 3]

Findings in CAG	Frequency (%)
Vessel involved, n (%)	
LAD	74 (66.1)
RCA	56 (50.0)
LCx	30 (26.8)
RI	5 (4.5)
LM	1 (0.9)
Type of vessel disease, n (%)	
SVD	67 (59.8)
DVD	25 (22.3)
TVD	19 (17.0)
LM disease	1 (0.9)
Culprit vessel, n (%) #	
LAD	52
RCA	33
LCx	10
RI	1
LM	1

No. of vessels in which PCI was done, n (%) &	
1	
2	80
3	28
	2
Outcome, n (%)	
Mortality	2 (1.8)

Family history of CAD was found to be significantly associated with Multivessel disease (MVD), with 38.6% of patients with MVD having a family history compared to 9.0% in patients with SVD. Diabetes mellitus and HTN were found to be more prevalent in patients with Multivessel disease, but were not significantly different from SVD group. [Table 4]

Risk factors	Single vessel disease (n = 67)	Multivessel disease (n = 44)	P-value
Male gender	51 (76.1)	34 (77.3)	1.0
Current smoking	27 (40.3)	12 (27.3)	0.22
Hypertension	15 (22.4)	14 (31.8)	0.28
Family history of CAD	6 (9.0)	17 (38.6)	<0.001
Dyslipidemia	12 (17.9)	8 (18.2)	1.0
Diabetes mellitus	8 (11.9)	10 (22.7)	0.19

DISCUSSION

Cigarette smoking has been the single factor most strongly associated with CAD in the young adult. It is supported by various studies.^{3-5,7-10} In a study conducted in Nepal, the relative risk for CAD was about 3 times higher in smokers age 35 to 44 years, compared to nonsmokers.¹¹ Most of the patients in our study were male which can be explained by the fact that male gender is prone to CAD. The finding is consistent in many of other studies.^{4,12,13,14} Hypertension is a well proven standard risk factor for CAD.¹⁵ Diabetes and hyperlipidemia are frequently present in young CAD patients in previous studies. The importance of these factors in the pathogenesis of CAD.^{5,16} Diabetes is found in only about 18% all young CAD patients. Our study clearly demonstrates that dyslipidemia, HTN and smoking were the most common risk factors in these patients which clearly suggest that diagnosis and treatment of these risk factors are the most important in the primary prevention of CAD in young population. Young patients with significant coronary obstruction have less extensive disease than older patients. Various studies reported that between 76% and 90% of young patients with MI are smokers compared with 40% of older patients with MI^{10,17} whereas our data suggest 39% of them were smoker. Family history is a factor known to be present in many of these patients and probably represents a combination of risk factors that are genetically determined. WM Yalter et al. also found similar findings on their study.¹⁸ The present findings of predominantly single-vessel disease in young patients and main culprit artery being LAD followed by the right coronary and left circumflex arteries has been noted in other reports of young patients.^{19,20} Similar to another study by Colkesen AY *et al.*, our study showed about 66.1% had LAD artery involvement.¹³ In another study by Laudari *et al.*, about 72.72% of the patient underwent PCI in single vessel only. Similarly, our study showed 59.8% of the patients had SVD involvement.⁷ Ge J *et al.*, highlighted the role of HTN in young adults and proved that HTN was an independent risk factor for MV CAD in young adults with ACS.²¹ Ge J *et al.*, also reported HTN and smoking as independent predictors of MVD in his study, in contrast to our study, which does not prove that HTN is a predictor of MVD in young Pakistani adults presenting with STEMI. Although our study was not significant, similar findings were reported by Shukija *et al.*,

which also reported a higher prevalence of MVD in HTN patients as compared to SVD patients.²² Parsa *et al.*, reported 89.1% diabetics in the MVD group and 10.9% in the SVD group, similar to this study where a higher prevalence of diabetics in the MVD (22.7%) and SVD (11.9%) groups was observed.²³ The contradict finding to hypertension could be due to small sample size. We clearly established the relation of positive family history of CAD and its association to MVD (38.6%) more than SVD (9%) .

LIMITATIONS

We only analyzed the patients who reached the hospital, so it might not be a true representative of the general population. Myocardial Infarction with Normal Coronary Arteries (MINOCA) represents an important subgroup in young patients, all of our patients had obstructive culprit vessels, probably because most of our study subjects underwent primary PCI. Nontraditional risk factors which are largely associated with a younger population with ACS like vasculitis and hypercoagulable state were not assessed. This was largely due to the high financial burden these special tests put on the patients.

CONCLUSION

The well-established risk factor and causative agent that contributes to ACS is cigarette smoking. Young adults mainly male and smoker seems to be at a higher risk for CAD. They commonly presented as STEMI rather than NSTEMI-ACS. Predominance of single-vessel disease was found but a family history was a strong predictor for multiple vessel disease. LAD is the most commonly involved coronary artery irrespective to number of arteries involved. ACS if not treated timely can have grave consequences.

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