



A STUDY OF CLINICAL & ANGIOGRAPHIC PROFILES OF YOUNG ACUTE CORONARY SYNDROME PATIENTS IN SOUTH INDIAN POPULATION IN THE POST COVID ERA

Cardiology

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ABSTRACT

Background Background: Acute myocardial infarction (AMI) has been reported more frequently in young individuals. The disease results in high mortality if not adequately diagnosed or treated. The current study aimed to evaluate the clinical & angiographic profile of patients with Acute coronary syndrome (ACS) in patients aged less than 40 years of age in the post covid era. **Methods:** A prospective cross-sectional study was conducted on a total of 800 patients out of which 169 patients had an Acute coronary syndrome (ACS) i.e. unstable angina (UA), Non-ST-elevation myocardial infarction (NSTEMI) (or) ST-elevation myocardial infarction (STEMI) at an age less than or equal to 40 years in the Cardiology Department of a tertiary care hospital in South India for a period of one year (Jan 2022-Jan 2023). Patients underwent angiographic tests for the assessment of angiographic profiles and mortality was assessed during hospital stay. **Results:** A total of 800 ACS patients were analysed over a time period of one year i.e. from Jan 2022 to Jan 2023 out of which there were 169 patients (21%) presented with young MI i.e. less than 40 years who presented with UA/NSTEMI/STEMI. Out of the 169 patients with young MI, 10 patients (5.9%) were less than 30 years. Majority of patients with young MI (101 patients, 59.8%) were more than 36 years with patients with a male predominance (74%). Family history of coronary artery disease was reported in 61.5% of individuals, whereas 38.5% did not have a family history. Dyslipidemia was the most common co-morbidity which was present in 34.3% of patients out of which only 1 patient had a familial hypercholesterolemia. Diabetes was the second most common co-morbidity that was present in 30.8% patients with the young MI followed by hypertension which was present in 21.9% patients. Most common presentation of disease was STEMI which was present in 79.9% (135 patients) patients with Anterior wall MI (AWMI) being the most common ECG presentation with Left anterior descending artery (LAD) being the most commonly involved artery on angiography (56.8%). Severe Ejection fraction (EF) impairment was reported in 8% of patients, while 40% of young ACS patients presented with normal EF. The most common angiographic presentation was single vessel disease (SVD) which was prevalent in 66.9% of cases. Factors such as EF, Killip class, involvement of multiple vessels on angiography were significantly associated with death ($p < 0.05$). Mortality was observed in 6 patients (3.6%) with a significant correlation to severity of myocardial disease at presentation in the form of EF & Killip class. **Conclusion:** These findings suggest that left ventricular function, the extent of coronary artery disease, the involvement of specific coronary arteries, and vascular recanalization on angiography all play significant roles in predicting patients' death. A larger cohort study with a long-term follow is warranted to analyze the detailed ACS progression status in young individuals in India.

KEYWORDS

Acute myocardial infarction, coronary angiography, clinical condition, prospective study, cross-sectional study

INTRODUCTION

Coronary artery disease is the main cause of death in developed and developing countries. Acute coronary syndrome (ACS), particularly ST-elevation myocardial infarction (STEMI) and high-risk non-ST-elevation ACS (HR-NSTEMI), is a substantial contributor to IHD mortality.^[1] Indians are more likely than Westerners to develop coronary artery disease (CAD), with symptoms appearing ten years sooner. One of the most prevalent manifestations of CAD is acute coronary syndrome (ACS), which comprises unstable angina, ST-segment elevation myocardial infarction (STEMI), and non-STEMI (NSTEMI). ACS in relatively young individuals under 40 is unusual, and in India, the prevalence of acute myocardial infarction (AMI) is 2%. When ACS happens at such a young age, it has a major impact on the patient's psyche, morbidity, and financial burden. The risk, clinical factor profile, and vascular involvement pattern differ between young and old CAD patients. CAD may emerge at a younger age in India due to metabolic, genetic, and conventional factors. ACS is a potentially fatal disease induced by atherosclerosis, which causes abrupt constriction of the coronary artery and then rupture of an unstable plaque with thrombosis. Diabetes, hypertension, smoking, a family history of CAD, and lipid abnormalities are all major risk factors for early atherosclerosis.^[2]

Acute coronary syndrome, often known as ischemic heart disease, is when the myocardium receives insufficient blood and oxygen. In cardiac tissues, there is a mismatch between demand and supply. In India, the prevalence of coronary artery disease has rapidly increased from 1 to 6% in the urban population and 4 to 6% in the rural population. Cardiovascular disorders have recently become the primary cause of morbidity among young adults. Diabetes mellitus accounts for approximately 20% of the risk of getting ACS. Hypertension is regarded as a distinct risk factor for ACS.^[3] Women take longer to present with symptoms and are less likely to receive guideline-directed therapy. Women fare worse than males as a result of this. In the Indian context, there has been little research on the clinical and angiographic features of acute coronary syndrome in women. Men have a higher frequency of CAD than women at any given age. Women

in both rural and urban regions receive less medical treatment than males. Gender differences in atherosclerotic plaque features may exist. Women are supposed to be protected against CAD by protective hormones till menopause. However, there has been a shift in the tendency, with acute coronary syndrome (ACS) growing even among premenopausal women.^[1] With most SVD, young CAD patients have a fair prognosis, and the most prevalent risk factors are smoking, a family history of CAD, and hypercholesterolemia.^[4]

Coronary atherosclerosis is the most prevalent cause of CAD in young people (80%). Among the numerous less common reasons for CAD in young adults are coronary vasospasm, medium vessel vasculitis, hypercoagulable syndromes, drug addiction, and embolism.^[5] Although CAD in young people has a reasonably fair prognosis, it is associated with severe morbidity, psychological effect, financial burden, and a greater loss of Disability-adjusted life years (DALYs) when the young productive age group is impacted. In several registries, the prevalence of juvenile CAD ranges from 5% to 7%. Even in young CAD patients, the traditional risk factors are fairly frequent. Despite recent breakthroughs, delayed presentation in acute coronary syndrome is sadly common, particularly among young patients. In this youthful demographic, anterior wall MI is more prevalent, most patients have a single-vessel illness, and in-hospital mortality is low.^[6]

Poor diet, obesity, and cigarette use are all variables that contribute to a major amount of the burden of coronary heart disease. Biomedical risk factors such as hypercholesterolemia, hypertension, obesity, and diabetes have all been linked to the disease's progression. The existence of numerous risk factors in individuals increases the likelihood of ACS. For persons with coronary heart disease, these extra risk factors can impact their recovery and future health. As a result, it is critical to determine the key risk factors and clinical profile of ACS in young people so that future preventative strategies such as lifestyle modification and medication may be implemented.^[7] There has been little research on the epidemiological, clinical, and angiographic profiles of young individuals with ACS in India. In the present study,

we aim to analyze the demographic, risk factors, and angiographic profile of acute coronary syndrome (ACS) in the South Indian population presenting with ACS in the tertiary care centre.

MATERIALS & METHODS

A prospective cross-sectional study was conducted in a tertiary care hospital in South India for a year. A total of 800 patients with ACS presented to the tertiary care center were analysed out of which the study enrolled 169 patients with Acute coronary syndrome aged ≤ 40 years who satisfied the inclusion criteria of the study. Patients with ACS and more than 40 years were excluded from the study. Written consent was taken from the patients before the start of the study.

Inclusion criteria:

Patients who were ready to provide consent, male and female patients with ≤40 years presenting ACS, were included.

Exclusion criteria:

Patients with concurrent valvular heart disease or cardiomyopathy, older patients aged > 40 and who did not provide proper consent were excluded.

Baseline clinical, demographic, laboratory tests, ECG, echo cardiographic evaluation, coronary angiography (CAG) information, therapy data, and results were documented. Current criteria were used to diagnose STEMI, non-ST-elevation myocardial infarction (NSTEMI), and unstable angina (UA). The information was gathered from the patients and entered into a pre-formatted case report form. Baseline data were collected, and the primary outcome was the total rate of ACS hospitalizations and ACS-related fatalities.

Statistical analysis:

All data from the research subjects were input into a Microsoft Excel spreadsheet. SPSS was used to analyze the data. Categorical variables were represented as percentages and numbers. The chi-square test was used to compare categorical variables across study groups. All probability values were determined using two-sided testing, and a p-value of 0.05 was considered statistically significant. The numerical data is given in the form of mean and standard deviations. The frequency and percentages are used to represent all category data. Frequency tables, summary statistics, and inferential statistics for the independent sample t-test, which were employed, all use descriptive statistics.

RESULTS

Among 169 patients, 125 (74%) were males, and 44 (26%) were females. Most patients (59.8%, 101 patients) were aged > 36, and 104 patients (61.5%) had a family history of coronary artery disease. 58 (34.3%) patients had dyslipidemia, 52 (30.8%) had diabetes, and 37 (21.9%) had hypertension. 77 (45.6%) patients were smokers, and 71 (42%) patients consumed alcohol.

One patient used cannabis; one patient had familial hypercholesterolemia; one patient had hypothyroidism; 147 (87%) patients were vaccinated, and 27 (16%) were Covid positive (Table 1). The majority of patients (65 patients, 38.5%) had mild EF impairment, 22 patients (13%) had moderate EF impairment, and 14 patients (8.3%) had severe EF impairment. Of most patients (49.1%), 83 were in Killip Class I, and 64 (37.9%) were in Killip Class II.

Out of the total 169 patients with young ACS 24 (14.2%) patients had unstable angina, 11 (6.5%) had NSTEMI. STEMI was the most common presentation with 135 patients (79.9%) out of which 87 patients (51.5%) had an AAMI. IWMI was seen in 47 patients (27.8%) and 141 (83.4%) had increased troponin levels (Table 2). The majority of patients (65 patients, 38.5%) had mild EF impairment, 22 patients (13%) had moderate EF impairment, and 14 patients (8.3%) had severe EF impairment. Of most patients (49.1%), 83 were in Killip Class I, and 64 (37.9%) were in Killip Class II.

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Double Vessel Disease (DVD) was seen in 17 patients (10.1%), and Triple Vessel Disease (TVD) was in 11 (6.5%) of patients. Left Main Coronary Artery Disease (LMCA) was in 19 (11.2%) of patients, and Left Circumflex (LCX) artery involvement was in 17 (10.1%) of patients. Right Coronary Artery (RCA) involvement was in 62 (36.7%) of patients, Minimal Coronary Artery Disease (CAD) was in 18 (10.7%) of patients, and Recanalization of coronary arteries was in 42 (24.9%) of patients. Among 169 patients, six (3.6%) died, and 163 (96.4%) patients survived (Table 3). The results showed that factors such as significantly low EF, high Killip class and TVD & LMCA involvement were were significantly associated with death (p<0.05). Conversely, the presence of UA, NSTEMI minimal CAD, or normal coronaries did not significantly affect death (p>0.05). These findings suggest that left ventricular function, extent of coronary artery disease, involvement of specific coronary arteries, and recanalization of vessels play crucial roles in predicting mortality in patients. Further studies are warranted to validate these results and explore potential interventions to improve outcomes in high-risk patient subgroups (Table 4).

Table 1: Patient characteristics

		Frequency	Percentage
Age group	<30	10	5.9%
	31-35	58	34.3%
	>36	101	59.8%
Sex	Female	44	26.0%
	Male	125	74.0%
Family history	No	65	38.5%
	Yes	104	61.5%
Dyslipidemia	No	111	65.7%
	Yes	58	34.3%
DM	No	117	69.2%
	Yes	52	30.8%
HTN	No	132	78.1%
	Yes	37	21.9%
Smoking	No	92	54.4%
	Yes	77	45.6%
Alcohol	No	98	58.0%
	Yes	71	42.0%
Other comorbidities	Cannabis user	1	0.6%
	Dressler syndrome	1	0.6%
	Familial hypercholesterolemia	1	0.6%
	Hypothyroidism	1	0.6%
	Nil	164	97.0%
	Post CPR	1	0.6%
Covid vaccination	No	22	13.0%
	Yes	147	87.0%
Covid positive	No	142	84.0%
	Yes	27	16.0%

Table 2: Clinical profile of young ACS patients

		Frequency	Percentage
EF	Mild	65	38.5%
	Moderate	22	13.0%
	Normal	68	40.2%
	Severe	14	8.3%
KILIP Class	I	83	49.1%
	II	64	37.9%
	III	7	4.1%
	IV	15	8.9%

UA	No	145	85.8%
	Yes	24	14.2%
NSTEMI	No	158	93.5%
	Yes	11	6.5%
STEMI	No	34	20.1%
	Yes	135	79.9%
AWMI	No	82	48.5%
	Yes	87	51.5%
IWMI	No	122	72.2%
	Yes	47	27.8%
TROP	No	28	16.6%
	Yes	141	83.4%

Table 3: Assessment of Coronary angiographic parameters and death among the population

		Frequency	Percentage
SVD	No	56	33.1%
	Yes	113	66.9%
DVD	No	152	89.9%
	Yes	17	10.1%
TVD	No	158	93.5%
	Yes	11	6.5%
LMCA	No	150	88.8%
	Yes	19	11.2%
LAD	No	73	43.2%
	Yes	96	56.8%
LCX	No	152	89.9%
	Yes	17	10.1%
RCA	No	107	63.3%
	Yes	62	36.7%
Minimal CAD	No	151	89.3%
	Yes	18	10.7%
Recanalised	No	127	75.1%
	Yes	42	24.9%
Normal coronaries	No	156	92.3%
	Yes	13	7.7%
Death	No	163	96.4%
	Yes	6	3.6%

Table 4: Distribution of different clinical and angiographic variables based on the mortality

		DEATH				P value
		No		Yes		
		Frequency	Percentage	Frequency	Percentage	
EF	Mild	65	100.0%	0	0.0%	<0.0001
	Moderate	22	100.0%	0	0.0%	
	Severe	8	57.1%	6	42.9%	
	Normal	68	100.0%	0	0.0%	
KILIP Class	I	83	100.0%	0	0.0%	<0.0001
	II	64	100.0%	0	0.0%	
	III	7	100.0%	0	0.0%	
	IV	9	60.0%	6	40.0%	
UA	No	139	95.9%	6	4.1%	0.31
	Yes	24	100.0%	0	0.0%	
NSTEMI	No	152	96.2%	6	3.8%	0.51
	Yes	11	100.0%	0	0.0%	
STEMI	No	34	100.0%	0	0.0%	0.211
	Yes	129	95.6%	6	4.4%	
AWMI	No	80	97.6%	2	2.4%	0.448
	Yes	83	95.4%	4	4.6%	
IWMI	No	118	96.7%	4	3.3%	0.759
	Yes	45	95.7%	2	4.3%	
TROP	No	28	100.0%	0	0.0%	0.266
	Yes	135	95.7%	6	4.3%	
SVD	No	50	89.3%	6	10.7%	<0.0001
	Yes	113	100.0%	0	0.0%	
DVD	No	152	100.0%	0	0.0%	<0.0001
	Yes	11	64.7%	6	35.3%	
TVD	No	154	97.5%	4	2.5%	0.007
	Yes	9	81.8%	2	18.2%	
LMCA	No	148	98.7%	2	1.3%	<0.0001
	Yes	15	78.9%	4	21.1%	

LAD	No	73	100.0%	0	0.0%	0.03
	Yes	90	93.8%	6	6.3%	
LCX	No	148	97.4%	4	2.6%	0.054
	Yes	15	88.2%	2	11.8%	
RCA	No	107	100.0%	0	0.0%	0.001
	Yes	56	90.3%	6	9.7%	
Minimal CAD	No	145	96.0%	6	4.0%	0.389
	Yes	18	100.0%	0	0.0%	
Recanalised	No	123	96.9%	4	3.1%	0.624
	Yes	40	95.2%	2	4.8%	
Normal coronaries	No	150	96.2%	6	3.8%	0.472
	Yes	13	100.0%	0	0.0%	

DISCUSSION

Our study included 169 patients ≤ 40 years of age presenting with ACS. Due to significant growth in the incidence and prevalence of these diseases in developing nations, the global burden of CVDs is rapidly increasing. In India, the prevalence of most cardiovascular risk factors, such as smoking, diabetes mellitus, hypertension, and dyslipidemia, has significantly grown during the past three decades. [8] sIragavarapu et al. reported that the frequency of juvenile ACS was 10.42%, with most males. One hundred twenty individuals in the study were all under 40 years old. They were treated more aggressively than older patients since most had anterior wall MI. 71.66% of young men have an ACS diagnosis. According to our analysis, the total risk variables were more prevalent in men than women, supporting earlier findings. [9] In our study, the incidence of ACS in young males is seen more than in females. ACS incidence in males in our study was 74% and the majority in the age group >36 years (101 patients, 59.8%). A significant risk factor for premature CAD(PCAD) is a family history of PCAD. It emphasizes the part genes play in the development of young CAD. According to studies, having a positive family history of PCAD increases the risk of developing severe coronary atherosclerosis. It is a very good indicator of developing an acute coronary event in the future. [10] According to Zimmerman et al., 92% of young CAD patients smoke. [11] According to the study, smoking is a significant risk factor for CAD in both research groups. In the younger study group, smoking was prevalent at 25.8%. Compared to older people, smoking is statistically much higher among young individuals. Additionally, the study shows that smoking was the main risk factor for earlier development of CAD. [9] In our study, 54.4% or 92 individuals, said they did not smoke. However, 77 patients—or 45.6%—confessed to smoking. Ninety-eight (58%) did not consume alcohol, and 71 patients (42.0%) admitted to consuming drinking.

Insulin resistance is a hereditary risk factor for type-2 diabetes mellitus in Indians. The atherosclerotic process in the coronary arteries in these patients is accelerated by hyperinsulinemia. In India, the impact of diabetes on health is only second to that of CAD. India already has 50 million diabetics, up from 32 million in the previous ten years. By 2030, this number might rise to 87 million. [12] The senior group in the research had a little greater incidence of diabetes (20.9%) than the younger group (20%), but there was no statistically significant difference between the two groups. [9] In our study, 30.8% of patients admitted to having diabetes. The comparatively high prevalence of DVD (21.08%) and TVD (9.70%) in diabetic patients as compared to nondiabetics (16.65%) and (7.06%), respectively, as well as similar mean age, validates diabetes's significance as a chronic risk factor in CAD. Another well-known risk factor for CAD is hypertension. Single Vessel Disease (SVD) was observed in 66.9% of cases, Double Vessel Disease (DVD) was found in 10.1% of cases & Triple Vessel Disease (TVD) was detected in 6.5% of people. The increased frequency of diabetes and hypertension in this region might be explained by the region's considerably faster growth and growing CAD pandemic. [13] Similar to Kumar et al. and Tewari et al.'s studies from north India, SVD was the most usually involved in both male and female patients, followed by DVD and TVD with statistical significance. Regarding diabetes or gender distribution, there was no statistically significant difference in the left main disease. Patients with UA had normal coronaries (15.6%) more frequently than NSTEMI (11.4%) and STEMI (9.72%). Many patients in the UA group may have been overdiagnosed, with false positives for ACS, particularly in females. [14][15]

Female patients had a considerably greater in-hospital death rate. Diabetes did not affect short-term outcomes or hospital mortality in our investigations. [16] Another study found that the NSTEMI/UA group had a considerably larger percentage of females (18%), which might be

due to females having false positive electrocardiographic stress tests. Furthermore, smoking/tobacco usage was the most frequent risk factor in the STEMI and NSTEMI/UA groups of patients. We feel that the prevalence of smoking/tobacco intake poses a major risk to young individuals. Because it is a preventable risk factor, we propose encouraging healthy lifestyles and implementing new smoking/tobacco intake measures to counteract the high prevalence of CAD.^[17] Research conducted by Colkesen et al. on young STEMI patients aged 35 found that the LAD was the most commonly affected vascular.^[18] In our study, among 169 patients, six (3.6%) died, and 163 (96.4%) survived. 24 (14.2%) patients had unstable angina, 11 (6.5%) had NSTEMI, 135 (79.9%) had STEMI, 87 (51.5%) had AWAMI, 47 (27.8%) had IWMI, and 141 (83.4%) had increased troponin levels

CONCLUSION:

Even in young CAD patients, the traditional risk factors are fairly frequent. Despite recent breakthroughs, delayed presentation in acute coronary syndrome is sadly common, particularly among young patients. In this youthful demographic, anterior wall MI is more prevalent with LAD being the most commonly involved arteries. Most patients who have a single-vessel illness had low in-hospital mortality. ejection fraction and kilip class at presentation played a significant role in in-hospital mortality. These data imply that left ventricular function, the amount of coronary artery disease, the involvement of particular coronary arteries, and vascular recanalization all play important roles in predicting patient death. More research is needed to confirm these findings and investigate possible strategies to enhance outcomes in high-risk patient categories.

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