



RISK FACTORS, POST THROMBOLYTIC RESOLUTION IN STEMI AND PATTERN OF CORONARY ARTERY INVOLVEMENT IN ACUTE CORONARY SYNDROME IN YOUNG ADULTS LESS THAN 30 YEARS OF AGE – A SINGLE CENTER PROSPECTIVE STUDY FROM SOUTH INDIA

Dr. Dharmaraj. G

Postgraduate Dm (Cardiology), Madras Medical College

Dr. Swaminathan. N*

Director And HOD, Institute Of Cardiology, Madras Medical College *Corresponding Author

ABSTRACT

BACKGROUND: Acute coronary syndrome is a new epidemic affecting Indians at younger age. The purpose of our study is to find the risk factor profile and pattern of coronary artery involvement in young patients less than 30 years of age.

MATERIALS AND METHODS: This study was conducted during the period of January 2016 to June 2017. 98 patients had undergone coronary angiography. Risk factors and angiographic profile analysis was done.

RESULTS: Out of 98 patients, 88 were male. 89 patients had STEMI, 69 had AWTMI, 18 had IWMI and 2 had HLWMI. 70(71%) patients were smokers, 11(11%) hypertensive, 9(9%) diabetics. Out of 89 STEMI, 72(81%) were lysed and 42(63%) patients had successful lysis. Significant SVD was seen in 39%, DVD in 3% and TVD 1%. LAD was the commonest 70% vessel involved.

CONCLUSION: ACS in young is common in male, smokers and STEMI is the most common presentation. LAD is the most common vessel involved (70%).

KEYWORDS : CORONARY ARTERY DISEASE, MYOCARDIAL INFARCTION, RISK FACTORS.

BACKGROUND/INTRODUCTION:

Coronary Artery Disease (CAD) is a new epidemic affecting Indians at younger age. In India CAD mortality has gone up by 103 % in men and by nearly 90% in women from 1985 to 2015²

Indians are affected with CAD about 5 – 10 years earlier than other ethnic groups and have higher incidence of hospitalization, mortality and morbidity³. Incidence of CAD in young Indians less than 40 years is 12 – 16% compared to less than 5% in western population^{4,5}.

The incidence of three vessel disease is high among Indian population. The prognosis⁸ in Indians as compared to western population is also worse.

South Indians have higher prevalence as compared to whites, 14% in urban areas and 7% in rural areas⁹. Conventional risk factors like smoking, dyslipidemia, hypertension, diabetes needs to be identified early. Smoking increases the risk of CAD by four times. About 40 to 50% of Indian males are smokers.¹¹

Prevalence of dyslipidemia ranges from 18.3% to 38.6% in India.

South Indians have higher rates of high HDL(C). Prevalence of Hypertension in urban population is 11 – 27%¹⁰.

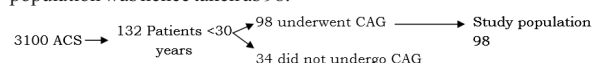
Prevalence of Diabetes in India is 20% in urban and 10% in rural population.

A major impediment in our country is the dearth of scientific research material on CAD.

The purpose of our study is to find the risk factor profile and pattern of coronary artery involvement in young patients less than 30 years of age who present with ACS.

MATERIALS AND METHODS:

This study was conducted in the cardiac ICU of Madras Medical College Chennai, from January 2016 to June 2017. All patients who presented to us with ACS were considered. A detailed history, ECG and ECHO were done on admission. CAG was done subsequently and analysis was done. During this period a total of 3100 ACS cases were registered. 132 patients in the age group less than 30 years were taken for the study. 98 patients underwent coronary Angiography. The study population was hence taken as 98.



The diagnosis of MI was made based on clinical symptoms, signs at the time of admission and ECG changes.

STEMI was defined as new ST elevation at the J point in two contiguous leads with cut off points as ≥ 0.1 mv in all leads (except $V_2 - V_3$). In leads $V_2 - V_3$ ST elevation at the J point ≥ 0.2 mv in men ≥ 40 years, ≥ 0.25 mv in men ≤ 40 years, ≥ 0.15 mv in women.

NSTE-ACS was defined as new horizontal or downsloping ST depression ≥ 0.05 mv in two contiguous leads or T wave inversion ≥ 0.1 mv in two contiguous leads with a prominent R wave or R/S ratio > 1 (2013 ACCF/AHA guideline).

ECHO showing new regional wall motion abnormality and left ventricular systolic dysfunction was taken as significant.

Conventional risk factors like smoking, dyslipidemia, hypertension, diabetes and family history were evaluated.

Thrombolysis and anticoagulation treatment was done as per standard guide lines. Successful thrombolysis was defined as more than 50% ST resolution and relief of symptoms.

Failed thrombolysis was defined as $< 50\%$ ST resolution or persistence of symptoms

All patients were subject to coronary angiography within 24 to 48 hours. Significant CAD is defined as more than 70% stenosis in non LMCA or more than 50% stenosis in LMCA.

Recanalised arteries were defined as less than 30% stenosis.

INCLUSION CRITERIA

Age above 18 and less than or equal to 30 years.
 Presentation with ACS

EXCLUSION CRITERIA

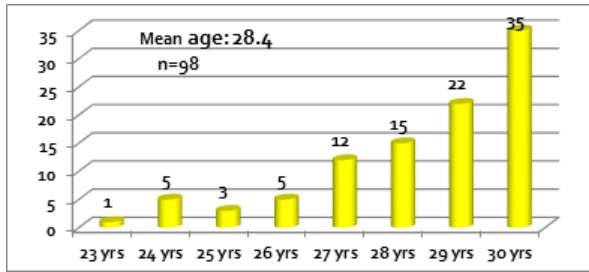
Patients with age less than 18 and more than 30
 Non Acute Coronary Syndrome presentation

Cardiac shock, refractive heart failure, severe co-morbid conditions like liver disease, Chronic renal failure etc, Patient not willing for CAG.

RESULTS:

Out of 98 patients 88 (89.7%) were male and 10 (10.3%) were female. Mean age of the study population was 28.4 years with the maximum number of patients being in the age group of 25 – 30 years. The youngest patient was 23 years old

Table: 1 Age Distribution



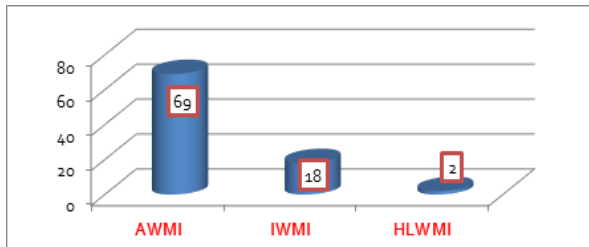
Smoking was the most common risk factor 70 (71%) followed by Dyslipidemia 34(34 %), Hypertension 11(11%), family history of premature CAD 8(8%) and Diabetes 8 (8%).

Table 2 Risk Factors of Young MI

Variable	Frequency n=98	Percentage
Male	88	89.7
Female	10	10.3
Smoking		
Yes	70	71.5
No	28	28.5
Diabetic		
Yes	8	8.15
No	90	91.85
Hypertension		
Yes	11	11.25
No	87	88.75

Typical angina (90%) was the commonest presentation followed by breathlessness, giddiness, nausea, vomiting and back pain. ST elevated MI (STEMI) was seen in 89 patients (90.8%), Anterior wall MI was found in 69 (70.4%), 18 had inferior posterior wall MI (18.31%) and 2 had high lateral MI(2%). 9 patients had Non STEMI (9.16%).

Table:3 Distribution of STEMI



Out of the 89 patients STEMI 72 (81%) underwent thrombolysis and 42(63%) had successful lysis

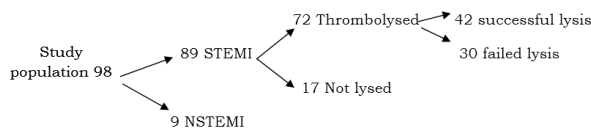
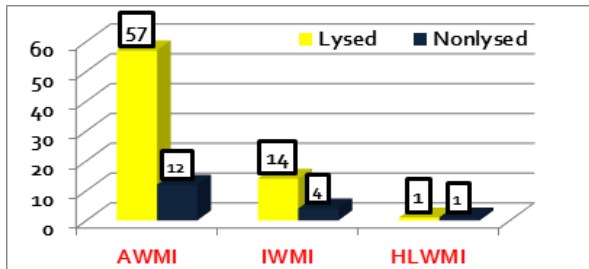


Table: 4 Lysed Vs Non-lysed in STEMI



Coronary Angiographic characteristics:

Angiography was done by either radial or femoral route. Recanalised coronaries were seen in 28 patients (31%). Among the 28 patient who had recanalised coronary arteries 24 patients had undergone Thrombolysis.

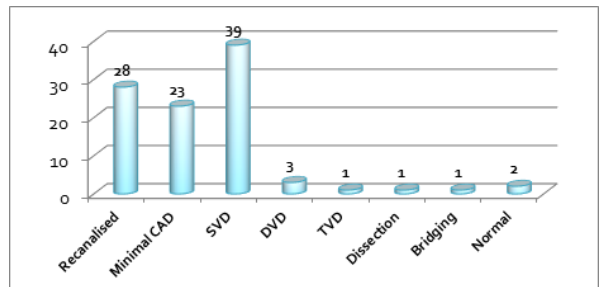
23 (23%) had minimal coronary artery disease. Single vessel disease (SVD) was observed in 39 (39%). Double vessel diseases in 3 cases

(3%) and Triple vessel diseases in 1 case (1%).

In single vessel disease Left Anterior descending coronary artery was the most common artery involved 26 cases (19 proximal / 7 MID). 8 cases involved left circumflex (1 proximal 7 distal) and 5 cases involved Right coronary artery (3 proximal 2 distal).

One patient had dissection in ostioproximal LAD (26years/ ACS/ HLWTMI/ LYSED) .One patient with Wellens syndrome presented with myocardial bridging (24 years/ACS).One 27 year old lady presented on the 21st postnatal day with ACS she had minimal CAD (Proximal LAD 30% discrete stenosis).A 24 year lady with Takayasu's arteritis had ACS/IWTMI/LYSED had SVD – DISTAL LCX territory had 100% occlusion.

Table: 5 CAG Results



DISCUSSION

Our results were compared to similar studies in the literature. The mean age in our study was 28.4 years. One study by Weinberg et al showed a mean age of 27.3 years.

RISK FACTORS

Our study showed that the myocardial infarction was significantly more common in male (88%) 89.7% than female population which was similar to findings of other studies of young MI.

This predominance in male population may be attributed to the protective effect of estrogens in woman and the prevalence of smoking which was common in male population.

The most common risk factor in our group was cigarette smoking 70 patients (71%). Similar results were found by studies in Wein Berg et al (66%); Uhl and Farell (61%). Other studies by Wolfe mw et al¹¹; Moret et al¹²; Gohlke et al¹³; Uhl GS¹⁴ et al; Kennelly et al¹⁵; reported that 73% to 90% of young patients with MI had history of smoking.

The prevalence of Dyslipidemia in our study was 34%. Weinberg et al which included less than 30 years showed dyslipidemia in 14%. In contrast the prevalence was in the range of 50% in many other studies (Davis et al 1974; Falsetti et al 1968; Heinle et al 1969 Tzagour et al; Shekelle et al 1981)

In our study the prevalence of hypertension was 11%. This is lower than other studies (Kannel et al; 1979 Stamler 1978; Truett et al.); The prevalence of diabetes in our study was 8%. A lower prevalence of glucose intolerance (4% - 11%) was reported in studies by weinberg et al; Falsetti et al; Tzagoruinis et al; Uhl et al; Sadiq et al;. The lower prevalence may be because of the younger age group taken in the study.

A positive family history was seen in 8% (8). It was higher than many other studies (4% in Weinberg et al).

When the risk factors were compared to studies which took Myocardial infarction patients of >50 years, the distribution was entirely different. Smoking was found only in 17% of patients and hypertension was found in 35% and diabetes in 48% of cases. (Davis et al ; Dolder & Oliver et al; Falsetto et al ; Heinle et al; Tzagoruinis et al; Uhl and Farell et al;)

THROMBOLYSIS

ST elevation MI (Particularly AWTMI) was found to be the most common presentation in our study. Compared to older aged western population Indians have STEMI as the most common presentation.

Out of the 89 STEMI (72) 81% of cases underwent thrombolysis with streptokinase. The rate of successful lysis was 63% (42 cases). The rate

of successful lyses was slightly lower than other studies of reperfusion with streptokinase (69.2% in HUD Zhonghua et al; 78.6 % in Shen L, et al 75% in Topol EJ et al).

The lower percentage of successful lysis may be attributed to the delayed presentation in our study. Most of the patients were brought after the 6 hour period being referred from lower centers.

In India lysis continues to remain as the main reperfusion strategy. The rate of lysis was compared with the presence or absence of each risk factor.

Table 6: Comparison of ECG Resolution with risk factors / site of infarction

RISK FACTORS	SUCCESSFUL LYSIS	FAILED LYSIS	TOTAL
	n= 40	n=32	n=72
Smoking Status			
Smokers	32	14	46
Nonsmokers	8	18	26
Chi-square = 10.1258; P value= 0.001462 which is significant			
Diabetic Status			
Diabetic	1	6	7
Non Diabetics	39	26	65
Chi-square = 5.348; Degree of Freedom: 1 P value= 0.02074 < 0.05 which is significant			
Hypertensive Status			
Hypertensive	2	5	7
Non Hypertensive	38	27	65
Chi-square = 2.25; Degree of Freedom: 1 P value= 0.1305 result is not significant at P value < 0.05			
Dys-lipidemia			
Dys-lipidemia	12	16	28
Nondys-lipidemia	28	16	44
Chi-square = 2.99; P value= 0.08366 which is not significant at P < 0.05			
Lysis and site of infarction			
Anterior Wall MI	57	12	69
Inferior Wall MI	14	4	18
Lateral Wall MI	1	1	2
Total	72	17	89
Chi-square = 1.469; Degree of freedom = 2 P value= 0.4772 which is not significant			

Out of 72 patients who underwent lysis 46 were smokers 32(69.5%) patients had successful lysis and 14(30.4%) had failed lysis. 26 patients were non smokers and 8(30.7%) patients had complete lysis and 18(69.3%) had failed lysis. The P value between the two groups was ($X^2 = 10.1258$ P = .001462) which was statistically significant. The analysis suggests that smokers responded better to thrombolytic therapy than non smokers. Similar results were reported by other studies (Shmuel Gottlieb et al Muller IIs et al, Maggioni Ap et al, Maynaed c et al). Several factors may explain the seemingly better early prognosis of smokers after STEMI.

Infarct size was smaller in smokers at 90 minutes of thrombolysis. Smokers have higher fibrinogen, hematocrit and factor VII level, impaired endothelial function and vasospasm, predisposing them to thrombus formation and Myocardial infarction. This coronary obstruction in smokers might be more thrombogenic and less atherosclerotic in nature. A large thrombotic component in smokers may be more amenable to vasodilatation and thrombolysis and hence to more complete reperfusion. This leads to early infarct related coronary artery flow and less residual atheromatous stenosis after thrombolysis. A smaller infarction and greater predilection of inferior infarction seen in smokers may lead to better survival rate.

Out of 7 diabetics 1(14.3%) had successful lysis and 6(85.7%) had failed lysis among non diabetics 39(60%) had successful lysis and 26(40%) had failed lysis. In our study complete resolution of ST

elevation was observed more in non diabetics as compared to diabetics patients ($X^2 = 5.348$ P value = 0.02074) which is <0.05. This was similar to studies by Zarus et al and Sameer et al. This can be explained by the fact that diabetics have increased levels of plasminogen activator inhibitor – 1 and a procoagulant milieu that reflect poor response of diabetics to thrombolysis.

On the other hand hypertension, dyslipidemia and site of infarction did not have any significance on the success of lysis.

ANGIOGRAPHIC FINDINGS

Recanalised coronary arteries was seen in 31% which was the similar to other studies Weinberg et al 30%, Roskam et al (37%) Robert et al (33%).

Single vessel disease was found to be more prevalent in the young (39%) similar findings were reported by other studies like Weinberg et al; (30%) Gohlke et al; (58%), Uhl and Farell et al; (24%).

Our analysis demonstrates that young patients < 30 with MI have a higher frequency of angiographically recanalised coronary arteries and minimal CAD than those in the age group >40

It was seen that young patients with significant coronary obstruction have less extensive disease than older patients. Single vessel disease especially involving the LAD was more common in the young patients. Older patients had multi vessel diseases with more extensive involvement.

CONCLUSION:

Young patients less than 30 years of age with ACS have less extensive disease when compared to adults. STEMI was the most common presentation. AWMI and LAD occlusion was the commonest site involved. Smoking was the most common risk factor while conventional risk factors like diabetes, hypertension and dyslipidemia were lower when compared to older patients. Smokers responded better to thrombolytic therapy(smokers paradox). In India thrombolysis continues to remain as the most common reperfusion strategy. Hence thrombolysis may be equivalent to primary PCI in the population of less than 30 years. This needs further research. Awareness on this topic with importance to hazards of smoking with early diagnosis and treatment will have huge economic impact as many patients present late for treatment.

REFERENCE:

- Enas EA, Garg A, Davidson MA, et al; Coronary disease and its risk factors in the first generation immigrant Asian Indians to the united states of America. Indian Heart J.1996;48: 343 – 54
- Bulatao RA, Stephens PW. Global estimates and projections of mortality by cause,1970 – 2015. Preworking paper 1007.Washington: Population Health and Nutrition Department, World Bank;1992
- Enus EA. Dhawan J, Petkar S. Coronary artery disease in Asian Indians: Lessons learnt and the role of lipoprotein-a. Indian Heart J.1996; 49: 25-34.
- Negus BH, Willard JE, Glamann DB, et al; Coronary anatomy and prognosis of young asymptomatic survivors of myocardial infarction. Am J med 1994;96:354 – 8
- Mammi MV, Pavithran P, Abdu Rahiman P, et al; Acute MI in north Kerala. A 20-year hospital based study Indian Heart J.1991;43:93-6
- Bahuleyan CG.Hospital data on coronary artery disease from north Kerala. In: Vijayaraghavan Trivandrum.54-9
- Girija G. Risk factors profile of patients with acute MI. In:Vijayaraghavan (Ed). Cardiovascular disease prevention Trivandrum.78-83.American Heart Association Heart and stroke statistical update; 1997.PP.26-7
- Danarag TJ, Acker MS, Danaraj W,et al. Ethnic group differences in coronary heart disease in Singapore: An analysis of necropsy records. Am Heart J.1959;58:516 – 26
- Rissam HS, Kishore S, Trehan N. Coronars artery disease in young Indians the missing link. Ind Acad clin Med.2001;2:128-32
- Chadha SL, Radhakrishnan S, Ramachandran k, et al. Prevalence , Awareness and treatment status of hypertension in urban population of delhi.Indian J Med Res. 1990;92:233 – 40.
- Wolfe MW, Vacek JL, Myocardial infarction in the young chest 1988;94 : 926 – 30
- Moret P, Gutzwiller F, Junod B,CAD in young adults under 35 years old risk factors. In ref2: 17 – 22.
- Gohlke H, Sturzen Ho Feeker P, Thilo A, Coronary Angiographic findings and risk factor in post infarction patients under 40 years
- Uhl GS Farrel PW. Myocardial infarction at young age: risk factors and natural history in ref2: 29 – 37
- Kenelly et al BM. Aetiology and risk factors in young patients with recent acute MI S Afr Med J 1982 : 61 : 503-7
- Thompson SI, Vieweg WVR, Alper JS Incidence and age distribution of patients with MI CCD 1997:31-9
- Glover MU, Kuher MT MI before age 36: Risk factors and arteriographic Analysis: Am J Cardiol 1982 : 49:1600-3
- Burkat F, Salzman C. Angiographic finding in post MI patients under 35 in ref 2 : 56 – 60
- Davia et al JE, Hallal FJ, Mc carty R. Footy W CAD in young patients of 40 cases aged 35 and under Am Heart J 1974 :87 689 – 96
- Gibson R.S, Watson DD, Craddock GB et al predication of cardiac events after uncomplicated MI Circulation 1983:68:321 – 336
- Sanz G et al, Castaner A, Betriu A et al Determinance of survivors in MI N Engl J Med

- 1982;306:1065-70
22. A primary report on thrombolytic therapy of Acute myocardial infarction in 40 cases HUD Zhonghua Xin Xue Guang Bing Za Zhi,1991.
 23. Effects of thrombolytic therapy on recanalization in different starting time after Acute MI Shen L,et al; Chin Med J (Eng) 1991;
 24. Coronary angiography after thrombolytic therapy for Acute MI Jopala EJ et al; Ann intern Med 1991
 25. Indications, timing and optimal technique for diagnostic angiography and angioplastic in acute MI Bittl JA, chest,1991
 26. Klues.HG, Schwarz ER, Vom Dahl J,et al; Disturbed intracoronary haemodynamics in myocardial bridging, circulation 1997;96:2905-13
 27. Vale PR, Baron DW. Coronary artery stenting for spontaneous coronary artery dissection a case report and review cathet cardiovas Diagn 1998;45:280-6