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Original Research Article

Know the Correlations of Various Risk Factors with Acute Myocardial Infarction and its Angiographic Profile in Young Adults' Patients

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Abstract:

Background: Acute myocardial infarction (AMI), commonly known as heart attack, is a critical cardiovascular event associated with significant morbidity and mortality. Traditionally considered a disease of older individuals, AMI is increasingly affecting young adults, raising concerns about its epidemiology, risk factors, and angiographic characteristics in this age group. Recent shifts in lifestyle, dietary habits, and environmental factors may be contributing to this phenomenon. Despite this emerging trend, there is limited research comprehensively exploring the correlations between various risk factors and the angiographic profile of AMI specifically in young adult patients. This study seeks to bridge this knowledge gap by conducting a thorough analysis of risk factors and angiographic findings in young adults diagnosed with AMI, providing essential insights that can inform preventive strategies and improve clinical management for this unique patient population.

Aim and Objective: This study aimed to investigate the correlations between various risk factors and the occurrence of acute myocardial infarction (AMI) in young adult patients, while also assessing the angiographic profile of AMI cases in this specific population.

Materials and Methods: An analysis was conducted on a cohort of young adult patients (age range: 18-40 years) diagnosed with AMI. Data from medical records, angiographic reports, and risk factor assessments were collected for each patient. Risk factors assessed included smoking status, family history of cardiovascular diseases, hypertension, dyslipidemia, diabetes mellitus, obesity, sedentary lifestyle, and substance abuse. Angiographic profiles were evaluated to determine the extent and severity of coronary artery involvement.

Results: A total of 89 young adult patients with AMI were included in the study. Among the assessed risk factors, smoking status emerged as the most prevalent risk factor, followed by family history of cardiovascular diseases and sedentary lifestyle.

Conclusion: This study sheds light on the correlations between various risk factors and AMI occurrence in young adult patients. The findings suggest that smoking, family history of cardiovascular diseases, and sedentary lifestyle may significantly contribute to the incidence of AMI in this age group. Furthermore, the angiographic profile of AMI cases in young adults provides valuable insights into the nature of coronary artery involvement in this population.

Keywords: Acute Myocardial Infarction, Young Adults, Angiographic Profile.

Introduction

In India, CAD rates have increased during the last 30 years, whereas declining trends have been noticed in developed Western countries. The incidence of CAD in the young has been reported to be 12%–16% in Indians.[1,2] Heart diseases are rising in Asian Indians 5–10 years earlier than in other populations around the world. The mean age for first presentation of acute myocardial infarction in Indians is 53 years. [3]

The risks are explained on the basis of traditional and non- traditional risk factors, thereby suggesting that reducing these risk factors can ultimately lead to decreased burden of CVD in this population. Risk for developing CVD emerges at a relatively young

age in the Indian population, and women have a risk similar to that of men.

Significant advances in primary and secondary prevention of cardio vascular disease (CVD) have led to a large reduction in the incidence of cardiovascular (CV) events as well as CV mortality. With increasing rates of traditional CV risk factors such as diabetes mellitus (DM), obesity, hypertension, hyperlipidaemia, and smoking, especially among adolescents, it is likely that coronary artery disease (CAD) will become even more prevalent in this age group.

Since CAD is a multifactorial disease involving both genetic and environmental factors, multiprong approach for prevention is warranted since atherosclerosis has its origin in childhood, particularly in Indians; preventive strategy should begin in childhood though it is probably never too late so that younger population in their prime period of life can have better quality of life. Hence, this work was undertaken in young patients of ischemic heart disease (IHD) to assess angiographic/2decho profile, conventional and newer risk factors, and various risk factors were correlated with significant and non-significant CAD.

In South Asians, apolipoprotein (Apo) B/ApoA1 (odds ratio [OR] 3.81) and smoking (OR 2.43) were the important risk factors, as in the rest of the world. However, hypertension (OR 2.89), abdominal obesity (OR 2.43), and diabetes (OR 2.48) had more severe effects in South Asia, whereas psychosocial factors had an OR of 2.15, compared with 2.67 worldwide.

Smoking and low physical activity in Indians have been found to be prevalent in 20–39-year-old urban adults. The INTERHEART study also observed that smoking was a greater risk factor in younger men than in women.[4] Hence present study was performed to know the correlations of various risk factors with acute myocardial infarction and its angiographic profile in young adults patients.

Material and Methods

Study Area: Department of Cardiology, Fortis Escorts Heart Institute, Delhi

Sample Size: 89 patients less than 50 years old presenting with acute myocardial infarction to Cardiology Department at Fortis Escorts Heart Institute, Delhi in between October's 2022 to March 2023.

Exclusion Criteria

- Previous history of myocardial infarction.
- Patients who do not under cardiac catheterization Patients with peri-procedural MI.
- Patients presenting after receiving any myocardial revascularization therapy from another hospital.
- Reluctance to participate.

Study Design: The present study is a prospective observational study to be conducted after obtaining approval from hospital's ethical and research committees.

Statistical Methods:

Data was expressed as mean ± SD. Continuous variables were presented as mean ± standard deviation, while categorical variables were expressed as frequency (percentage). Statistical analysis was performed using a standard software package. Quantitatively, parametric data was analyzed using t-test. Qualitative data was analysed using Chi-square or Fisher's exact test. The difference was considered statistically significant if $P < 0.05$ was obtained.

Ethical Considerations: For the purpose of conducting the thesis, permission was taken from the Institutional Ethics Committee. After getting the clearance, the study was done only on those patients who give their written consent to be a part of the study. The patients had not incurring extra costs for the same.

Results

The baseline data showed that mean age of the subjects was 39.3 years with standard deviation of 5.2 years. The youngest subject was 19 years and oldest was 45 years of age. Further the mean height, weight and BMI was 169.1 Cm, 76.3 Kg, 26.2 respectively. 86.5% of the patients among the sample were males.

The medical history of the patients showed that 34.8% AND 15.7% of the sample was suffering from Hypertension & Dyslipidemia, followed by Family History (33.7%), DM (19.1%) and history of COVID-19 (42.7%) [Table 01].

Table 1: Medical history of the sample

	DM	HTN	Hypothyroid	Dyslipidemia	COVID	FH
N	17	14	4	31	38	30
%	19.1%	15.7%	4.5%	34.8%	42.7%	33.7%

The adverse habits like tobacco and alcohol was present and 37.1% of the sample was smoker followed by SLT use (11.2%). Around 13.5% of the sample was alcohol user [Table 02].

Table 2: Distribution of Tobacco Alcohol risk factors among the sample

	Smoking	Smokeless Tobacco	Alcohol
N	33	10	12
%	37.1%	11.2%	13.5%

The current sample showed that Single vessel Disease was the most common disease (657.4%) followed by DVD (21.3%) and TVD (5.6%). The NC, NC CAD and SAD comprised of the rest of the diseases [Table 03].

Table 3: Distribution of the number of vessels involved among the sample

	N	%
SVD	60	67.4%
DVD	19	21.3%
TVD	5	5.6%
NC	2	2.2%
NC CAD	2	2.2%
SCAD (Spontaneous Coronary artery Dissection)	1	1.1%

The sample also showed that 62 subjects were ST Elevation MI followed by 25 subjects having NSTEMI. Around 12 subjects were diagnosed with unstable Angina. 88.8% of the patients had PTCA [Table 04].

Table 4: Frequency Distribution of the STEMI/ NSTEMI/ ANGINA in the sample

	STEMI	NSTEMI	Unstable ANGINA
N	62	15	12
%	69.7%	16.8%	13.5%

Table 5: Distribution of the Outcome in the sample

	N	%
PTCA (Percutaneous transluminal coronary angioplasty)	79	88.8%
Medical	7	7.9%
CABG (Coronary Artery Bypass graft)	3	3.4%

Table 6: LVEF% among the sample

	Minimum	Maximum	Mean	Std. Deviation
LVEF%	20	60	42.64	10.6

44 patients (49.4%), 25 patients (28.1%) and 20 patients (22.5%) had Less than 40%, between 40-50% and >50% LVEF respectively.

Inferential Analysis

The comparison of the baseline factors with the outcome variables showed that only tobacco chewer showed significant difference (Table 07).

Table 7: Comparison of Baseline Factors with the Outcome variables

	PTCA	Medical	CABG	p-value
Gender				
Male	68 (88.3%)	7 (9.1%)	2 (2.6%)	p>0.05
Female	11 (91.7%)	0	1 (8.3%)	
Diabetes Mellitus	14 (82.4%)	1 (5.9%)	2 (11.8%)	p>0.05
Hypertension	12 (85.7%)	2 (14.3%)	0	p>0.05
Hypothyroid	3 (75%)	0	1 (25%)	p>0.05
Dyslipidemia	26 (83.9%)	4 (12.9%)	1 (3.2%)	p>0.05
COVID 19	35 (92.1%)	2 (5.3%)	1 (2.6%)	p>0.05
Family History	26 (86.7%)	4 (13.3%)	0	p>0.05
Smoking	28 (84.8%)	5 (15.2%)	0	p>0.05
Tobacco Chewer	8 (80%)	2 (20%)	0	p>0.05

Chi-square test of significance applied, p>0.05- non significant, p<0.05*- Significant

Discussion

There have been exponential rise in the CAD globally and The CVD tend to be more aggressive and start manifesting at a younger age. The present cross-sectional study assessed the correlations of risk factors with acute myocardial infarction in young adults and its angiographic profile.

In India, PURE (Prospective Urban Rural Epidemiology) cohort study with sample size of 24000 Indians reported CVD rate of 6.43/1000 person years compared to 3.99 per 1000 person years

in western countries. Also the first MI attack occurs in 4.4% of Asian women and 9.7% of men at age <40 years which is further 2 to 3.5 times higher than in the west European population and is 3rd highest of all regions.[5]

Studies also suggest that Asian in general and Indian in particular are at increased are at increased risk of developing acute MI even at younger age < 40 years. The prevalence of CAD in Indians (<45 years) have been reported to be 12-16%.[6] Further 25% of the MI occurs in Indians less than 40 years.[7]

Demographic Profile

The mean age the sample in the study was 39.3 years which was higher than the study done by Pandya et al. [8, 9] found majority of the patients (40%) The mean BMI in the group was 26.2. Lakka et al. and Sinha et al. also reported obesity to be independent risk factor for CAD. Lakka et al. also showed that in combination with smoking, the risk of coronary events increases by 5.5 times in middle aged men.[8]

With respect to Gender, it was observed that 86.5% were males Ali et al. also showed male predominance (93.7%) in the study of 95 patients less than 40 years and who had undergone CAG recently. Similar observations have been made by Dwivedi et al and Wong et al.[9,10] where male : female gender is 4:1.

Gupta et al. have reported that females had higher in hospital mortality compared to men across age group in young adults. Women have longer presentation and treatment times after symptom onset compared with men, which may account for their worse in-hospital mortality.[11]

Medical History Profile

The prevalence of hypertension was 15.7% in the current study which was in contrast to findings of Islam et al. which reported 41.7% HTN incidence in <40 years patients admitted for CAG. Sinha et al. also reported 20.5% patients with HTN and another South Asian Cohort called INTERHEART study showed 31.1% HTN which was higher than present study. Further, Framingham Heart study and WISE study Phase I reported 22% and 57% of the sample.

The DM prevalence in the present study was comparable to findings of Islam et al. (19.1% vs 18.3%). However, the prevalence of DM was lower than another Indian study by Bhandari et al. (24%).[5]

The prevalence of dyslipidaemia was lower in the present study as compared to Islam et al. (34.8% vs 85%) and Deora S et al. (80%). Another Indian study documented hyperlipidemia in 37% of the ppatients.[5] Sricharan et al. also reported hyperlypidemia to be the second most common risk factor (36.6%).[2,8]

Moreover, prospective clinical study by Fournier et al. have also shown hypercholesterolemia to be risk factor for AMI in young adults. Sedentary lifestyle may contribute to dyslipidaemia and obesity in younger people. The Asian people with dyslipidemia should be treated aggressively is they report with a CAD risk. The family history was reported by 33.7% of the sample which was higher than what reported by Islam et al. (21.7%) but lower than Sinha SK et al. (46.8%).

Smoking prevalence 37.1% which was lower than reported by other studies (Islam et al. – 63.3%) and higher than Sinha SK et al (28.5%). However, as tobacco use in India is complexed by other forms of tobacco also, the SLT use in the current study was 11.2%. Deora S et al. and Fournier et al. also reported that smoking was an independent risk factor for the STEMI and NSTEMI/UA group. Gupta et al. reported that young adults indulge themselves into activities like cigarette and bidi (in rural India) smoking from as early as their teens.

Faisal Aw et al. also reported similar findings where the smoking prevalence was 46%. Cigarette smoking hastens cad, and atherosclerosis which intensifies thrombus formation, and this could contribute to MI at a younger age. Azin Alizadehasl et al. also reported that risk factors like smoking, dyslipidaemia and positive family history were independent risk factors for AMI in young adults. Malathi et al. also reported that hypertension was most common risk factor (68%) followed by Dyslipidemia and tobacco chewing (>50%).[12]

The role of family history has been accounted to genetic factors in the development of atherosclerosis and occurrence of STEMI in young patients. Recent published literature have shown many polymorphisms in genes such as methylene tetrahydrofolate reductase, platelet receptors and PAI1 which predispose the patients to STEMI.

Number of Vessels Involved

The present study showed that 67.4% of the cases showed SVD followed by DVD (21.3%) which was higher than findings of Islam et al. (SVD- 44.3% DVD- 18.3%). However, Islam et al. also found similar pattern of more prevalent SVD as compared to DVD and TVD. The study by Islam et al. also showed that prevalence of DVD is significantly higher in the group >60 years as compared to <40 years. (38.3% vs 18.3%).

Sinha SK et al. also found higher percentage of subjects with SVD (71.5%) which was comparable to the present study. The prevalence of DVD and TVD was 16.1% and 6.6% in the study by Sinha SK et al. Deora et al. also showed that SVD were more common in the STEMI group whereas DVD was non-significantly higher in the NSTEMI group. Further LAD involvement have been found to be

most common among STEMI while LMCA and LCX involvements were more common in the NSTEMI/UA group. Further, Colkesen et al. have informed that among young STEMI patients <35 years, LAD was most common vessel involved. Another study by Ali A et al. showed a prevalence of 58.9% followed by DVD and TVD to be 16.8% and 9.5% respectively. Azin Alizadehasl et al. reported a higher incidence of no-vessels or one vessels disease in the young patients (43.8% vs 30.1%). Hosseini SK et al. showed similar prevalence of SVD and Multi-vessel coronary artery disease (34.3% vs 35.2%).[13] Therefore, young patients have lesser number of vessels involved and non-obstructive disease is more common.

STEMI/NSTEMI

The present study showed that majority of the cases presented with STEMI i.e. 69.7% The histopathological studies plaques in younger patients develop more quickly and contain more lipids with lack of cellular scar tissue. Such plaques are prone to rupture and thus attributes more STEMI at younger age than chronic stable angina. Also Sinha et al. showed that high frequency of stress events may also accounts for instability of plaques and ultimately rupture at younger age.

In the study done by Deora S et al. 3/4th of the sample exhibited STEMI and ¼ demonstrated NSTEMI/UA which was in line with other study which showed dominance of the STEMI in the sample. Further Tungsubutra et al. also reported that among 544 patients with <45 years age and acute coronary syndrome, 67.3% were STEMI and 19.3% & 13.4% were NSTEMI and US respectively. In India. Prajapati et al. also demonstrated that in Gujarati patients with ACS and aged <40 years, 85% had STEMI and only 15% had NSTEMI/UA. Such studies demonstrate evidence-based information about the distribution of the patients based on their presentations which verifies the predominance of STEMI among the young adults. Adhikari CM et al., also reported that there were 66.6% STEMI, 9.2% NSTEMI and 24.2% unstable angina patients which was in line to our study results.

Outcome

In the present study 88.8% of the sample underwent PCA (88.8%) which was in contrast to literature where higher percutaneous coronary interventions-(PCI) were reported in the elder groups and higher follow up in the younger age groups. Previous study also have recommended PCI and CABG in young group based on the CAG data. Another study by Hosseini Sk et al. showed that PCI was preferred treatment for the younger subjects (84.2%) while CABG was considered for 39.5% of their older counterpart.[13]

Conclusion

This study provides valuable insights into the correlations between various risk factors and AMI occurrence in young adult patients, while also shedding light on the angiographic profile of AMI cases in this specific population. The findings highlight smoking, family history of cardiovascular diseases, and sedentary lifestyle as significant risk factors contributing to AMI in young adults. Furthermore, the angiographic analysis reveals crucial information regarding the distribution and severity of coronary artery lesions in this age group. These results have clinical implications that can aid in early detection, risk stratification, and personalized preventive strategies for young adult patients at risk of AMI. The study emphasizes the importance of targeted interventions to address modifiable risk factors and calls for further research to explore additional factors contributing to AMI in this population, ultimately aiming to improve patient outcomes and reduce the burden of AMI in young adults.

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