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Original Article

AN ANALYSIS OF DIFFERENCES IN CLINICAL DEMOGRAPHICS, RISK FACTORS, PROPORTION, IN-HOSPITAL OUTCOMES, AND ANGIOGRAPHIC FINDINGS BETWEEN ELDERLY AND YOUNG ADULTS WITH MYOCARDIAL INFARCTION: A RETROSPECTIVE. STUDY.

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Abstract

Objectives
The study aimed to assess the demographics, angiographic parameters, riskfactors, and clinical outcomes during hospital stays of individuals aged 55 years or younger presenting with acute myocardial infarction.

Methods
The study employed a retrospective design, analyzing 184 patients diagnosed with acute myocardial infarction (MI) at Indira Gandhi Institute of Medical Science (IGIMS) in Patna, Bihar, India, over a year. Inclusion criteria encompassed individuals aged 18 or older exhibiting at least 70 % epicardial coronary artery stenosis, with data retrieved from the local catheterization database. Ethical considerations were adhered to, and statistical analyses involved categorical and continuous variable comparisons, ensuring data completeness and significance at $p \leq 0.05$.

Results
Examining 184 acute myocardial infarction patients aged ≤55 years old, a higher male representation and increased family history of premature coronary heart disease was observed. Notably, the younger cohort (20-41 years) exhibited elevated troponin I ($p < 0.05$) and creatine kinase ($p < 0.05$). Multivariate analysis revealed male gender and dyslipidemia as predictors for multivessel disease in the young, while in the other cohort, diabetes was the sole predictor. In-hospital outcomes for these patients show a significant rise in deaths ($p < 0.05$) and major adverse cardiovascular events, all stemming from cardiac causes.

Conclusion
This study underscores the significance of exploring demographics and risk factors associated with acute myocardial infarction, providing valuable insights that contribute to our understanding of this critical medical condition. The findings emphasize the importance of ongoing research to enhance prevention and treatment strategies, ultimately improving patient outcomes in the realm of cardiovascular health.

Recommendation
The study recommends further investigations into the factors influencing acute myocardial infarction, informing targeted interventions and policies for enhancing cardiovascular health.

Keywords: Acute Myocardial Infarction, Coronary Angiography, Retrospective Analysis,Cardiovascular Outcomes
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Introduction
Coronary heart disease (CHD) stands as the major cause of mortality worldwide, claiming around 17.8 million lives annually [1]. While traditionally considered an ailment afflicting older adults, emerging evidence underscores a notable percentage of individuals experiencingCHD and myocardial infarction (MI) at a younger age [2, 3].

The potential ramifications of encountering MI early in life extend beyond immediate health implications, encompassing substantial psychological and socioeconomic effects that affect the patients and their dependents. Previous research has delineated distinctive predisposing factors and demographic profiles among younger MI patients (defined as those aged 45 or younger) compared to their older counterparts [4, 5]. Variances in angiographic results,indicating less systematic disease in patients aged 45 or below, have also been reported [6, 7].

Furthermore, clinical outcomes during hospital stays for

young MI patients seem to exhibit a favorable trend [8]. However, there exists a notable gap in data regarding MI in the young vs older population. In light of this, our retrospective analysis aims to assess the incidence rates of young patients with acute MI in our tertiary unit, shedding light on potential disparities in demographics, angiographic observations, risk factors, and clinical outcomes during hospitalization amongst younger and older cohorts.

Materials and Methods

Study design

A retrospective analysis

Study setting

The study was carried out on patients who presented to Indira Gandhi Institute of Medical Science (IGIMS), Patna, Bihar, India, between January 2023 to December 2023 and were diagnosed with acute myocardial infarction (MI), exhibiting at least 70% epicardial coronary artery stenosis as diagnosed by coronary angiography.

Participants

Inclusion and exclusion criteria

Patients with acute MI, aged 18 years or older, and demonstrating at least 70% epicardial coronary artery stenosis were included in the study. In contrast, those aged under 18 years with myocardial infarction (MI), prior percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG), in stent restenosis were excluded from the analysis.

Study size

The study included 184 patients who met specific inclusion criteria.

Data collection

The necessary data were collected through a retrospective analysis of patients with acute myocardial infarction (MI). The patients were selected based on the data from the local cardiac catheterization database, which included procedures conducted at IGIMS, Patna cath lab. The coronary angiography was visually assessed for the degree of stenosis of the coronary artery, and ad-hoc percutaneous coronary intervention (PCI) was done based on the discretion of the attending interventional cardiologist. Data, including outcomes such as MACE during hospitalization and fatality,-were retrieved from the local cardiac catheterization database.

Bias

The study's retrospective design introduces recall biases, while the exclusion criteria and reliance on a single tertiary center may lead to the selection and institutional biases, impacting the generalizability of findings. Awareness of these potential biases is essential before interpreting and applying the study's results.

Ethical consideration

Ethical considerations were prioritized throughout the study. The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants. Patient confidentiality and privacy were rigorously maintained in adherence to ethical standards.

Statistical Analysis

Percentages were used to represent categorical variables while the mean was utilized to represent continuous variables. Comparison of groups used Fisher's exact test, Chi-squared, and unpaired t-test. The statistical significance was set at $p \leq 0.05$.

Results/Outcomes

Participants

Over 184 patients were admitted to the tertiary unit with a diagnosis of acute myocardial infarction (MI), meeting the specified criteria during the study duration. The patient cohort was subclassified into three groups according to their age. Among this cohort, 32.1 % (59/184) were aged between 19 to 40 years, 26.6 % (49/184) were aged between 41 to 50 years, and the remaining 41.3 % (76/184) fell into the patients belonging to the 51-55 years age group. Examining demographic and risk factor profiles, a noteworthy observation was the higher representation of men in all the patient cohorts. Additionally, individuals aged 51-55 years exhibited a significantly greater incidence rate of a family history of prematureCHD and current smokers compared to their younger counterparts. Moreover, it was noted that patients belonging to the 41-50 years age group demonstrated higher incidences of diabetes mellitus (83.6%) and dyslipidemia (65.3%) as shown in Table 1.

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Table 1: Attributes of patients included in the study

	Total cohort (n = 184)	Patients aged 19-40 years (n = 59)	Patients aged between 41 to 50 years (n = 49)	Patients aged between 51 to 55 years (n = 76)
Mean age (yrs)	62.4	19.6	39.2	51.6
Mean BMI (kg/m2)	28.1	28.9	27.2	29.1
Men, n (%)	149 (81.0 %)	52 (88.2 %)	31 (63.2 %)	66 (86.6 %)
Women, n (%)	35 (19 %)	7 (11.8 %)	18 (36.7 %)	10 (13.1 %)
Family history of CHD, n (%)	36 (19.6 %)	2 (3.3 %)	11 (22.4 %)	23 (30.2 %)
Diabetes mellitus, n (%)	57 (31.0 %)	4 (6.7 %)	41 (83.6 %)	12 (15.7 %)
High blood pressure,	111 (60.6 %)	13 (22.0 %)	35 (71.4 %)	63 (82.8 %)
n (%)				
Dyslipidaemia, n (%)	101 (54.9 %)	25 (42.3 %)	32 (65.3 %)	44 (57.8 %)
Current smokers, n (%)	70 (38.3 %)	12 (20.3 %)	23 (46.9 %)	35 (46.0 %)
Previously smokers, n (%)	38 (20.4 %)	5 (8.4 %)	18 (36.7 %)	15 (19.7 %)
PVD, n (%)	6 (3.5 %)	1 (1.7 %)	2 (4.0 %)	3 (3.9 %)
CVA, n (%)	8 (4.4 %)	2 (3.4 %)	2 (4.0 %)	4 (5.2 %)

Clinical characteristics further unveiled distinctions between the age groups, with patients aged 41-55 years demonstrating higher mean peak serum creatine kinase and serum troponin I levels. Subsequent multivariate analysis pinpointed male gender and dyslipidemia as independent predictors for cardiac ailments specifically in the younger cohort. Conversely, in the other group (between 20-41 years), diabetes mellitus emerged as the sole independent predictor for cardiac ailments. Further stratification revealed that among the patients undergoing percutaneous coronary intervention (PCI), the older group (41-55 years) exhibited a notably higher proportion with two or more than two vessel occlusions when compared to the patient cohort in the 20-41 years age group (46.6% vs. 34.8%).

Shifting the focus to in-hospital clinical outcomes, the older patient cohort experienced a significant increase in both in-hospital deaths and major adverse cardiovascular events (MACE). With regards to mitral valve regurgitation (MVR) and cerebrovascular accidents, there was no significant difference in the number of cases between the patients aged 41-50 years and 51-55 years of age. Importantly, all recorded deaths during this period were attributed to cardiac causes, emphasizing the gravity of cardiovascular implications in this patient population (Table 2).

Table 2: In-hospital clinical outcomes

	Total cohort (n = 184)	Patients aged 19-40 years (n = 59)	Patients between 41 to 50 years of age (n = 49)	Patients between 51 to 55 years of age (n = 76)	p-value
Death, n (%)	6 (3.2 %)	0 (0 %)	2 (4.0 %)	4 (5.2 %)	0.011
MVR, n (%)	2 (1.0 %)	0 (0 %)	1 (2.0 %)	1 (1.3 %)	1
CVA, n (%)	3 (1.6 %)	0 (0 %)	1 (2.0 %)	2 (2.6 %)	1
MACE, n (%)	9 (4.9 %)	0 (0 %)	2 (4.0 %)	6 (7.8 %)	0.013

Discussion

In the present study, an unexpectedly high prevalence of individuals aged 20-41 years, comprising around one-third of all individuals hospitalized with acute myocardial infarction (MI), was observed. This finding contrasts with the study by Fournier et al., who reported only 4% of MI patients in this younger age group, with a lower age threshold of ≤ 40 years [5]. The younger cohort (patients aged between 19-41 years) in this study exhibited reduced incidences of hypertension (22%), diabetes mellitus

(6.7%), and hyperlipidemia (42.3%) compared to Fournier et al.'s study [5].

In comparison to Loughnan et al.'s findings, where approximately 20% of MI patients were aged under 55 years old, the higher proportion of young patients in this study could potentially be attributed to the inclusion criteria focusing on individuals undergoing coronary angiography [2]. Additionally, the socioeconomic status of the study cohort, characterized by a low socioeconomic status, could contribute to the observed differences in age distribution compared to other studies [3-6].

The findings align with existing research, indicating that young myocardial infarction (MI) patients are more likely to be male, have a family history of premature coronary heart disease, and be active smokers [4, 5]. This trend is consistent with several prior studies [7-11], and evidence suggests that these patients are less prone to having a history of CHD, hypertension, or diabetes mellitus [7-9, 12]. A greater number of ex-tobacco users among the 41-50 years age cohort was revealed, a pattern evidenced by an earlier investigation [8, 9]. The observation that around two-thirds of younger patients were active smokers at the time of MI diagnosis raises significant public health concerns, likely influenced by the low socioeconomic situation of the hospital's range.

The study also explores the connection between dyslipidemia and young MI, with patients aged between 41-50 years displaying a numerically higher rate, although statistical significance was not reached. This discrepancy might stem from potential underreporting, underdiagnosis, or undertreatment of dyslipidemia in the cohort aged below 40 years, a phenomenon documented in other studies [5, 6]. This nuanced understanding of risk factors in young MI patients contributes valuable insights for targeted interventions and underscores the need for tailored public health strategies in socioeconomically disadvantaged communities.

No distinction was observed in the incidence of ST-segment elevation myocardial infarction (STEMI) between the three age groups. While contemporary data indicates a predominance of non-STEMI (NSTEMI) presentations among young MI patients, a noteworthy rise in STEMI cases is reported [13]. Surprisingly, the older cohort (51-55 years) exhibited a higher mean peak serum troponin I, contrary to prior findings of elevated troponin levels in the geriatric population [14-16]. This unexpected result may be attributed to the laboratory's troponin reporting limit of up to 50 micrograms/L, potentially obscuring higher values in the older group.

Furthermore, consistent with earlier research, the occurrence of cardiac disease affecting multiple blood vessels and three blood vessels was less prevalent in the young patients, possibly attributed to factors such as age and a higher prevalence of diabetes and high blood pressure in the cohort with patients aged 41-50 years [6, 7]. The findings reveal that, in the <55 age group, males are more prone to multivessel disease than females [7, 11]. Additionally, the study demonstrates a correlation between dyslipidemia and multivessel disease in patients aged 41-50 years, possibly reflecting an increased susceptibility to multivessel disease with prolonged exposure to diabetes mellitus [17, 18].

The study reveals an unexpectedly high proportion of mortality rates in patients aged 51-55 years (5.2%), as opposed to the patients aged 41-50 years (4.0%). Furthermore, these patients also exhibited distinct risk factors, including a higher prevalence of major adverse cardiovascular events (7.8 %), indicating the need for regular monitoring and timely interventions. Despite less extensive coronary disease, the patients of the 41-50 years cohort also faced adverse outcomes such as mitral valve regurgitation (MVR) (2 %), cerebrovascular accident (2 %), and major adverse cardiovascular events (MACE) (4 %), emphasizing the need for targeted interventions in this demographic as well. A comprehensive understanding of these patterns is crucial for effective management and preventive strategies in diverse populations.

Generalizability

The study revealing a high prevalence of acute myocardial infarction (MI) in younger individuals aged 20-41 years, particularly those with lower incidences of traditional risk factors like hypertension, diabetes, and hyperlipidemia, underscores a shift in the risk profile for MI. These findings, while specific to the studied population, highlight the need for a revised approach in public health and clinical practice in other settings. The high smoking prevalence and low socioeconomic status associated with younger MI patients call for targeted public health interventions and a heightened awareness among clinicians about the potential for MI in younger patients, even in the absence of conventional risk factors. This study opens avenues for further research and necessitates a nuanced approach to cardiovascular risk assessment and management in younger populations across different demographic and geographic contexts.

Conclusion

The present study highlights a noteworthy proportion of individuals aged 55 or younger experiencing acute MI, possibly influenced by selective inclusion criteria. The younger cohort exhibited distinctive risk factors, emphasizing the need for targeted interventions. Despite less extensive coronary disease, adverse outcomes were observed, underscoring the importance of tailored management for this demographic. These findings contribute to a comprehensive understanding of effective preventive strategies in diverse populations.

Limitations

The study has limitations inherent to its retrospective, single-center, and observational design,introducing the possibility of selection bias and restricting the evaluation of long-term

Outcomes. Additionally, the exclusion of older patients

who did not undergo coronary angiography and potential missing information pose constraints on the study's overall scope and reliability.

Recommendations

The study recommends conducting further prospective, multicenter investigations to enhance generalizability and comprehensively understand long-term outcomes in acute MI, particularly in older patient populations. Additionally, incorporating follow-up mechanisms, such as telephone interviews, is suggested to provide valuable insights into post-hospitalization patient trajectories.

Acknowledgment

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List of Abbreviations

CHD - Coronary Heart DiseaseMI - Myocardial Infarction
BMI - Body Mass Index
MI - Myocardial Infarction
PCI - Percutaneous Coronary Intervention
CABG - Coronary Artery Bypass Grafting
PVD - Peripheral Vascular Disease
CVA = Cerebrovascular Accident

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Conflict of interest

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