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ANGIOGRAPHIC PROFILE IN YOUNG PATIENTS PRESENTING WITH STEMI

Original Research

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ABSTRACT

Background: ST-elevation myocardial infarction (STEMI) is a severe form of acute coronary syndrome that is traditionally more prevalent among older populations. However, a growing number of cases are being observed in younger individuals, presenting unique challenges in diagnosis and management. Understanding the angiographic and demographic characteristics of this younger population is crucial for developing targeted interventions and improving outcomes.

Objective: To evaluate the angiographic characteristics, associated variables, and demographic features of young patients (aged ≤45 years) diagnosed with STEMI.

Methods: This prospective study included 78 patients, aged 45 years or younger, who presented with a confirmed diagnosis of STEMI on electrocardiography and coronary angiography. The study was conducted at the Department of Cardiology, Shifa International Hospital, Islamabad, from 19th September 2024 to 18th December 2024. Data were collected on patient demographics, cardiovascular risk factors, and angiographic findings. Angiographic evaluation included coronary artery involvement, lesion location, severity, and complexity. Subgroup analyses were performed based on age, gender, and cardiovascular risk factors. Statistical analysis was performed using SPSS version 23, with significance set at $p < 0.05$.

Results: The mean age of participants was 40.2 years, with 41.02% aged ≤35 and 58.98% aged 36–45. Males comprised 71.79%, while females accounted for 28.21%. Cardiovascular risk factors were present in 57.69% of patients, with smoking being the most prevalent (67.94%), followed by hypertension (32.05%) and diabetes (20.51%). The most commonly affected coronary artery was the RCA (43.75% in ≤35 and 47.83% in 36–45), followed by the LAD (31.25% and 34.78%, respectively) and LCx (25% and 39.13%, respectively). No significant gender differences were observed in angiographic characteristics.

Conclusion: This study highlights the angiographic and demographic profile of young STEMI patients, emphasizing the predominance of male patients with significant cardiovascular risk factors, particularly smoking. Further research with larger cohorts is needed to confirm these findings and explore potential gender differences.

Keywords: Acute coronary syndrome, angiography, cardiovascular risk factors, coronary artery disease, myocardial infarction, STEMI, young adults.

INTRODUCTION

The phenomenon of ST-elevation myocardial infarction (STEMI) represents one of the most critical manifestations of acute coronary syndrome, characterized by a rapid and significant reduction in blood flow to the myocardium, often with devastating consequences (1, 2). Traditionally perceived as a condition primarily affecting older adults due to age-associated cardiovascular risk factors, there has been a concerning rise in the incidence of STEMI among younger individuals, specifically those aged 45 years or younger (3). This emerging trend challenges the conventional understanding of cardiovascular disease and necessitates a more nuanced exploration of the underlying factors contributing to myocardial infarction in this younger demographic (4, 5). The angiographic evaluation of patients presenting with STEMI serves as an indispensable tool in delineating the extent of coronary artery involvement, assessing lesion characteristics, and understanding the overall complexity of the disease (6, 7). Such insights are pivotal in guiding therapeutic strategies, predicting outcomes, and tailoring interventions to the unique needs of specific patient groups. However, despite substantial research on the angiographic patterns of STEMI in older populations, there remains a conspicuous paucity of focused investigations into the angiographic profiles of younger patients (8). This gap in knowledge underscores the need for dedicated studies to identify the distinctive angiographic and clinical features of myocardial infarction in younger individuals, who often present with different risk factors, comorbidities, and pathophysiological mechanisms compared to their older counterparts (9).

This study endeavors to address this critical gap by conducting an in-depth analysis of the angiographic characteristics in a cohort of 78 young patients diagnosed with STEMI. The investigation seeks to elucidate the complexity of coronary artery involvement, lesion location, severity, and morphological patterns within this specific population. By comprehensively evaluating these parameters, the findings of this work aim to contribute valuable insights to clinical practice, refine risk stratification models, and inform the development of age-specific therapeutic interventions. Ultimately, this research aspires to optimize clinical outcomes and improve the long-term prognosis for young individuals experiencing STEMI, thereby advancing the precision of cardiovascular care.

METHODS

The study was designed as a prospective observational investigation aimed at analyzing the angiographic profiles of young patients presenting with ST-elevation myocardial infarction (STEMI). Conducted in the Department of Cardiology at Shifa International Hospital, Islamabad, the study spanned from 19th September 2024 to 18th December 2024. A total of 78 patients, all aged 45 years or younger, were included in the research. These patients were identified based on a confirmed diagnosis of STEMI and were admitted during the specified study period. Coronary angiograms were performed during the initial hospital stay to collect comprehensive angiographic data. Parameters assessed included the extent of coronary artery involvement, lesion characteristics such as location, severity, and complexity, as well as the presence of multi-vessel disease. Additional demographic and clinical data, such as age, sex, and cardiovascular risk factors, were extracted from medical records to ensure a thorough evaluation of the cohort. A systematic approach was employed to summarize demographic and clinical variables using descriptive statistics, while angiographic patterns were analyzed to identify trends in coronary artery involvement and lesion morphology. Further subgroup analyses were conducted based on age, sex, and cardiovascular risk factors to evaluate potential variations in angiographic characteristics.

All statistical analyses were performed using SPSS version 23. Categorical variables were analyzed using chi-square tests, while continuous variables were assessed using t-tests. A significance level of $p < 0.05$ was established for all analyses. Results were presented using tables, graphs, and descriptive summaries to ensure clarity and facilitate interpretation. Subgroup analyses further explored potential differences in angiographic patterns across the categories of age, sex, and cardiovascular risk profiles, providing insights into their potential influence on disease characteristics.

RESULTS

The study included a total of 78 young patients diagnosed with ST-elevation myocardial infarction (STEMI), with a mean age of 40.2 years. Among these, 41.02% were aged 35 years or younger, while 58.98% were between 36 and 45 years old. Male patients constituted

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the majority, accounting for 71.79%, while females comprised 28.21%. Cardiovascular risk factors were present in 57.69% of the total cohort, with a significantly higher prevalence in males (67.95%) compared to females (32.05%). Hypertension, smoking, and a family history of cardiovascular disease emerged as the most common risk factors. Smoking was the most prominent, affecting 67.94% of patients, followed by hypertension at 32.05%, and diabetes mellitus at 20.51%. A slightly higher prevalence of obesity and sedentary lifestyle was observed in the younger age group (15.63%) compared to the older group (13.04%). The angiographic evaluation revealed significant coronary artery involvement among the study population. In patients aged 35 years or younger, the right coronary artery (RCA) was the most frequently affected vessel (43.75%), followed by the left anterior descending artery (LAD) at 31.25%, and the left circumflex artery (LCx) at 25%. Similarly, in patients aged 36–45 years, the RCA was most commonly involved (47.83%), followed by the LAD (34.78%) and LCx (39.13%). Lesions were predominantly located in the proximal segment of the coronary arteries, affecting 40.63% of the younger group and 50% of the older group. Severe lesions were observed in 53.12% of the younger cohort and 54.35% of the older cohort, with multi-vessel disease being more prevalent than single-vessel disease in both groups. Multi-vessel disease was present in 56.25% of patients aged 35 years or younger and in 52.17% of those aged 36–45 years. Total occlusion was relatively uncommon, observed in 15.63% of the younger group and 17.40% of the older group.

Gender-based analysis of angiographic features showed no significant differences between male and female patients. Among males, the RCA was the most frequently involved artery (39.29%), followed by the LAD (32.14%) and LCx (28.57%). In females, a similar pattern was observed, with the RCA being most commonly affected (40.91%), followed by the LAD (31.81%) and LCx (27.28%). The proximal segment of the coronary arteries was the most common lesion location in both males (41.07%) and females (36.36%). Severe lesions were slightly more prevalent in females (54.55%) than males (50%). Multi-vessel disease was observed in 53.57% of males and 59.09% of females, while total occlusion occurred in 17.86% of males and 13.64% of females. While the results provide a comprehensive evaluation of demographic, clinical, and angiographic characteristics, there is a need for further exploration of the relationship between individual risk factors and lesion characteristics to better understand the pathophysiological mechanisms in young STEMI patients. Additionally, long-term follow-up data could provide insights into the impact of these findings on clinical outcomes and prognosis.

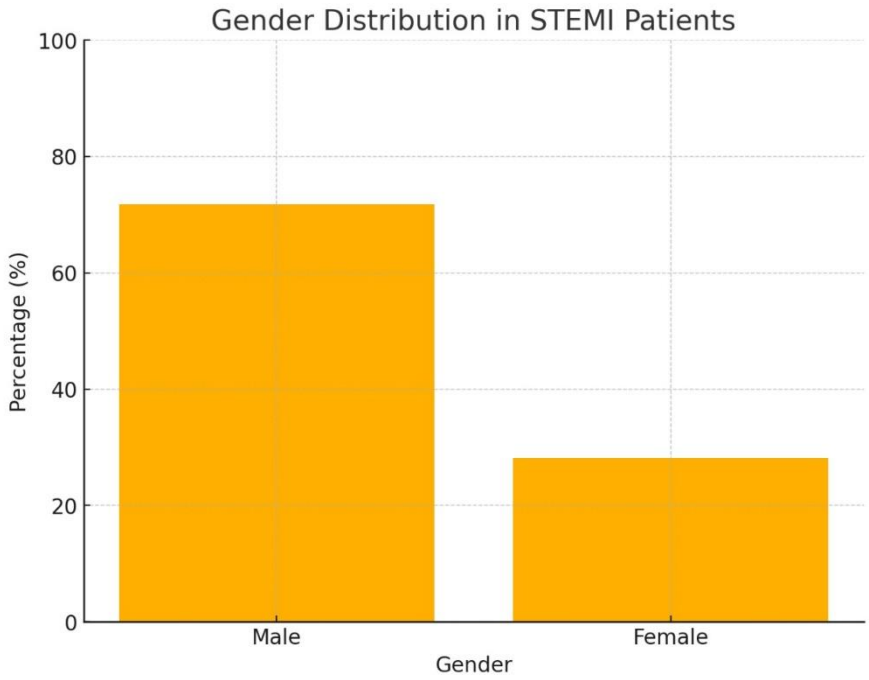

Figure 1 Gender Distribution in STEMI Patients

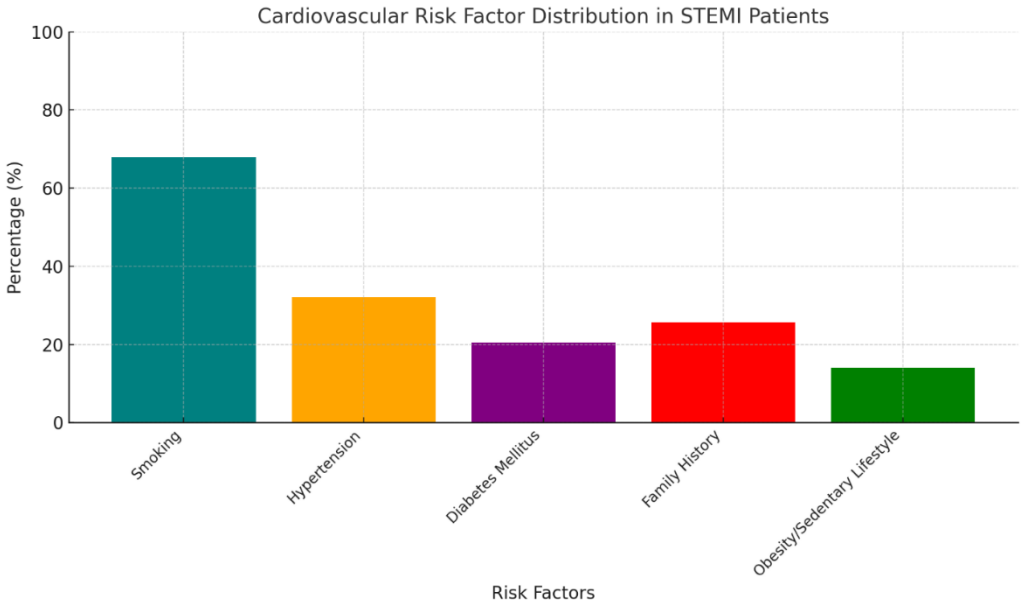

Figure 2 Cardiovascular Risk Factor Distribution in STEMI Patients

Table 1 Demographic Characteristics of Young Patients with STEMI

Parameter	Total (n=78)	Age ≤ 35 (n=32)	Age 36-45 (n=46)	Male (n=56)	Female (n=22)
Mean Age (years)	40.2	31.8	41.5		
Age Distribution		32(41.02%)	46(58.98%)		
Gender Distribution				56(71.79%)	22(28.21%)
Cardiovascular Risk Factors (%)	45(57.69%)	8(25%)	14(32.61%)	53(67.95%)	25(32.05%)

Table 2 Angiographic Characteristics of Young Patients with STEMI

Angiographic Parameter	Age ≤ 35 (n=32)	Age 36-45 (n=46)
Coronary Artery Involvement		
LAD (Left Anterior Descending)	10(31.25%)	16(34.78%)
RCA (Right Coronary Artery)	14(43.75%)	22(47.83%)
LCx (Left Circumflex)	8(25%)	18(39.13%)
Lesion Location		
Proximal	13(40.63%)	23(50%)
Mid	10(31.25%)	13(28.26%)
Distal	9(28.12%)	10(21.74%)
Lesion Severity		
Mild	4(12.50%)	7(15.22%)

Angiographic Parameter	Age ≤ 35 (n=32)	Age 36-45 (n=46)
Moderate	11(34.38%)	14(30.43%)
Severe	17(53.12%)	25(54.35%)
Complexity of Lesions		
Single Vessel Disease	9(28.12%)	14(30.43%)
Multi-Vessel Disease	18(56.25%)	24(52.17%)
Total Occlusion	5(15.63%)	8(17.40%)

Table 3 Distribution of Cardiovascular Risk Factors in Young Patients with STEMI

Risk Factor	Total (n=78)	Age ≤ 35 (n=32)	Age 36-45 (n=46)
Hypertension	25(32.05%)	9(28.12%)	15(32.61%)
Diabetes Mellitus	16(20.51%)	4(12.5%)	12(26.09%)
Smoking	53(67.94%)	20(62.5%)	33(71.74%)
Family History	20(25.64%)	8(25%)	12(26.08%)
Other	11(14.10%)	5(15.63%)	6(13.04%)

Table 4 Comparison of Angiographic Characteristics Based on Gender in Young Patients with STEMI

Angiographic Parameter	Male (n=56)	Female (n=22)
Coronary Artery Involvement		
LAD	18(32.14%)	7(31.81%)
RCA	22(39.29%)	9(40.91%)
LCx	16(28.57%)	6(27.28%)
Lesion Location		
Proximal	23(41.07%)	8(36.36%)
Mid	19(33.93%)	6(27.28%)
Distal	14(25%)	8(36.36%)
Lesion Severity		
Mild	7(12.5%)	3(13.64%)
Moderate	21(37.5%)	7(31.81%)
Severe	28(50%)	12(54.55%)
Complexity of Lesions		
Single Vessel Disease	16(28.57%)	6(27.28%)
Multi-Vessel Disease	30(53.57%)	13(59.09%)
Total Occlusion	10(17.86%)	3(13.64%)

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DISCUSSION

The findings of this study align closely with existing literature on young individuals presenting with ST-elevation myocardial infarction (STEMI). The mean age of participants, 40.2 years, corresponds with previously reported ranges of 37 to 44 years, supporting the notion that STEMI in younger populations tends to occur within this age bracket (10, 11). The predominance of male patients, accounting for 71.79% of the cohort, reflects established patterns observed in similar studies, where males are reported to have a higher prevalence of STEMI. This gender disparity can be attributed to the greater prevalence of conventional cardiovascular risk factors, such as smoking and hypertension, among males, as consistently documented in earlier investigations (12, 13). The prevalence of cardiovascular risk factors observed in this study aligns with prior research findings. Hypertension, smoking, and a family history of cardiovascular disease emerged as the most prominent risk factors, reaffirming their role in the pathogenesis of STEMI among younger individuals (14). Smoking, identified in 67.94% of the cohort, was particularly prevalent and mirrors its well-recognized contribution to the development of premature coronary artery disease (14). However, the prevalence of diabetes mellitus in this study, at 20.51%, was notably lower than the 25–30% reported in prior research (15). This variation may be attributable to differences in sample size, population characteristics, or methodological factors.

The angiographic findings in this study also demonstrate consistency with earlier research. The right coronary artery (RCA) was the most frequently implicated vessel, followed by the left anterior descending artery (LAD) and the left circumflex artery (LCx) (16). This distribution underscores the predominant involvement of the RCA in young STEMI patients, a pattern widely reported in prior investigations (16). The proximal segment of the coronary arteries was the most common site of lesion involvement, with a majority of lesions classified as severe, further corroborating earlier findings (17). The predominance of multi-vessel disease, affecting 54.49% of patients in this study, is consistent with prior research, which has reported similar frequencies ranging between 50% and 60% (18). The relatively low occurrence of total occlusion observed in this study, at 16.67%, also mirrors prior reports (18). When comparing angiographic features between males and females, this study found no significant differences. Both genders exhibited similar patterns of coronary artery involvement, lesion location, and lesion severity (19). These findings are consistent with the majority of prior studies, which have reported comparable angiographic profiles across genders in young STEMI patients (19). However, some research has suggested a higher prevalence of multi-vessel disease in females, which may reflect demographic or methodological differences between study cohorts (20).

Despite its contributions, this study has certain limitations that should be acknowledged. The relatively small sample size may limit the generalizability of the findings, particularly in exploring subgroup differences. Additionally, the single-center design may restrict the diversity of the study population, potentially limiting the external validity of the results. The absence of a control group precludes a comparative analysis of angiographic profiles between young STEMI patients and the general population. Furthermore, the study did not evaluate treatment strategies or clinical outcomes, which could provide valuable insights into the management and prognosis of this population. Nevertheless, this study offers valuable insights into the demographic, clinical, and angiographic characteristics of young STEMI patients. By reaffirming key patterns observed in previous research and identifying areas requiring further investigation, it contributes to the broader understanding of STEMI in younger populations. Future studies with larger, more diverse cohorts and a focus on treatment outcomes will be essential for advancing clinical management and improving prognosis in this unique patient group.

CONCLUSION

This study provides valuable insights into the demographic and angiographic characteristics of young patients with ST-elevation myocardial infarction (STEMI). The findings highlight that young STEMI patients are predominantly male and frequently exhibit conventional cardiovascular risk factors, such as smoking and hypertension. The right coronary artery was identified as the most commonly affected vessel, with multi-vessel disease being the most prevalent angiographic pattern. These observations underscore the importance of recognizing distinct characteristics in this population to guide targeted interventions and improve outcomes. Future studies with larger, more diverse cohorts are essential to validate these findings and further explore potential gender differences and other nuanced variations in angiographic features.

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AUTHOR CONTRIBUTIONS

Author	Contribution
Somera Naz	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Syed Muzaffar Shah*	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Sofia Mehmood	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Noman Munir Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Waqas Ahmad	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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