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Demographic profile and Risk factors associated with early onset of ST elevation Myocardial Infarction in younger people aged <40 years attending a tertiary care hospital in a major city of Bangladesh

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Abstract:

Background: Acute coronary syndrome (ACS) is a global health concern that results in increased healthcare expenses, disability, and premature mortality. Acute myocardial infarction (AMI) is a condition that is typically observed in elderly adults, but it is now affecting younger individuals. Public awareness of acute myocardial infarction (AMI), its risk factors, and complications is regrettably inadequate. The prevalence and outcomes of youthful coronary artery disease (CAD) are also unknown. The purpose of this investigation is to assess the demographic profile, risk factors, and in-hospital outcomes of acute ST-segment elevation myocardial infarction (STEMI) in patients aged 40 years or younger.

Methods: 50 patients who were younger than 40 years old and had been diagnosed with acute STEMI participated in research that was carried out at the Department of Medicine at Khulna Medical College Hospital. In-hospital outcomes, demographic features, risk factors, echocardiographic results, and other variables were evaluated. For the purpose of conducting data analysis, the Statistical Package for the Social Sciences (SPSS) was utilized. The statistical significance was established at a p-value of ≤0.05 utilizing this software. For the purpose of analysis, the Chi-square test was utilized.

Results: In terms of the patient demographic, male patients made up 74% of the total. Among the group, there was a considerably greater prevalence of smoking (70 percent), a positive family history of ischemic heart disease (52 percent), dyslipidemia (48 percent), and a significantly higher body mass index (BMI). On the other hand, hypertension (14%), diabetes (20%), and a history of angina (16%) were shown to constitute less important factors. A significant improvement in the left ventricular ejection fraction (LVEF) was seen (p = 0.005), which is an important finding to take into consideration. Heart failure (16%), arrhythmias (8%), cardiogenic shock (2%), post-myocardial infarction (6%), and in-hospital mortality (6%) were the problems that occurred with a lower degree of frequency.

Conclusions: Younger patients aged <40 with acute myocardial infarction (AMI) show a unique risk profile but tend to have favorable in-hospital outcomes relative to age. The main risk factors in these younger patients include male gender, family history of ischemic heart disease (IHD), smoking, overweight, and dyslipidemia. Early intervention to manage modifiable risk factors, such as smoking, obesity, and dyslipidemia, is essential for reducing the incidence of AMI in this group.

Keywords: Acute coronary syndrome (ACS), Young, Risk factors, In-hospital outcome.

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Introduction:

The incidence of acute ST-elevated myocardial infarction (STEMI) in younger adults under 40 years of age is a growing concern and poses unique clinical and public health challenges. Although traditionally considered a condition affecting older populations, the occurrence of STEMI in younger individuals signals a shift that warrants deeper investigation into the contributing demographic and risk profiles specific to this age group. Understanding these profiles is crucial for developing targeted preventive strategies.

Younger patients with STEMI often present with a distinct set of risk factors compared to their older counterparts. The most common risk factors include male predominance, family history of ischemic heart disease (IHD), smoking, overweight status, and dyslipidemia. Unlike older patients who may have more complex comorbidities, younger patients' profiles often reflect modifiable lifestyle-related risk factors that could be mitigated through early and effective intervention. Smoking was A study conducted in Middle east found that the most prevalent risk factor was smoking followed by hypertension, family history of CAD, hyperlipidemia and Diabetes mellitus.(1)Myocardial infarction is primarily caused by abnormal lipids, smoking, hypertension, diabetes, abdominal obesity, psychosocial factors, fruit, vegetable, and alcohol consumption, and regular physical activity in both sexes.(2) Current literature emphasizes that while younger STEMI patients generally exhibit better in-hospital outcomes due to fewer comorbidities and enhanced recovery potential, the early onset of such a serious cardiovascular event still results in significant long-term implications for health and quality of life. This underscores the importance of identifying and managing these modifiable risk factors early. Careful risk factor modification and treatment of the underlying cause should reduce the incidence of recurrent cardiac events.(3)

This study aims to explore the demographic characteristics and associated risk factors contributing to early-onset STEMI in individuals under the age of 40 presenting to a tertiary care hospital. The findings from this research may inform better-targeted preventive and management strategies, thereby improving early detection and reducing the burden of cardiovascular disease in younger populations.

Materials and Methods:

An observational study was conducted at the Department of Medicine at Khulna Medical College Hospital in Khulna, Bangladesh, from June 2016 to November 2016. This hospital-based study sought to evaluate the clinical characteristics and in-hospital outcomes of patients under 40 diagnosed with acute ST-elevation myocardial infarction (STEMI). A total of 50 patients were enrolled in this study. Participation eligibility was granted to patients exhibiting acute STEMI with one or more predisposing risk factors. The risk factors encompassed diabetes, hypertension, dyslipidemia, tobacco use, obesity, a familial predisposition to coronary artery disease, or a prior myocardial infarction. Patients diagnosed with valvular heart disease, congenital heart disease, cardiomyopathy, severe renal impairment, cancer, or other significant systemic disorders were excluded from the study. Informed consent was a fundamental component of the study protocol and was secured from all patients or their legal guardians prior to any data collection. The clinical history of each participant was meticulously documented, followed by an extensive physical examination that emphasized the assessment of the cardiovascular system. Diagnostic methods employed to verify acute STEMI comprised electrocardiograms (ECGs), serum cardiac enzyme assessments, and fasting lipid profiles. The data collection process was standardized via structured case record forms, and participant selection was conducted using non-randomized purposive sampling to effectively achieve the study objectives. The principal clinical outcomes assessed during the patients' hospitalization encompassed the onset of heart failure, arrhythmias, mechanical complications, re-infarction, cardiogenic shock, and in-hospital mortality. The gathered data were rigorously analyzed utilizing the Statistical Package for the Social Sciences (SPSS) software. The Chi-square test was utilized to assess the statistical significance of the results, with a significance level established at $p \leq 0.05$.

Ethical considerations were meticulously maintained throughout the study, in accordance with the ethical guidelines established in the Declaration of Helsinki. This commitment guaranteed that participants were thoroughly informed regarding the study's purpose, methodologies, and procedures. Furthermore, their entitlement to withdraw from the study at any time was explicitly conveyed. Informed written consent was secured from all participants or, when applicable, from their legally authorized representatives, thereby ensuring adherence to ethical standards and respect for patient autonomy.

Statistical analysis: All data were analyzed using SPSS software (version 22.0).

Results:

The research project included a total of fifty patients who had been diagnosed with ST-segment elevation myocardial infarction (STEMI) and who fulfilled the criteria that were established for inclusion and exclusion. The Khulna Medical College Hospital's Medicine ward was the location where each and every participant was admitted. In order to guarantee uniformity and comprehensive documentation for each individual patient, the principal investigator was the one who carried out the data collection process by means of a structured questionnaire. For the purpose of analyzing the data, the Chi-square test was utilized, with the threshold for statistical significance set at $p \leq 0.05$.

Following the completion of the demographic analysis of the participants, it was discovered that the majority of them were male, making up 74% of the total population of the study. It was determined through the analysis of occupational data that the most common type of employment among these patients was jobs related to providing services (Table 1).

Table-1: Distribution of the study population according to sex (n=50)

Sex	Number	Percentage
Male	37	74%
Female	13	26%

Table 1 showed sex distributions of the study population. In this study 74% male patients had ST elevated MI and 26% female had ST elevated MI.

In addition, the investigation revealed that a sizeable percentage of patients, specifically 74%, were engaged in activities that were considered to be sedentary. It is possible that this finding is connected to the growing mechanization in agriculture as well as

the significant reliance on migrant labor in both the agricultural and non-agricultural sectors (Table 2).

Table-2: Distribution of the study population according to occupational (n=50)

Occupation	Number	Percentage
Sedentary	37	74%
Active	13	26%

Table 1 showed work distributions of the study population. In this study 74% patients were sedentary worker and 26% patients were active worker.

The results of the risk factor assessment, which are presented in Table 3, illustrated that a significant proportion of patients were smokers (70 percent), had a history of ischemic heart disease in their families (52 percent), and exhibited dyslipidemia (48 percent). Participants also tended to have higher body mass index (BMI) levels. On the other hand, conditions such as hypertension (14%), diabetes (20%), and a previous history of angina (16%) were found to have considerably lower incidences, particularly when age was taken into consideration.

Table-3: Distribution of study population according to risk factors (n=50).

Risk factors	**≤40 Years**
Hypertension	07(14%)
Diabetes mellitus	10(20%)
Dyslipidemia	24(48%)
Obesity • Normal • Obese • Overweight	 22(44%) 12(24%) 16(32%)
Previous history of Angina or acute MI	08(16%)
Family early history of IHD	26(52%)
Smoking	35(70%)
History of taking alcohol	08(16%)

Table-3 showed the study population had a significantly higher proportion of smoking (70%), family history of IHD (52%), dyslipidemia (48 %), and higher BMI. But hypertension (14%), diabetes (20 %) and history of angina (16%) were not significantly higher according to age consideration.

The patients were found to have a significantly higher left ventricular ejection fraction (LVEF), as indicated by a p-value of 0.005 (Figure 3). This was another finding that emerged from the study.

According to the findings of the clinical outcome analysis, only a relatively small percentage of the patients experienced extremely serious complications. To be more specific, sixteen percent of the patients developed heart failure, eight percent of them experienced arrhythmias, and only two percent of them experienced cardiogenic shock. According to the data presented in Table 4, the mortality rate within the hospital was 6%, while the incidence of post-myocardial infarction (post-MI) angina was reported to be 6%.

Table-4: Distribution of study population according to in-hospital outcome (n-50).

In-Hospital outcome	**≤40 Years**
Heart failure • Class I • Class II • Class III • Class IV	08(16%) 00(00%) 04(08%) 03(06%) 01(02%)
Post MI angina	03(06%)
Re-infarction	01(02%)
Significant Arrhythmia • Ventricular tachycardia/Ventricular fibrillation • Atrial fibrillation • Complete heart block	 02(04%) 00(00%) 02(04%)
Cardiogenic shock	01(02%)
Mechanical complications (MR)	01(02%)
Death	03(06%)

Table 4 showed the in-hospital outcome of the study participants. In this study the patients had developed heart failure (16%), arrhythmia (8%), cardiogenic shock (2%), post MI angina (6%) and death (6%).

These findings offer valuable insights into the demographic, occupational, and clinical characteristics of younger patients who have suffered from STEMI, as well as the risk factors associated with them and the outcomes that they experienced while they were in the hospital.

Discussion:

The present study provides comprehensive insights into the demographic, occupational, and clinical characteristics of patients under 40 years old diagnosed with ST-segment elevation myocardial infarction (STEMI) at Khulna Medical College Hospital. The results underscore critical risk factors and in-hospital outcomes within this patient group, contributing to a broader understanding of STEMI among younger populations in the region. Although within a large community-based population, the incidence of myocardial infarction decreased significantly after 2000, and the incidence of ST-segment elevation myocardial infarction decreased markedly after 1999(4)(5). But the recent incidence of early onset of STEMI has been increasing alarmingly.

One of the significant findings of this research was the predominance of male patients, who comprised 74% of the study sample. This aligns with existing literature that suggests a higher prevalence of STEMI in males compared to females in younger age groups, potentially due to differences in risk factor profiles and lifestyle behaviors. The occupational analysis highlighted that most patients were engaged in service-related jobs, with a substantial 74% identified as participating in sedentary activities. This observation could be attributed to shifts in occupational patterns,

including the increased mechanization of agriculture and reliance on migrant labor, which may reduce physical activity levels and contribute to higher cardiovascular risk.

The assessment of risk factors revealed a concerning prevalence of modifiable risk factors among the patients. A striking 70% of participants were smokers, which aligns with established knowledge of smoking as a significant and independent risk factor for STEMI, particularly in younger individuals. Furthermore, 52% of patients reported a family history of ischemic heart disease (IHD), highlighting the importance of genetic predisposition in early-onset STEMI. Dyslipidemia, noted in 48% of the sample, further underscores the role of lipid imbalances in the development of acute myocardial infarction. These findings emphasize the need for targeted interventions aimed at controlling these modifiable risk factors through public health initiatives focused on smoking cessation, lipid management, and lifestyle modifications. Interestingly, lower incidences of traditional cardiovascular comorbidities such as hypertension (14%), diabetes (20%), and prior angina (16%) were observed compared to older STEMI populations. This may reflect differences in the etiology of STEMI in younger individuals, where lifestyle and genetic factors might play a more significant role than chronic conditions commonly associated with older age groups. A notable finding from this study was the significantly higher left ventricular ejection fraction (LVEF) ($p = 0.005$) observed in the patient group, suggesting a relatively preserved cardiac function in most participants. This could be indicative of a better baseline cardiac condition due to their younger age and possibly shorter exposure to chronic cardiovascular stressors.

The analysis of clinical outcomes showed that while some patients did experience complications, the rates were lower than those typically reported in older populations. Only 16% of the participants developed heart failure, and arrhythmias were observed in 8% of cases. Cardiogenic shock, a severe complication, was rare, occurring in only 2% of the patients. The post-myocardial infarction (post-MI) angina rate was reported at 6%, and the in-hospital mortality rate was relatively low at 6%. These findings could suggest that younger patients may have a better capacity for recovery and resilience following a STEMI, potentially due to fewer chronic comorbidities and a better overall health status compared to older patients.

Along with known risk factors like being male, smoking, and having a family history of early CAD, Fib and HbA1c are also linked to STEMI in people younger than 44 who have never had angina pectoris before(6). Which supports this study findings.

Young and old patients have different risk factor profiles, clinical presentations, angiographic findings and prognosis(7). Overall, the results of this study highlight the critical need for prevention strategies tailored to younger populations. Public health campaigns should focus on increasing awareness of modifiable risk factors, especially smoking cessation, and promoting healthier lifestyle choices. When cholesterol levels were low, smoking had a bigger effect on heart disease, stroke, and death from any cause than high blood pressure(8). Additionally, the presence of a strong family history of IHD among the patients points to the importance of early screening and risk stratification for individuals with a genetic predisposition.

Limitations:

Despite the valuable findings, the study's limitations should be noted. The sample size was relatively small, and the single-center design may limit the generalizability of the results to broader populations. Future research with larger, multicenter cohorts would be beneficial to confirm these findings and further explore the impact of various risk factors and outcomes in younger STEMI patients.

Conclusion:

Patients under 40 with acute myocardial infarction (AMI) have better in-hospital outcomes despite a unique risk profile. These younger patients are at risk for ischemic heart disease (IHD) due to male gender, family history, smoking, obesity, and dyslipidemia. Early management of modifiable risk factors like smoking, obesity, and dyslipidemia is crucial to reducing AMI in this group.

Authors contribution:

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