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# Risk Factors & In-Hospital Outcome of Acute ST Segment Elevation Myocardial Infarction among Young (<40 Years) versus Older (>40 Years) Patients: A Comparative Study

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***Abstract:***

***Introduction:*** *Acute coronary syndrome (ACS) is a global health issue that causes premature death, disability, and rising healthcare costs. Younger people are now experiencing acute myocardial infarction (AMI), which is usually seen in older adults. Unfortunately, public awareness of AMI, its risk factors, and complications is low. Youthful coronary artery disease (CAD) prevalence and outcomes are also unknown. This study compares risk factors and in-hospital outcomes of acute ST-segment elevation myocardial infarction (STEMI) in younger (≤40 years) and older (>40 years) patients.* ***Material and Methods:*** *An observational, hospital-based study was conducted at the Department of Medicine, Khulna Medical College Hospital. The study included 100 consecutive patients, with 50 patients aged 40 years or younger and 50 patients older than 40 years, all diagnosed with acute STEMI. Clinical characteristics, echocardiographic findings, and in-hospital outcomes were evaluated and compared between the two age groups. Data analysis was carried out using SPSS (Statistical Package for Social Science), with statistical significance determined at a p-value ≤0.05, applying the Chi-square test for analysis.* ***Results:*** *The majority of patients in both age groups were male (74% in the younger group vs. 80% in the older group). The younger cohort demonstrated a significantly higher prevalence of smoking (70% vs. 54%), a positive family history of ischemic heart disease (52% vs. 32%), dyslipidemia (48% vs. 36%), and a higher body mass index (BMI). Conversely, conditions such as hypertension (14% in the younger group vs. 80% in the older group), diabetes (20% vs. 46%), and a history of angina (16% vs. 28%) were more common among older participants. Notably, the left ventricular ejection fraction (LVEF) was significantly better in the younger group (p = 0.005). Complications such as heart failure (32% vs. 16%), arrhythmias (24% vs. 8%), cardiogenic shock (18% vs. 2%), post-MI angina (12% vs. 6%), and in-hospital mortality (14% vs. 6%) were more frequent in older patients, though these differences did not reach statistical significance.* ***Conclusion:*** *Young patients with AMI exhibit distinct risk profiles and generally have better in-hospital outcomes compared to their older counterparts. This study underscores the importance of early intervention and control of modifiable risk factors, such as smoking, poor diet, obesity, and dyslipidemia, to mitigate the incidence of AMI in younger populations.*

***Key words:*** *Acute coronary syndrome (ACS), Young, Older adults, Risk factors, In-hospital outcome.*

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## Introduction:

Coronary artery disease (CAD) is an increasingly significant global health concern, with various risk factors contributing to its rising prevalence across different age groups. Common contributing factors include hypertension, diabetes mellitus, smoking, and dyslipidemia. Among younger individuals, hypertension is the predominant risk factor, while in older patients, diabetes becomes more prevalent, driven by age-related changes in beta cell function and insulin resistance[1,2]. Over the past few decades, numerous epidemiological


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studies such as the WHO's MONICA study, INTERHEART, Euroheart SES studies, and the India Heart Watch study (2012), along with various randomized control trials, have highlighted that certain risk factors, including family history, obesity, dyslipidemia, and tobacco use, are stronger predictors of outcomes in younger individuals compared to older ones[3]. The etiology of CAD is multifactorial, with many contributing risk factors influenced by lifestyle. The rapid shift in dietary habits and reduced physical activity, often linked to urbanization, may partially explain the increased prevalence of CAD[4]. Bangladesh is currently undergoing an epidemiological shift, marked by rapid urbanization. This shift has led to economic growth but also an increase in fast food consumption, tobacco use, and reduced physical activity. Consequently, the disease spectrum has shifted from communicable to non-communicable diseases, particularly CAD and diabetes[5].

A study by Morrilas et al on patients under 45 years old admitted to 17 hospitals in Spain found that these younger patients exhibited distinct clinical characteristics and better short-term prognoses compared to older patients[6]. Similar observations have been reported in studies from other countries[7-10]. However, data on the Bangladeshi population in this context remains limited. Gaining better insights into the characteristics and outcomes of AMI in the Bangladeshi population could help clinicians develop more effective age-specific treatment strategies. Thus, this study aimed to analyze the characteristics and in-hospital outcomes of AMI patients across two age groups admitted to Khulna Medical College Hospital.

**Materials and Methods:**

From June 2016 until November 2016, this hospital-based observational study was conducted at the Department of Medicine at Khulna Medical College Hospital, which is located in Khulna, Bangladesh. This study aimed to evaluate the clinical characteristics of patients who had been diagnosed with acute ST-elevation myocardial infarction (STEMI) as well as the outcomes that occurred while they were in the hospital. A total of one hundred patients were enrolled, with fifty patients belonging to the younger age group (those under the age of forty) and fifty patients belonging to the older age group (those over the age of forty). Patients with acute ST-elevation myocardial infarction who presented with one or more risk factors, such as diabetes, hypertension, dyslipidemia, smoking, obesity, a family history of coronary artery disease, or a previous history of myocardial infarction, were eligible for inclusion in the study. All patients who were diagnosed with valvular heart disease, congenital heart disease, cardiomyopathy, severe renal impairment, cancers, or any other major systemic disorders were not allowed to participate in the study. Following the acquisition of informed consent from the patients or their legal guardians, a comprehensive clinical history was gathered, and a physical examination was carried out, with a particular emphasis placed on the cardiovascular system. In order to diagnose the participants, diagnostic tests such as electrocardiograms, serum cardiac enzyme analyses, and fasting lipid profiles were carried out on each individual. Information was gathered through the use of structured case record forms, and the selection of participants who fulfilled the inclusion criteria was accomplished through the use of non-randomized purposive sampling. The primary outcomes that were of interest were heart failure, arrhythmias, mechanical complications, re-infarction, cardiogenic shock, and mortality while the patient was in the hospital. The data that was collected was analyzed using SPSS, which stands for Statistical Package for the Social Sciences. The Chi-square test was utilized to evaluate the statistical significance of the data, with a significance level of p (less than or equal to 0.05). In accordance with the principles outlined in the Declaration of Helsinki, ethical considerations were adhered to in a stringent manner. This included ensuring that all participants were provided with comprehensive information regarding the objectives and procedures of the study, as well as the right to withdraw from the study at any time. Before enrollment, written informed consent was obtained from each and every participant in the study, or more specifically, from their legally recognized guardians.

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

**Results**:

A total of 100 patients with ST-segment elevation myocardial infarction (STEMI) who met the inclusion and exclusion criteria were included in the study. These patients were admitted to the Medicine ward of Khulna Medical College Hospital. Data were collected by the investigator using a structured questionnaire for each patient. The Chi-square test was applied to analyze the data, with a significance level set at $p \leq 0.05$.

The study found that 50% of the patients with STEMI were in the younger age group (≤40 years), while the other 50% were in the older age group (>40 years). A majority of the patients were male, with 74% of younger patients and 80% of older patients being male. Occupational categorization revealed that the most common occupation in both age groups was service holder (Figure 1). Additionally, most patients were engaged in sedentary occupational activities, with 74% of younger patients and 80% of older patients in sedentary roles, which could be attributed to the mechanization of agriculture and the heavy reliance on migrant labor in both agriculture and other sectors (Figure 2).

Table I shows that the younger age group had a significantly higher proportion of smokers (70% vs. 54%), a family history of ischemic heart disease (IHD) (52% vs. 32%), dyslipidemia (48% vs. 36%), and higher BMI. In contrast, the older age group had significantly higher rates of hypertension (80% vs. 14%), diabetes (46% vs. 20%), and a

history of angina (28% vs. 16%). Left ventricular ejection fraction (LVEF) was also significantly higher in the younger group (p = 0.005) compared to the older group (Figure 3).

In terms of clinical outcomes, a higher proportion of older patients developed heart failure (32% vs. 16%), arrhythmias (24% vs. 8%), cardiogenic shock (18% vs. 2%), post-MI angina (12% vs. 6%), and death (14% vs. 6%) compared to the younger group, although these differences were statistically not significant (Table II).

Figure-1: In this study the occupational categorization had been done according to service holder, business, farmer, house wife and others. Among 100 patients with ST segment elevated groups.

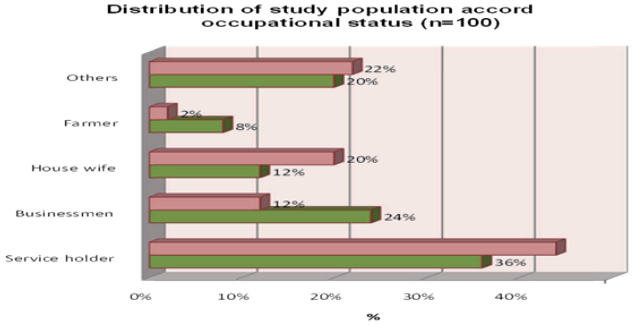


**Figure-1: Distribution of study population according to occupational status (n=100).**

Figure-2: Column chart showed, majority of patients were in sedentary occupational activities (young 74 % vs. old 80 %) due to mechanization of agriculture and also due to extreme dependence on migrant labor in both agriculture and other occupational activities.

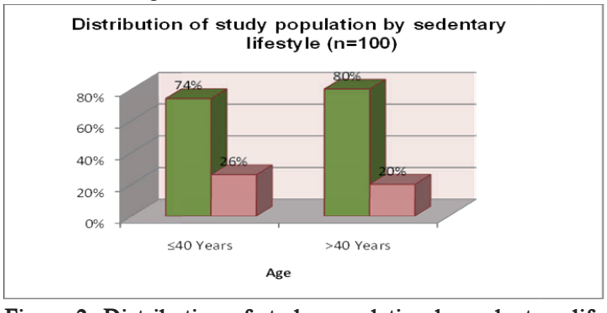


**Figure-2: Distribution of study population by sedentary life style (n=100).**

Figure-3: In this study, left ventricular ejection fraction (LVEF) was in the younger group (p = 0.005) than older.

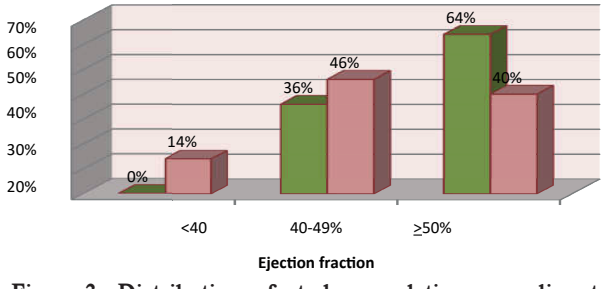


**Figure-3: Distribution of study population according to Echocardiographic findings (n=100).**

Table-I showed younger group had a significantly higher proportion of smoking (70 % vs 54 %), family history of IHD (52 % vs 32 %), dyslipidemia (48 % vs 36%), and higher BMI. In contrast, hypertension (14 % vs 80 %), diabetes (20 % vs 46 %) and history of angina (16 % vs 28 %) were significantly higher among participants of the older group.

**Table-I: Distribution of study population according to risk factors (n=100).**

| Risk factors | ≤40 Years | >40 Years | p-value |
|---|---|---|---|
| Hypertension | 07(14%) | 40 (80%) | <.001[S] |
| Diabetes mellitus | 10(20%) | 23 (46%) | <.001[S] |
| Dyslipidemia | 24(48%) | 18(36%) | <.001[S] |
| Obesity | | | |
| • Normal | 22(44%) | 30(60%) | |
| • Obese | 12(24%) | 08(16%) | <.001[S] |
| • Overweight | 16(32%) | 12(24%) | <.001[S] |
| Previous history of Angina or acute MI | 08(16%) | 14(28%) | <.001[S] |
| Family early history of IHD | 26(52%) | 16(32%) | <.001[S] |
| Smoking | 35(70%) | 27(54%) | <.001[S] |
| History of taking alcohol | 08(16%) | 04(8%) | |

n= study population, S= significant.

Table II showed the in-hospital outcome of the study participants. In this study older patients had developed heart failure (16% vs 32%), arrhythmia (8% vs 24%), cardiogenic shock (2% vs 18%), post MI angina (6% vs 12%) and death (6% vs 14%) than the younger group, which was statistically not significant.

**Table-II: Distribution of study population according to in-hospital outcome (n-100).**

| In-Hospital outcome | ≤40 Years | >40 Years | p-value |
|---|---|---|---|
| Heart failure | 08(16%) | 16(32%) | |
| • Class I | 00(00%) | 00(00%) | |
| • Class II | 04(08%) | 03(06%) | 0.10NS |
| • Class III | 03(06%) | 04(08%) | |
| • Class IV | 01(02%) | 9(18%) | |
| Post MI angina | 03(06%) | 06 (12%) | 1.00NS |
| Re-infarction | 01(02%) | 03(06%) | 1.00NS |
| Significant Arrhythmia | | | |
| • Ventricular tachycardia/Ventricular fibrillation | 02(04%) | 04(08%) | 0.43NS |
| • Atrial fibrillation | 00(00%) | 03(06%) | |
| • Complete heart block | 02(04%) | 05(10%) | |
| Cardiogenic shock | 01(02%) | 09(18%) | 1.00NS |
| Mechanical complications (MR) | 01(02%) | 02(04%) | 1.00NS |
| Death | 03(06%) | 07(14%) | 1.00NS |

n= study population, NS= not significant.

**Discussion:**

This observational study was conducted on patients with ST-segment elevation myocardial infarction (STEMI) admitted to the Department of Medicine at Khulna Medical College Hospital, Khulna. The results showed that the majority of patients were male (74% in the younger group vs. 80% in the older group), which aligns with previous studies in Bangladesh where the percentage of male STEMI patients ranged from 80% to 92%[11,12]. Among the 100 patients with STEMI, the most common occupation in both age groups was being a service holder. Additionally, the majority of patients were engaged in sedentary occupational activities (74% in the younger group vs. 80% in the older group), likely due to the mechanization of agriculture and a heavy dependence on migrant labor in both agriculture and other sectors. A previous study found that 84% of subjects were involved in sedentary occupations, while 16% were moderately active[13]. In terms of risk factors, the younger age group had a significantly higher proportion of smokers (70% vs. 54%), a family history of ischemic heart disease (IHD) (52% vs. 32%), dyslipidemia (48% vs. 36%), and a higher body mass index (BMI). In contrast, the older age group had significantly higher rates of hypertension (80% vs. 14%), diabetes (46% vs. 20%), and a history of angina (28% vs. 16%). A study by Khan et al. on young patients with acute myocardial infarction (AMI) reported high rates of smoking (84.4%), hypertension (46.9%), dyslipidemia (56.3%), diabetes (12.5%), and family history (34.4%), with higher triglyceride levels and lower HDL 14. These findings are consistent with other studies[14–16]. Another study in Bangladesh found that AMI in young patients is most commonly seen in males, with smoking being the most frequent risk factor[17]. In this study, left ventricular ejection fraction (LVEF) was significantly higher in the younger group ($p = 0.005$) compared to the older group. A majority of the older patients developed heart failure (32% vs. 16%), arrhythmias (24% vs. 8%), cardiogenic shock (18% vs. 2%), post-MI angina (12% vs. 6%), and death (14% vs. 6%) compared to the younger group, although these differences were statistically not significant. These findings are consistent with previous studies[17,18].

Our results indicate that ST-elevation MI was associated with significantly higher mortality and cardiovascular events in the elderly compared to the young, a finding that is in agreement with an Indian study. In a study by Chowdhury and Marsh, the in-hospital mortality rate among young MI patients ranged from 1% to 6%, while it ranged from 8% to 22% in older patients. Screening for risk factors in the young population could improve prognosis and help prevent AMI in younger individuals[19–21]. The better clinical outcomes observed among younger patients in this study are consistent with previous reports. However, studies in other countries have suggested that although young AMI patients experience better in-hospital outcomes due to less severe coronary vessel involvement, they are at higher long-term risk for complications, including previous MI, peripheral vascular disease, and low ejection fraction, all of which contribute to higher mortality.

**Limitation of Study:**

The study was conducted for academic and clinical purposes within a short timeframe and with a small sample size and limited resources. As it was carried out in a single hospital, the findings may not be generalizable to the broader population. The purposive sampling method used could introduce bias, potentially affecting the results. A larger sample size would have provided more robust findings.

**Conclusion:**

Younger patients with acute myocardial infarction (AMI) exhibit a distinct risk profile and generally experience more favorable in-hospital outcomes compared to older patients. The predominant risk factors in the younger cohort included male gender, a family history of ischemic heart disease (IHD), smoking, overweight, and dyslipidemia. Early intervention aimed at controlling modifiable risk factors, such as smoking, obesity, and dyslipidemia, is crucial to reducing the incidence of AMI in this population.

**Conflict of Interest:** None.

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