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Short Communication

In-Hospital Outcomes of Patients with Acute Myocardial Infarction - An Analysis of Two Age Groups

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- Acute myocardial infarction
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Abstract

Background: In-hospital outcomes of patients with acute myocardial infarction (AMI) of different ages have been widely reported. However, very limited data on Bangladeshi patients is available regarding this matter. The aim of the current study was to analyze the in-hospital outcomes of patients with AMI of two age groups admitted in a national cardiac hospital of Bangladesh.

Methods: The patients with AMI admitted from February 2013 to January 2014 in National Institute of Cardiovascular Diseases (NICVD) were enrolled in this observational study. Data on patient's demography, existence of traditional risk factors for cardiovascular diseases (CVD) and baseline clinical parameters were recorded on hospital admission day. For each enrolled patients, the incidences of specified in-hospital outcomes were also recorded throughout the hospital staying period. The patients were categorized in two groups, Group-I (<45 years) and Group-II (≥45 years). The in-hospital outcomes were compared between these two groups.

Results: A total of 483 patients with AMI were admitted over the study period (413 male and 70 female; M/F ratio – 5.9:1). 118 patients were in Group-I and 365 patients were in Group-II. Between these two age groups, there was no significant difference in patient's demography, existence of risk factors and baseline clinical parameters. However, significantly more patients in Group-II had diabetes compared to Group-I (141 versus 32, p = 0.023). In terms of in-hospital outcome, significantly more patients in Group-II suffered from heart failure, persistent chest pain, cardiogenic shock, atrial fibrillation, ventricular tachyarrytmias and in-hospital mortality compared to Group-I.

Conclusion: The patients with AMI aged 45 years or more had a significantly greater incidence of diabetes and poorer in-hospital outcome compared to patients younger than 45 years. These data could be useful to adopt early aggressive treatment strategies for the patients with AMI aged 45 years or more.

ABBREVIATIONS

AMI: Acute Myocardial Infarction; CVD: Cardiovascular Diseases

BACKGROUND

Acute myocardial infarction (AMI) accounts for about 2.5 million hospital admissions worldwide and is a major cause of mortality and morbidity [1]. Several prior studies have revealed the age associated differences in the clinical presentation and outcomes of AMI [2-7].

Morillas et al studied differential features of AMI in patients younger than 45 years old compared to older patients admitted in 17 hospitals in Spain. They found that patients younger than 45 years had different clinical features as well as a better short-term prognosis compared to patients over 45 years [3]. Timóteo et. al also studied similar features of AMI patients admitted in a single hospital in Portugal. They divided the patients into four groups according to age: <45 years, 45 to 64 years, 65 to 74 years and ≥75 years. They reported that both complications and in-hospital mortality were worse in the older groups [4].

Indeed, Hoit BD et al [5] examined the clinical features as well as morbidity and mortality of patients with AMI from the database of 3 hospitals of San Diego, United States of America

and 1 hospitals of Vancouver, Canada. They also found that in-hospital mortality was significantly lower in young patients (< 45 years) compared to patients aged 45 years or more (p <0.001). Some other authors from different countries also reported similar findings [6,7].

However, very limited data on Bangladesh is available regarding this matter. A better understanding of this matter in Bangladeshi patients may help the clinicians in Bangladesh to adopt better treatment strategies for AMI according to the age of the patients. Considering the situation, we aimed to analyze the characteristics and in-hospital outcomes of patients with AMI of two age groups admitted in a national cardiac hospital of Bangladesh.

The current study was carried out in the Cardiology department of National Institute of Cardiovascular Diseases (NICVD), Sher-e-Bangla Nagar, Dhaka, Bangladesh. This is the largest Government owned specialized cardiac hospital in Bangladesh.

MATERIALS AND METHODS

Study population

The male or female patients with AMI admitted from 1st February 2013 to 31st January 2014 were enrolled in this observational study. The diagnosis of AMI was established by elevation of cardiac biomarkers (preferably troponin) along with any of the criteria such as symptoms of ischemia, ECG changes indicative of new ischemia (ST changes or Left Bundle Branch Block LBBB), development of pathological Q waves in the ECG or imaging evidence of loss of viable myocardium or regional wall motion abnormality [8].

Data collection

Data on patient's demography (age, sex), existence of traditional risk factors for cardiovascular diseases (CVD) such as hypertension, hyperlipidemia, diabetes mellitus, family history of CVD, Smoking etc. and baseline clinical parameters (prior angina, MI or chronic kidney disease, blood pressures, heart rate) were recorded during hospital admission. For each enrolled patients, the incidences of specified in-hospital outcomes (heart failure, persistent chest pain, cardiogenic shock, atrial fibrillation, ventricular tachyarrytmias and in-hospital mortality) were also recorded throughout the hospital staying period.

Patient groups

The patients were categorized in two groups, Group-I and Group-II. Group-I included the patients younger than 45 years and Group-II comprised of patients aged 45 years or more. The in-hospital outcomes were compared between these two groups.

Study ethics

The study protocol was reviewed and approved by the National Institute of Cardiovascular Diseases Ethical Committee (NICVD/Ethical Committee/19). Written informed consent was obtained from each patient.

Statistical analysis

All data were analyzed with SPSS statistical software version 19.0 (Chicago, Illinois, USA). Continuous variables (age, blood pressure data, and heart rate) were expressed as mean ± standard deviation. The comparison of continuous variables between two age groups was performed using the t-test. Categorical variables were expressed as number (n) with regard to percentage (%). The comparison of categorical variables between two age groups was performed using the chi-square test. $p < 0.05$ was considered statistically significant.

RESULTS

A total of 483 patients with AMI were admitted over the study period. The number of female patients was about six times less than the males. 413 patients were male and 70 were female. The Male/Female ratio was 5.9:1. Patients younger than 45 years were 3 times less than patients aged 45 years or more. 118 patients belonged to Group-I and 365 patients belonged to Group-II.

Demographic and baseline characteristics

The Demographic and baseline characteristics of Group-I and Group-II patients are summarized in Table 1. There was no significant difference in the number of male gender, existence of risk factors (hypertension, hyperlipidemia, family history of CVD, smoking) and baseline clinical parameters (prior angina, prior MI, chronic kidney disease, mean blood pressure and heart rate) between these two age groups. However, diabetes was more prevalent among Group-II patients. Significantly, more patients in Group-II had diabetes compared to Group-I (141 versus 32, $p = 0.023$).

In-hospital outcomes

The In-hospital outcomes are presented in Table 2. Group-II patients had inferior in-hospital outcomes than Group-I patients. More patients in Group-II suffered from in-hospital complications like heart failure, persistent chest pain, Cardiogenic shock, atrial fibrillation, ventricular tachyarrytmias compared to Group-I patients. The comparison between two age groups is statistically significant for all these in-hospital complications.

In-hospital mortality

In-hospital Mortality was also significantly higher among Group-II patients. 27 (7.4%) patients in Group-II and only 1 patient in Group-I had died during the hospital staying period. The comparison between two age groups is statistically significant ($p = 0.008$).

DISCUSSION

In present study, we have recruited patients with AMI admitted over one year (from February 2013 to January 2014) in a national cardiac hospital of Bangladesh (NICVD). We have recorded the data on patient's demography, existence of traditional risk factors for cardiovascular diseases and baseline clinical parameters during hospital admission. For each enrolled patients, we have also recorded the incidences of specified in-hospital outcomes throughout the hospital staying period. We have compared the in-hospital outcomes between patients aged < 45 years and ≥ 45 years. We have found that a significantly more patients aged ≥ 45 years suffer from in-hospital outcomes

Table 1: Demographic and baseline characteristics of the patients with AMI admitted from February 2013 to January 2014 in National Institute of Cardiovascular Diseases (NICVD), Bangladesh (n=483).

	Group-I < 45 years (n=118)	Group-II ≥ 45 years (n=365)	p-value
Mean age, mean ± SD, years	39.6±4.6	59.1±9.2	< 0.0001
Male gender	107 (90.7%)	306 (83.8%)	0.066
Hypertension	35 (29.7%)	123 (33.7%)	0.416
Hyperlipidemia	14 (11.9%)	57 (15.6%)	0.317
Diabetes mellitus	32 (27.1%)	141 (38.6%)	0.023
Family history of CVD	33 (28.0%)	75 (20.5%)	0.093
Smoking	64 (54.2%)	171 (46.8%)	0.163
Prior angina	25 (21.2%)	98 (26.8%)	0.220
Prior MI	4 (3.4%)	15 (4.1%)	0.727
Chronic kidney disease	20 (16.9%)	42 (11.5%)	0.124
Mean SBP, mean ± SD, mm Hg	114 ± 22.1	118 ± 22.9	0.097
Mean DBP, mean ± SD, mm Hg	75 ± 11.8	76 ± 12.8	0.453
Heart rate, mean ± SD, beats/min	74.5 ± 15.4	73.1 ± 14.8	0.377

Categorical variables were expressed as number with regard to percentage (%). The comparison of categorical variables between two age groups was performed using the chi-square test. Continuous variables (age, blood pressure data, and heart rate) were expressed as mean ± standard deviation. The comparison of continuous variables between two age groups was performed using the t-test. $P < 0.05$ was considered statistically significant.

Table 2: In-hospital outcomes of the patients with AMI admitted from February 2013 to January 2014 in National Institute of Cardiovascular Diseases (NICVD), Bangladesh (n=483).

Complications	Group-I < 45 years (n=118)	Group-II ≥ 45 years (n=365)	p-value
Heart failure	48 (40.7%)	212 (58.1%)	0.001
Persistent chest pain	24 (20.3%)	110 (30.1%)	0.039
Cardiogenic shock	1 (0.8%)	18 (4.9%)	0.047
Atrial fibrillation	1 (0.8%)	22 (6.0%)	0.022
Ventricular tachyarrytmias	3 (2.5%)	29 (7.9%)	0.040
In-hospital mortality	1 (0.8%)	27 (7.4%)	0.008

Variables were expressed as number with regard to percentage (%). The comparison of variables between two age groups was performed using the chi-square test. $P < 0.05$ was considered statistically significant.

(heart failure, persistent chest pain, Cardiogenic shock, atrial fibrillation, ventricular tachyarrytmias and mortality) compared to patients aged <45 years. This is the first study in Bangladesh to analyze such effects. However, the findings of our study are similar with the results of several other studies [2-7] performed in different countries.

In terms of demography, our study observed that AMI in young patients occurs typically in men (90.7% of patients < 45 years were male). Some other previous studies reported similar observation [9,10]. The reasons why young women are less prone to AMI is still unclear. Suggested reasons are less number of smokers [11,12] and effect of endogenous estrogen on apolipoprotein or lipid levels [11,13-15].

Among the risk factors, our study seen that diabetes is significantly more prevalent in AMI patients aged ≥ 45 years. Saquib N et al. has also reported increasing incidence of type-II diabetes and metabolic syndrome with age among Bangladeshi population [16]. The incidence of diabetes in AMI patients aged ≥ 45 years in a higher frequency may account for their poor in-hospital outcome. Several studies [17-19] are in favor of this finding.

Among the in-hospital outcomes, 40.7% patients aged < 45 years and 58.1% patients aged ≥ 45 years in our study suffered from heart failure. Previously, Hoit BD et al. found similar results. They reported that 41.0% AMI patients aged < 45 years and 59.4% AMI patients aged ≥ 45 years suffered from heart failure during hospital stay [5]. 20.3% patients aged < 45 years in our study had faced persistent chest pain. It was little bit higher reported by Hoit BD et al. They reported occurrence of persistent chest pain in 30.0% of AMI patients aged < 45 years. In patients aged ≥ 45 years, 30.1% had persistent chest pain in our study which was similar to findings of Hoit BD et al [5]. In our study, cardiogenic shock occurred in 0.8% of patients aged < 45 years and in 4.9% of patients aged ≥ 45 years. Timóteo AT et al [4] and Hoit BD et al [5]. Reported no incidence and 2% incidence of cardiogenic shock respectively in patients aged < 45 years. These

authors found reported 2.3% and 3.6% incidence of cardiogenic shock respectively in patients aged ≥ 45 years.

0.8% patients aged < 45 years and 7.4% patients aged ≥ 45 years in our study had died during hospital stay. Timóteo AT et al. reported similar results previously. They stated in-hospital mortality of 1.1% in AMI patients aged < 45 years and 7.3% in AMI patients aged ≥ 45 years [4]. Hoit BD et al. found higher in-hospital mortality rate in AMI compared to our study. They found in-hospital mortality of 2.5% and 12.9% in patients aged < 45 years and patients aged ≥ 45 years respectively [5].

The association of age with in-hospital outcomes of hospitalized acute MI patients is subjected to the influence of multiple factors. Older age is associated with significant cardiovascular structural and physiologic changes that might predispose patients to adverse outcomes, including abnormalities of left ventricular diastolic function [20,21], decrease in systemic vascular compliance [22], increase in left ventricular mass index [23] and altered neurohormonal and autonomic influences [24,25]. Similarly, coagulation factors (VII, VIII and IX) are increased compared with anticoagulation factors (antithrombin III, Protein C and Protein S) with advancing age, leading to a greater risk of thrombosis in older patients [26]. The present study has some limitations such as it was single-centered and the sample size was small.

CONCLUSION

We have found that the patients with AMI aged 45 years or more had a significantly greater incidence of diabetes and poorer in-hospital outcome compared to patients younger than 45 years. Further studies with larger sample size and multiple centers are required to re-confirm our findings. However, these data could be useful to adopt early aggressive treatment strategies for the patients with AMI aged 45 years or more.

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