

## Acute ST-Elevation Myocardial Infarction Patients with Impaired Renal Function in Bangladesh: Our Experience

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### Abstract:

**Background:** Acute ST-Elevation Myocardial Infarction (STEMI) is a massive heart attack and profoundly life-threatening medical emergency. Acute STEMI is found to be associated with the impaired renal function and evolve inverse outcomes.

**Objective:** The purpose of this study is to evaluate the Outcome of admitted patients of acute ST elevation myocardial infarction with impaired renal function in Bangladesh.

**Methods:** The study was done in the NICVD, Dhaka after approval of protocol for 1 year. For the current study, 100 patients of STEMI diagnosed by clinical, biochemical and ECG criteria were included in the study. After getting serum creatinine level from them, eGFR was calculated and patients having <60ml/min were selected for the further studies.

**Results:** In the STEMI patients, the ratio of male patients 77% and females' patients (35%) was 3.34:1 with mean  $\pm$  SD of age was 52.84  $\pm$  8.40 year. The outcomes of cardiogenic shock were found in 14% patients, heart failure was found in 21%, arrhythmias were found in 73% and death occurred in 4% of cases. After calculating levels of eGFR, all the outcomes showed statistically significant ( $P < 0.05$ ) except cardiogenic shock which didn't show significance ( $P > 0.05$ ).

**Conclusion:** Early detection of renal impairment can decrease the mortality prevent the adverse outcomes by adequate and appropriate measurements.

**Keywords:** Acute ST-Elevation Myocardial Infarction (STEMI), impaired renal function, serum creatinine, outcomes.

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### I. Introduction

Myocardial infarction (MI) is a common cardiac disease caused by occlusion of atherosclerotic blood vessels by thrombus which is composed of fibrin & platelets. Acute MI is a common presentation of acute coronary syndrome [4]. In acute MI, most of the complications occur within few minutes to few days of initial attack. Nevertheless, some of these early complications are benign and some are life threatening [1][2][3][4][5]. Approximately 865,000 Americans suffer from an acute myocardial infarction (AMI) per year. The incidence of AMI has declined over the past two decades from 244 per 100,000 populations in 1975 to 184 per 100,000 populations in 1995. Afterwards, in-hospital mortality rate also has declined from 18 percent in 1975 to 12 percent in 1995. Even with these improvements, AMI continues to be a serious public health problem. It has been estimated that the number of years of life lost because of an AMI is 14.2 years [6].

Acute MI are classified as ST elevation (STEMI) and Non-ST-elevation MI [4]. The utility classification of myocardial infarction as ST-elevation MI and non-ST elevation MI has difference on management and prognosis. Most of the studies demonstrated lower mortality patients in hospitals with non-ST-elevation MI [7]. However, mortality rate in the short term in patients with STEMI remain remarkably high, around 12% in hospital of US National Registry [8]. Patients at high risk of developing STEMI face multiple coronary risk factor with unstable angina and rarely suffer hypercoagulability, collagen vascular disease, cocaine abuse, and intracardiac thrombi or masses [9]. Besides, the risk factors can play an important role in the STEMI developing patients. The effects of risk factors are found multiplicative rather than additive. People with a combination of risk factors (e.g. hypertension, DM smoking, and dyslipidaemia) are at greatest risk. Thus, assessment should be based on a holistic approach that takes account of all identifiable risk factors [10].

Renal impairment can be easily detected and its severity assessed by serum creatinine, age, sex and body weight of the patient by Cockcroft- Gault formula. Long standing renal impairment may adversely influence the outcome of acute coronary events especially acute STEMI [11]. Early recognition of renal impairment in acute STEMI patients is essential for risk stratification. Those who have renal impairment previously or develop after acute STEMI have adverse outcomes.

On the other hand, impaired renal function can be manifested by decreased GFR, which can be measured by increased serum creatinine or more precisely by reduced creatinine clearance (<60ml/min). It may be an independent risk factor for CAD outcome [11][12]. Another report suggested that cardiovascular disease may develop early in the course of renal dysfunction due to association mild renal impairment with an increased risk of coronary artery disease and stroke [13][14]. So, this prospective observational study is designed to find and evaluate the outcomes of acute STEMI patients with impaired renal function.

## II. Objectives

### General Objective

To evaluate the outcome of admitted patients of acute ST elevation myocardial infarction with impaired renal function in Bangladesh.

### Specific objectives:

To identify risk factors among the acute STEMI patients.

To detect examination findings and investigations findings.

## III. Materials and Methods

|                           |   |
|---------------------------|---|
| <b>Type of study</b>      | Prospective observational.  |
| <b>Place of study</b>     | NICVD, Dhaka  |
| <b>Study period</b>       | October 2012 to September 2013  |
| <b>Study population</b>   | Patients of acute STEMI with impaired renal function admitted in CMCH Cardiology Department |
| <b>Sampling technique</b> | Purposive   |

### Sample size:

To analyze the result of test estimate was controlled by the accompanying equation<sup>12</sup>:

$$n = \frac{Z^2 p q}{e^2}$$

Where,

Z = 1.96;

p = 50%

= 0.50 (predicted percentage of Myocardial Infarction among the patients of impaired renal function)

Q = 1-p

= 0.50

e= 10%

So, n =  $\frac{(1.96)^2 \times 0.50 \times 0.50}{(0.1)^2}$

= 96.4

= 100 (Apprx.)

### Selection criteria:

#### Inclusion criteria:

1. Patients of acute STEMI within twelve hours after the onset of chest pain who are eligible for thrombolysis;
2. eGFR <60ml/min (Cockcroft-Gault formula);
3. Voluntarily given consent to participate in the study.

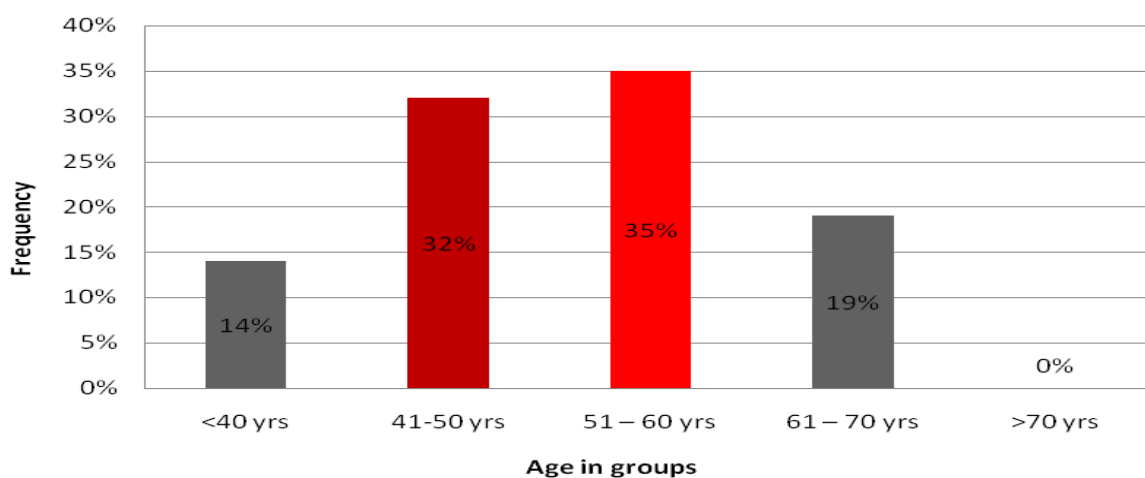
**Study procedure:** A patient with diagnosed case of MI or his/her trustee was totally enlightened regarding the aims, objectives and careful procedure of the study before examination. He/She was inspired for voluntary participation and allowed freedom to withdraw from the study whenever he/she likable even when participation. From all eligible subjects when obtaining consent clinical history was taken and clinical examination was done to elicit findings relating to MI. connected investigations like blood sugar and serum creatinine were done.

Blood was collected at intervals 2 hours when admission of the patient in the hospital. All relevant information for every individual study subject was recorded once obtaining getting informed written consent on a preformed data sheet. Collected information was checked repeatedly. Information was collected by the research worker himself.

**Data analysis:** Data was processed and analyzed by using pc bases software system SPSS- 19 (Statistical Package for Social Science). Discrete or qualitative variables were analyzed by Chi-squared test and continuous variables are going to be analyzed by T-test. P value will be considered as statistically vital once it is below 0.05.

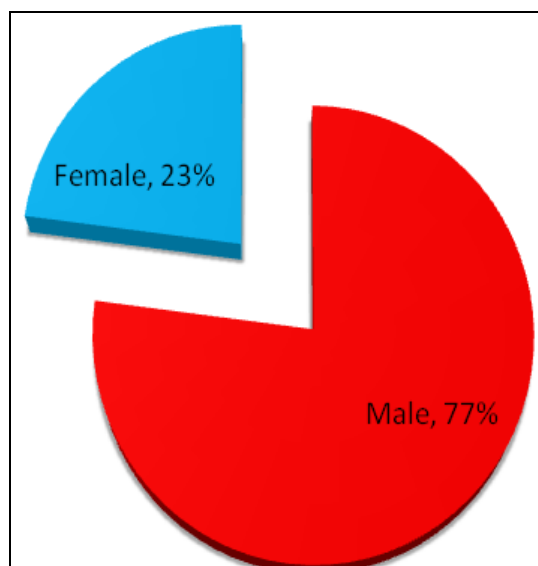
**IV. Results**

In figure 1, columns presenting age group distribution where among the 100 patients most of the patients were in age group 51-60 years (35%) next to which was 41-50 years (32%) (Mean  $\pm$  SD of age was 52.84  $\pm$  8.40 years). The following figure is given below in detail:



**Fig-1:** Distribution of age (n=100)

In figure-2 shows gender distribution of the patients where among 100 patient’s male was 77% and female was 23% (Male to female ration was 3.34:1). The following figure is given below in detail:



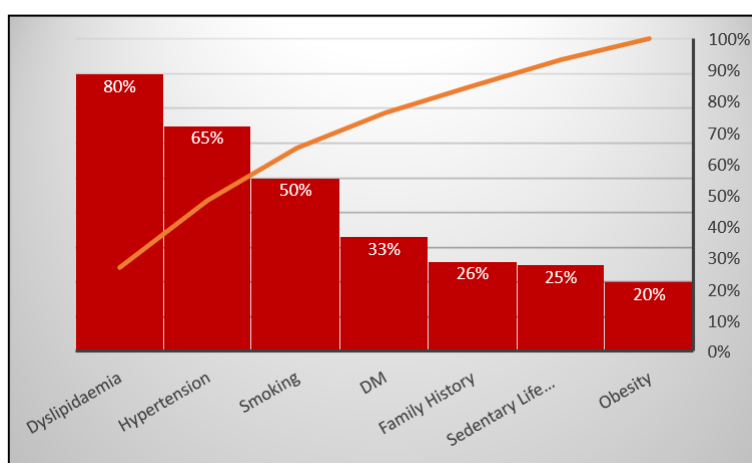
**Fig 2:** Distribution of sex (n=100)

Table 1 describing examination findings and investigations where Mean  $\pm$  SD of systolic blood pressure was found 136.75  $\pm$  20 and random blood sugar was found in 222.82  $\pm$  74mg/dl as well as gallop rhythm was found in 9% patients, those are remarkable. The following table is given below in detail:

**Table 1: Distributions of examination findings and investigations findings (n=100)**

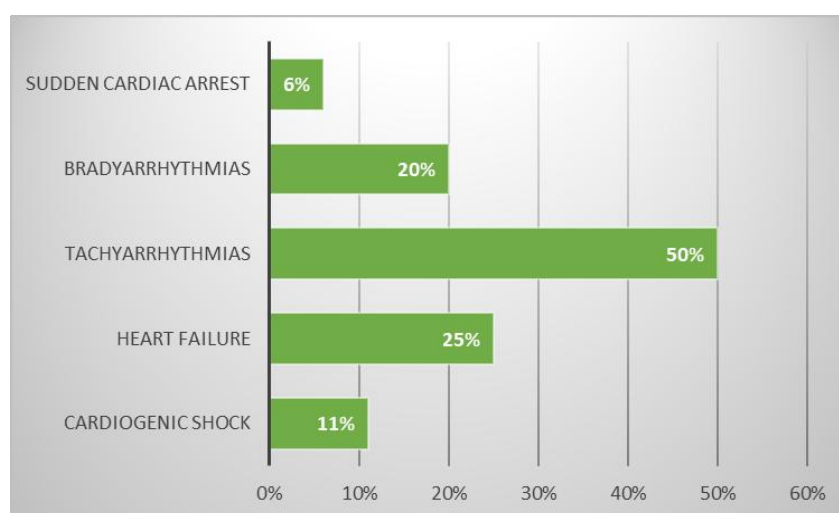
| Clinical Examinations and Investigations | n = 100<br>Mean ± SD / n (%) |
|--|------------------------------|
| Heart Rate (per minute)                  | 90 ± 15                      |
| Respiratory rate(bpm)                    | 23 ± 5                       |
| Systolic BP (mmHg)                       | 136.75 ± 20                  |
| Diastolic BP (mmHg)                      | 87 ± 11.52                   |
| BMI (Kg/m <sup>2</sup> )                 | 25.76 ± 4                    |
| Raised JVP                               | 13 (13%)                     |
| Gallop rhythm                            | 9 (9%)                       |
| Basal crepitations                       | 22 (22%)                     |
| LVEF (%)                                 | 50.82 ± 11                   |
| RBS (mg/dl)                              | 222.82 ± 74                  |
| LDL C                                    | 210 ± 24.5                   |
| Serum creatinine                         | 1.62 ± 0.39                  |

In figure 3, displaying risk factor analysis where STEMI hypertension was found in 65% and dyslipidaemia was present in 80%. The following figure is given below in detail:



**Fig 3: Distribution of risk factors (n=100)**

In figure 4, among the 100 patients, chart indicating the outcome of the study patients where cardiogenic shock was found in 11% patients, heart failure was found in 25%, arrhythmias were found in 70% and death occurred in 6% of cases. The following figure is given below in detail:



**Fig 4: Distribution of outcomes (n = 100)**

Table 2 showing Stratification of patients by in relation with eGFR where different pattern and frequency of outcome was observed in relation with level of eGFR described. The following table is given below in detail:

**Table 2:** Outcomes of patients stratified by eGFR with outcome (n = 100)

| Outcomes                        | eGFR              |                   |                | P-value             |
|---------------------------------|-------------------|-------------------|----------------|---------------------|
|                                 | 60-30<br>(n = 71) | 30-15<br>(n = 22) | <15<br>(n = 7) |                     |
|                                 | %                 | %                 | %              |                     |
| Cardiogenic Shock               | 7                 | 17                | 43             | 0.137 <sup>NS</sup> |
| Heart Failure                   | 17                | 28                | 55             | 0.024 <sup>S</sup>  |
| Arrhythmias                     | 70                | 61                | 70             | 0.001 <sup>S</sup>  |
| Sudden cardiac arrest and Death | 6                 | 4.5               | 26.5           | 0.042 <sup>S</sup>  |

#### IV. Discussion

Total 100 patients diagnosed with acute STEMI with impaired renal function admitted in Cardiology Department of Chittagong Medical College Hospital (CMCH) were being examined. All investigations were done in the Biochemistry Departments of CMCH and if not possible in the standard laboratories of Chittagong.

The study was conducted among 100 patients and most of STEMI patients were found between 51 to 60 years (35% of the total patients), followed by 41-50 years (32%) and 61-70 years (19%). In another study<sup>[15]</sup>, STEMI occurred in 26.5% cases in age less than 55 years, in 23.1% cases in age 55-64 years, and in 27.7% cases in age 65-74 years. Therefore, the results of the present study were consistent with the previous reports<sup>[16]</sup><sup>[15]</sup> The mean  $\pm$  SD of age was  $52.84 \pm 8.40$  years, similar to another study done in Pakistan<sup>[17]</sup> where the mean age was  $55.69 \pm 13.45$ . Among the 100 patients, 77 % were male and 23 % were female (Male to female ration was 3.34:1), which reports that ischemic heart disease has a higher prevalence in male than female, suggested in a study from England<sup>[16]</sup>. Thus the present results are in agreement that male population is more prone to STEMI linked to any genetic or hormonal differences. Finally, the present study found that the STEMI occurrence after the age of 40 in Bangladesh.

Mean  $\pm$  SD of systolic blood pressure was found  $136.75 \pm 20$  and random blood sugar was found in  $222.82 \pm 74$ mg/dl as well as gallop rhythm was found in 9% patients, those are remarkable.

Regarding the evaluation of risk factors of STEMI, dyslipidemia was present in 80%, hypertension was found in 65%, smoker was 50%, DM was in 33%, family h/o IHD was 26%, sedentary life style was found in 25% patients obesity was common among 20 % of total patients. The results of present study with reference to risk factors were similar to previous published papers where type 2 diabetic patients were more hypertensive than non diabetic<sup>[18]</sup>. These findings are consistent with the earlier study<sup>[18]</sup>

Among the 100 patients, cardiogenic shock was found in 11% patients, heart failure was found in 25%, arrhythmias were found in 70% and sudden cardiac arrest death occurred in 6% of cases. These findings are as expected from the patients with STEMI.

Regarding eGFR calculation, in the study creatinine clearance rates less than 60 ml/min were taken in the studies as creatinine clearance rates of 30–60 ml/min indicates moderate renal dysfunction, < 30 ml/min represents severe renal dysfunction and > 60 ml/min indicates normal and minimally impaired renal function<sup>[19]</sup> The present study showed that patients admitted with STEMI and across each STEMI grouping, creatinine clearance is an important independent predictor of hospital mortality. In this study, 6% were died with low eGFR. However, the significance outcomes (P<0.05) of heart failure, arrhythmias and sudden cardiac arrest death were found in the STEMI patients.

#### V. Conclusion

From the present study it can be concluded that those who have renal impairment previously or develop after acute STEMI have inverse outcomes. As renal impairment is associated with an increased risk of coronary artery disease and stroke, the cardiovascular disease may develop early in the course of renal dysfunction. In our country management facilities of complications of acute STEMI are limited. Early detection of renal impairment may help to avoid complications. However, if we can detect impaired renal function early, we can prevent the adverse outcomes by adequate and appropriate measures.

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