# IN- HOSPITAL OUTCOME OF ACUTE ST ELEVATION MYOCARDIAL INFARCTION WITH IMPAIRED RENAL FUNCTION

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**Abstract**

**Background:** Ischemic Heart disease (IHD) is a common cardiac disorder and is the no.1 cause of mortality and morbidity worldwide. Associated Chronic Kidney Disease (CKD) may further affect the outcome of acute ST elevation myocardial infarction adversely. So, Effective risk stratification is integral to the management of patients with acute coronary syndromes with a co-morbidity of CKD. This observational study was conducted to evaluate the clinical outcome of patients with acute ST Segment Elevation Myocardial Infarction (STEMI) with impaired renal function. **Materials and methods:** The study was done in the Department of Cardiology, Chittagong Medical College from January 2015 to December 2015. 100 STEMI patients diagnosed by clinical, biochemical and ECG criteria were included in the study. Biochemical and clinical parameters were obtained from eligible subjects. Data was analyzed by computer based software SPSS-17. **Results:** Mean ages of patients were 51. 4 years ± SD- 9.54 years.  Male to female ratio was 3.34:01. 97% patients were presented with chest pain and breathlessness was found in 65% of patients. Among 100 patients 73 had arrhythmias, 21 were found to develop heart failure, 14 were having cardiogenic shock and death occurred in case of 4 patients.

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**Conclusion:** Early detection and appropriate management of renal impairment is necessary to avoid increased mortality and morbidity in STEMI patients.

**Key words**
STEMI; CKD; ST Elevation; In-hospital outcome.

**Introduction**
Coronary heart disease is a major public health concern worldwide. Worldwide 30 percent of all deaths can be attributed to cardiovascular disease of which more than half are caused by coronary heart disease. 80 percent of deaths due to cardiovascular diseases occur in developing countries[1]. Every minute an American dies of coronary artery disease and about 38 per cent of people experience an acute coronary event[2]. It was estimated that worldwide coronary artery disease was responsible for 11.8 per cent of all death in low income countries[3].

Myocardial Infarction (MI) is caused by occlusion of atherosclerotic blood vessels by thrombus composed of fibrin & platelets. Acute MI is a common presentation of acute coronary syndrome. All acute (STEMI) is defined by at least two of the followings in which typical ECG changes is a must and any one either typical chest pain of cardiac origin or significantly raised Troponin I level[4]

The utility of classifying myocardial infarction as ST-elevation MI and non-ST-elevation MI is on difference on management and prognosis. Most studies have demonstrated lower hospital mortality in patients with non-ST-elevation MI[5]. Despite tremendous advances in the primary and secondary prevention of coronary artery disease, ST-Elevation Myocardial Infarction (STEMI) still occurs in vast numbers. According to US National Registry of MI in hospital mortality in the short term in patients with STEMI is remarkably high[6].

In STEMI cigarette smoking, male gender and a family history of cardiovascular and renal disease are associated with adverse prognosis in young patients, whereas dyslipidemia, hypertension and diabetes mellitus are associated with adverse prognosis in the elderly[7]. Most of the complications of acute MI occur within few minutes to few days of initial attack.

Decreased GFR is an independent risk factor for CAD outcome[8-9]. Some of these early complications are benign and require no treatment and some are life threatening[10]. Mild renal impairment is associated with an increased risk of coronary artery disease and stroke, suggesting that cardiovascular disease may develop early in the course of renal dysfunction[10-11]. Long standing renal impairment is an important contributor of atherosclerosis and may adversely influence the outcome of acute coronary events specially acute STEMI[8].

Early recognition of renal impairment in acute STEMI patients is essential for risk stratification and may assist in development of effective management strategies to improve outcome in such patients. Those who have renal impairment previously or develop after acute STEMI have adverse outcomes. In our country management facilities of complications of acute STEMI are limited. Early detection of renal impairment may help to avoid such complications. If we can detect impaired renal function early, we can prevent the adverse outcomes by adequate and appropriate measures. Studies on outcome of acute STEMI patients with impaired renal function are limited in our context. So the study was conducted to evaluate it.

**Materials and methods**

The study was designed as an observational study to evaluate clinical outcomes in acute STEMI patients with impaired renal function. The study was conducted in Department of Cardiology, Chittagong Medical College Hospital (CMCH) Chittagong from January, 2015 to December 2015. 100 admitted patients diagnosed with acute STEMI and impaired renal functions.

Clinical history was taken and clinical examination was done for patients with diagnosed case of MI to elicit findings related to MI. Related investigations like blood sugar level and Serum Creatinine were done. If calculated eGFR was less than 60 ml/min and ECG criteria confirmed the acute STEMI then he/she was included in the study after attaining written informed consent.

Patients were followed up till discharge with special attention to serum creatinine level and development of other complications. All investigations were done in Department of Biochemistry, CMCH. The authors did not influence or interfere into ongoing hospital management. The endpoint of the study was sudden cardiac death or rise of Serum Creatinine level double of the baseline value. All relevant data was noted in the pre tested data sheet. Before completion of data collection all data sheets were checked for missing fields. Data was processed and descriptive analysis was done by using computer bases software SPSS- 17 (Statistical Package for Social Sciences).

*Inclusion criteria*

i) Patients of acute STEMI within 12 hours of onset of chest pain who are eligible for thrombolysis

ii) Patients having impaired renal function with eGFR <60ml/min (Cockcroft-Gault formula)

iii) Voluntarily given written informed consent to participate in the study.

*Exclusion criteria*

i) Patients who are not eligible for thrombolysis

ii) STEMI with previous history of MI

iii) STEMI Patients with history of vulvular heart diseases, cardiomyopathy and congestive heart failure.

**Results**

**Table I:** Age and sex distribution of subjects

| Age in Groups | Male | Female | Total |
|---|---|---|---|
| <40 yrs | 11 | 3 | 14 |
| 41-50 yrs | 24 | 8 | 32 |
| 51 – 60 yrs | 27 | 8 | 35 |
| 61 – 70 yrs | 15 | 4 | 19 |
| > 70 yrs | 0 | 0 | 0 |
| | 77 | 23 | 100 |

**Table II:** Findings on clinical examination of patients and duration of hospital stay

| Clinical Examinations | n=100 Mean ± SD |
|---|---|
| Heart Rate (Per minute) | 88 ± 15 |
| Systolic BP (mmHg) | 136.75 ± 19.25 |
| Diastolic BP (mmHg) | 85.30 ± 11.52 |
| BMI (Kg/m$^2$) | 25.76 ± 2.51 |
| Hospital Stay in Days | 5.51 ± 1.77 |
| | **Frequency** |
| Raised JVP | 12(12%) |
| Gallop Rhythm | 10(10%) |
| Basal Crepitations | 21(21%) |

**Table III:** Distribution of findings on biochemical investigation

| Investigations | n=100 Mean ± SD |
|---|---|
| LVEF (%) | 50.82 ± 9.99 |
| Random Blood Sugar-RBS (mg/dl) | 222.82 ± 72.16 |
| LDL in Serum Lipid profile | 210 ± 23.8 |
| Serum Creatinine (mg/dl) | 1.62 ± 0.37 |
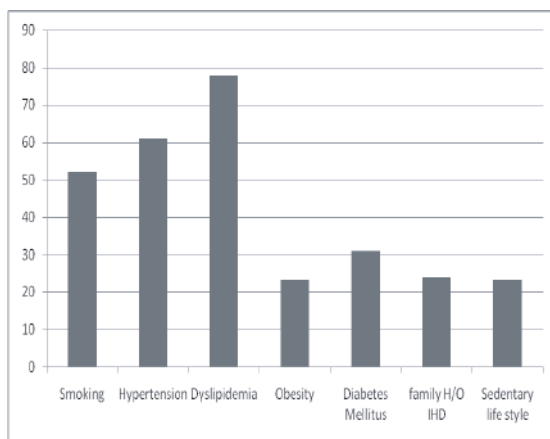


**Fig 1:** Distribution of risk factors for Ischemic Heart Disease (IHD) in patients with impaired renal function (Creatinine clearance < 60 ml/min)
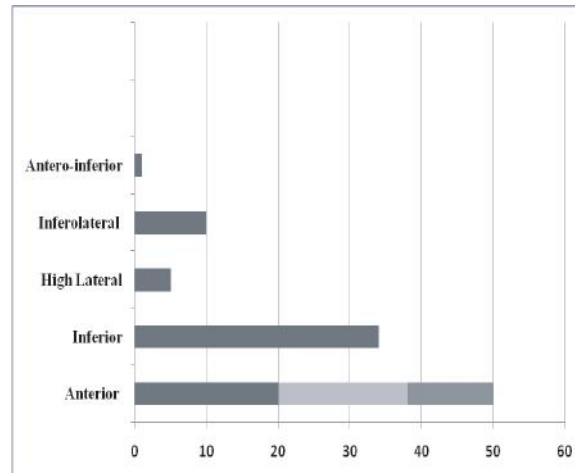


**Fig 2:** Distribution of location of STEMI
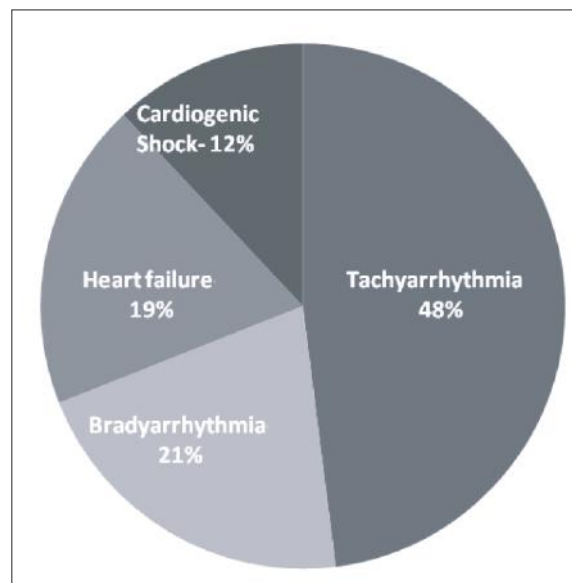


**Fig 3:** Distribution of clinical outcomes and death in STEMI patients with impaired renal function

Table I shows the distribution of age group of patients ranging from less than 40 years to more than 70 years divided into 5 subgroups. Most of the patients (27) were in age group 51-60 years followed by 41-50 years (24) with a mean age of 51. 4 ± SD- 9.54 years. Out of 100 patients, 77 were male and 23 were female having a ratio 3.34:1. In terms of clinical presentation 97 patients reported chest pain and 65 patients reported breathlessness.

On clinical examination mean heart rate was found 88 per minute and SD was 15 per minute. Systolic blood pressure found to be (Mean-136.75mm of Hg ± SD- 19.25 mm of Hg) and diastolic blood pressure was (Mean- 85.30 mm of Hg ± SD- 11.52 mm of Hg). Raised JVP was found in 12 patients, gallop rhythm was found in 10 patients and basal Crepitations were found in 21 patients (Table II). Biochemical investigations revealed average left ventricular ejection fraction as 50.82 % with a SD of 9.99% and mean Serum Creatinine level to be 1.62 mg/dl while SD was 0.37 mg/dl (Table III).

According to Fig 1, most prevalent risk factor among the subjects were dyslipidemia, found in 78 cases followed by hypertension-61, smoking-52, DM-32, sedentary life style-23 and obesity-23. 24 patients were having a positive family history of Ischemic Heart Disease (IHD). Based on ECG findings the locations of STEMI were having a distribution like anterior (20) extensive anterior (12) antero-septal (18) inferior (34) infero-lateral (10) high lateral (5) and antero-inferior (1) as illustrated in Fig 2.

Fig 3 is demonstrating clinical outcomes among the patients under the study. Most common outcome experienced by the patients was arrhythmia (69), out of which 48 were tachyarrhythmia and 21 were bradyarrhythmia. There were 19 cases of heart failures and 12 cases of cardiogenic shocks. 4 patients died due to sudden cardiac arrest in hospital.

**Discussion**

Acute Myocardial Infarction (AMI) is one of the major health problems all over the world and the coronary artery thrombosis is the virtually only cause of it[12]. In the developing country like Bangladesh, urbanization is taking place at a rapid pace that is responsible for change in the lifestyle which adversely affects the metabolism thereby causing a large increase in the number of diabetic patients[13]. In the present study, among 100 patients male was 77% and female was 23%. Male to female ration was 3.34:1. A higher prevalence of ischemic heart disease in male than female has been reported in a study from England[14]. Thus the present results are in agreement that male population is more prone to develop STEMI which may be linked to genetic/hormonal difference.

The present study showed 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 ± SD of age was 52.84 ±8.40 years. In a study done in Pakistan it was found that the mean age was 55.69 ± 13.45[15]. It was found that patients with risk factors had below 40 age group which suggests that STEMI is now occurring in relatively young people in Bangladesh. In another study STEMI occurred in 26.5% cases in age less than 55 years, in 23.1% cases in age 55-64 years, in 27.7% cases in age 65-74 years, in 18.9% cases in age 75-84 years and 3.8% cases in age more than 85 years. Thus the results of the present study were consistent with the previous reports[14, 16].

Regarding the evaluation of risk factors of STEMI hypertension was found in 61%, smoker was 52%, dyslipidemia was present in 78%, DM was in 31%, sedentary life style was found in 23% patients obesity was common among 23 % of total patients and family history of IHD was found in 24% of patients. The results of present study with reference to risk factors were similar to those published earlier that type 2 diabetic patients were more hypertensive than non diabetic since 48% patients were found hypertensive in the diabetic group where as only 36% patients were found hypertensive in non diabetic group. All of the above findings are consistent with the earlier studies[17].

Out of all patients in the study ECG findings revealed that inferior MI was 34%, anterior MI was 20%, extensive anterior MI was 18%, antero-septal MI was 12%, Inferolateral MI was 10%, lateral MI was 2%, high lateral MI was 3% and antero-inferior was 1%. The present study found non significant difference in the site of infarction among all patients. Inferior and anterior infarctions were found commonest. In some studies lateral infarction was found common in diabetic group[18]. But in present study it was not found which may be due to relatively small sample size.

Increased renal dysfunction was observed more often in elderly (Aged > 65 years) and female patients. It is well known that renal function decreases with age, and women are considerably older than men when they are admitted with an STEMI, which may partially explain the predominance of women with reduced renal function[19].

In an analysis of data from the TRACE (Trandolapril Cardiac Evaluation) registry, the prognostic role of renal dysfunction on mortality in more than 6000 patients with acute myocardial infarction was examined over a six year follow up. The investigators concluded that only severely reduced renal function was associated with increased mortality after acute myocardial infarction, and the risk associated with moderate renal dysfunction may be explained by the presence of other co morbidities[19].

Different pathophysiological mechanisms may play a part in explaining these discrepant results. These include accelerated atherosclerosis and a greater prevalence of co morbidities acting over a longer period of time. The GRACE findings are in agreement with the results of an earlier study 18 of 2,763 patients, in which renal insufficiency was an independent risk factor for cardiovascular events in patients with known coronary artery disease[19]. Furthermore, increased Creatinine concentrations are common in older patients and are independently associated with an increased risk of death, cardiovascular disease, and congestive heart failure. So it can be said that the increased risk of death begins with mildly elevated concentrations of Serum Creatinine.

### Limitations
It was a single centre study with relatively small sample size which could not lead to generalization of the findings. It also followed the patients up to their discharge from the hospital. Further follow ups were not conducted which might fail to sort out the long term clinical sequel of the patients with later complications or mortality.

### Contribution of Authors

MIC - Acquisition of data, interpretation of data, drafting the article and final approval.

MMAS - Conception, drafting and final approval.

AD - Design, acquisition of data, analysis, critical revision of content and final approval.

MMM - Design, interpretation of data, critical revision and final approval.

### Conclusion
The study evaluated that impaired renal function in acute STEMI patients adversely affect the clinical outcomes. So detecting and managing renal impairment in acute STEMI patients at early stage of hospital reporting could prevent the complications and reduce the mortality. Further study can be initiated to explore the effects of renal impairment in other clinical set ups and may contribute to develop a clinical guideline for management of acute STEMI with compromised renal function.

### Disclosure
All the authors declare no competing interest.

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