A Comparative Study of In-Hospital Outcome of Patients with ST-Segment Elevation Myocardial Infarction with and Without Diabetes Mellitus, after Thrombolytic Therapy; In Government Hospital of Rajkot, Gujarat, India

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Abstract

Background: Diabetes mellitus is considered as a major health problem and an epidemic throughout the world. The mortality of patients with diabetes is almost twice that of non-diabetic. The outcome of in-hospital patients with myocardial infarction with and without diabetes after thrombolytic therapy is presented here.

Aim: To compare the outcome of patients with myocardial infarction after thrombolysis in diabetics and non-diabetics in government hospital of Rajkot, India.

Methods: A retrospective, observational study was carried out between the period of March-2014 to April-2015. Patients who presented with acute myocardial infarction having ST-elevation as MI picture, were admitted to the emergency room of medicine department. All these patients were treated with streptokinase as a thrombolytic agent. Baseline ECG was taken on admission and the one after 60 minutes of thrombolysis. The study group involved two types: (i) diabetic (ii) nondiabetics.

Results: A total of 395 patients were included in the study. Out of them around 104 were females and 291 were males. ST-segment resolution in non-diabetic patients was found in 180 patients out of 186 and in diabetics it was found in 174 patients out of 208. Complications related to post fibrinolytic therapy was more prevalent in diabetics 148 patients (71.15%) as compared to those in non-diabetics 47 patients (25.26%). Mortality was observed only with diabetics (23.52%) as compared to no mortality in non-diabetics.

Conclusion: Overall, morbidity and mortality of diabetic patients with Acute Myocardial Infarction was found to be greater as compared to non-diabetics; post thrombolysis.

Introduction

Acute myocardial infarction is considered as one of the major epidemic of mankind. In a developing country like India, coronary artery disease incidence is rising. There is an entity called

Editorial Viewpoint

- Mortality in diabetic patients with STEMI is almost twice than that in non-diabetics.
- This study finds mortality only in diabetics with STEMI.
- Post-thrombolytic complications were also more prevalent in diabetes.

Acute Coronary Syndrome which includes various conditions like: unstable angina, non ST-segment elevation MI (NSTEMI) and ST-segment elevation MI (STEMI). Apart from other conditions like dyslipidaemia, smoking, hypertension, any suggestive family history of atherosclerotic disease in the family, Diabetes Mellitus is considered as one of the major risk factor leading to MI. Diabetes Mellitus is a metabolic disorder which enhances the atherosclerotic rate of vascular occlusion. Even after prompt thrombolysis, outcome of patients with diabetes is worse as compared to those without diabetes indicating impaired cardiac function post

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thrombolysis and of course; the prognosis.

In MI, for early and complete myocardial reperfusion, prompt thrombolysis is carried out.\(^2\) Chances of complications increases when there is incomplete or failed reperfusion. After fibrinolytic therapy, coronary reperfusion can be assessed by noting ECG changes pre and post thrombolysis in the form of ST-segment resolution. Micro vascular reperfusion can be better judged by ST- segment resolution whereas epicardial reperfusion can be better judged by coronary angiogram. Although epicardial reperfusion serves as a good marker for prognosis, micro vascular flow correlates more strongly with good clinical outcome. Therefore, ST segment is considered as a better prognostic tool, and it provides information which cannot be assessed by coronary angiogram alone\(^3,5\). In one of the study done by Schroeder et al\(^4\), it was reported that absence of ST-segment resolution is one of the powerful predictor of early mortality. In order to identify candidates for early invasive procedures like PTCA, ST-segment non-resolution is considered as an important tool after thrombolytic therapy\(^6\). In a developing country like India, it becomes very important to establish the effectiveness and importance of ECG for assessing reperfusion as it is widely available everywhere. ECG will offer cheapest alternative for judging myocardial salvage and recovery. This study aims at establishing correlation between post thrombolytic complications with diabetics when the diagnosis is made by ST-segment elevation found on ECG in patients with Acute Myocardial Infarction (AMI) then in those with non-diabetics.

### Patients and Methods

This retrospective study was done at government civil hospital Rajkot, India, from March-2014 to April-2015. All cases with ST-Elevation acute myocardial infarction were included. Following factors were considered in diagnosis:

i. ECG changes i.e.ST- elevation >0.2mv in atleast two contiguous chest leads or >0.1mv in atleast two contiguous limb leads.

ii. Elevated CPK-MB levels more than twice the reference values

iii. Positive trop-t test done from kits available commercially.

These patients were presented within 12 hours and were given streptokinase as a thrombolytic agent.

The exclusion criteria followed were those patients presented after 12 hours of chest pain and those suffering from diabetes mellitus type-1.

The study population was divided in 2 groups:

i. Group-A :- Diabetic

ii. Group-B :- Non-diabetic

Group B included only those patients who were known cases of diabetes or who were declared diabetic after repeated glucose testing or random blood sugar tests, during their in-hospital stay.

History, in detail was taken regarding age, sex, address, smoking history, any family history of atherosclerotic disease, hypertension. Pulse and blood pressure were noted on admission of patient to the emergency ward along with the entire clinical check-up. Daily follow-up was done. Any complications, ECG changes or pulse abnormalities were noted and checked regularly till discharge or death of the patient.

Exact time of onset of chest pain, its presentation and nature were noted through the history. Patients’ ECG were recorded and looked for ST-segment elevation. The segment showing maximum elevation was recorded in millimetres and treatment of thrombolysis was started. Streptokinase injection was given to all patients with the dose of 1.5 million units, diluted in 100 ml normal saline, over one hour.

ECG was repeated after almost 60 minutes of thrombolytic therapy by streptokinase and the lead with the maximum ST-segment elevation was observed for ST-resolution. Here we define resolution of ST-segment when the elevation has reduced to >50%. Informed written consent was obtained from all the patients included in the study. Routine follow-up and check-up of all the vitals and RBS was done daily and noted, as far as the in-hospital patients were concerned.

In order to differentiate between stress hyperglycaemia and non-diabetic, fasting blood sugar was done in stable condition at the time of discharge.

### Assessment related to complications was also made, which mainly included: hypotension due to streptokinase, arrhythmia, chest pain-non relieving type and sometimes death.

### Results

A total of 394 patients were taken as a study population, out of them 208 were found diabetic and 186 were non-diabetic. The following table shows the demographic distribution of our study population.

Smoking was the most common associated risk factor found to be involved according to this study, even hypertension was also associated with increased co-morbidity. The average age group involved in case of diabetics was about 54-56 years whereas in
case of non-diabetics was around 60-62 years. Average time taken to thrombolyze all these patients presented at the emergency department from the time of onset of chest pain to thrombolysis was around 7 hours and 6.8 hours from the onset of chest pain in diabetics and non-diabetic, respectively.

Out of 395 patients investigated, 355 patients showed resolution of ST-segment elevation and remaining 40 patients showed non resolution of ST-segment elevation. These are the patient who were thrombolyzed within about 60-180 minutes on arrival by streptokinase. Out of these 395 patients, 208 patients were found diabetic, either a known case or diagnosed by continuous blood glucose monitoring inward and remaining 186 were non-diabetic.

Complete ST-segment resolution was seen in 174 diabetic patients and in 180 non diabetic patients. Failed ST-segment resolution in diabetics was 34 patients (16.34%) whereas in non-diabetics it was 06 patients (3.22%) the above data indicates a remarkable difference in the patients’ recovery without diabetes as compared to those with diabetes.

On analysing the complications related to post thrombolisation, most common complication encountered was recurrent ischaemic chest pain of acute onset, few days after the discharge. Apart from it, heart failure and various types of arrhythmias were also noted as complications. Table 2 indicates the relationship between complications and ST-segment resolution in diabetics and non-diabetics.

In the present study, we found that in diabetic population about 86 (41.34%) patients suffered from chest pain, whereas in non-diabetic population the figure reduced to 21 (11.29%). Similarly, second most common complication encountered in both group of population was arrhythmias of different types, where again affection rate of diabetics was 20.19% whereas that of non-diabetics was 11.82%. Incidence of arrhythmias in diabetics was more (16.09%) as compared to other related complications. Overall mortality post-thrombolysis is very much less. In the present study, mortality is seen in diabetics only (23.52%).

### Discussion

The time taken for reperfusion after presentation and complete reperfusion plays a key role in fibrinolysis. In cases of STEMI, ST-segment resolution indicates reperfusion. Its importance as a good prognostic tool cannot be denied. It is mostly hypothesized that type-2 diabetes interferes with the effectiveness of thrombolysis intravenously, which may be established by ECG or angiographic findings.

In the present study, we observed that in non-diabetic patients with acute myocardial infarction, complete ST-segment resolution was seen in 180 patients and 6 patients’ showed failed resolution of ST-segment; and in case of diabetics 174 patients’ showed complete resolution and 34 patients’ showed failed ST-segment resolution.

Onset of complications post-thrombolysis was observed more in diabetics (71.15%) as compared to those in non-diabetics (25.26%).

This is in support of one study which stated that complications were more prevalent in diabetics as compared to non-diabetics.\(^7\)

As shown in another study, there was found a positive correlation between diabetic patients with increased morbidity as well as mortality after thrombolization. In context of ischemia, there is one another study mentioning the residual lesion in the infarct related artery was greater in diabetics post fibrinolytic therapy; thereby leading to higher rate of recurrent ischemia.\(^8\)

Post myocardial infarction, heart failure remains one of the most important prognostic factor. Here in the present study, heart failure is found to be associated with diabetic to a greater extent than non-diabetic. Any patient showing signs of heart failure post thrombolysis are considered in the category. In one of the study, it was found that in-hospital heart failure among diabetics was more common.\(^9\) In that study, heart failure developed in 9% diabetics and 4.3% non-diabetics (p=0.001).

Arrhythmias are also found to be associated with post fibrinolytic therapy. Their incidence is more in case of diabetics (20.2%) as compared to non-diabetic (11.82%). It indicates that arrhythmias are more common in diabetics than in non-diabetics, which is supported by another study which also showed positive correlation between arrhythmias and diabetics(p<0.0001).\(^7\) In another study, it was observed that the incidence in the patients dying of AV-block or LBBB, was almost three times more common in diabetic patients’ as compared to non-diabetics.\(^10\)

In the present study, mortality associated with diabetes, post fibrinolytic therapy was found to be about 3.8% of total diabetic population it was associated with failed ST-resolution post therapy. No mortality was observed in non-

### Table 2: Comparison between two groups and its correlation with complications

<table>
<thead>
<tr>
<th></th>
<th>Diabetic (N=208)</th>
<th>Non-Diabetic (N=186)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total (208)</td>
<td>Complete ST resolution (174)</td>
</tr>
<tr>
<td>Arrhythmia</td>
<td>42</td>
<td>28 (16.09%)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>12</td>
<td>09 (5.17%)</td>
</tr>
<tr>
<td>Chest pain</td>
<td>86</td>
<td>71 (40.80%)</td>
</tr>
<tr>
<td>Death</td>
<td>08</td>
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</tbody>
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\(^7\) For a positive correlation between complications and fibrinolysis, see another study.

\(^8\) See another study for increased morbidity.

\(^9\) See another study for increased heart failure.

\(^10\) See another study for increased arrhythmias.
diabetic population. The study has limitations due to small sample size and inadequate and irregular follow-up after discharge of the patient. As hospital is equipped with the equipment to deal with various medical emergencies, in-hospital death ratio is overall less. The results of the study are supported by another similar study carried out by Muhammad AK et al?their study also indicated significant correlation between mortality and failed ST- resolution in diabetics (7.4%) as compared to non-diabetics with failed ST-resolution. In another study, carried out by Timmer JR et al, it was found that diabetes is associated with increased 30-day mortality.

In previous study, it was shown that there was a close negative association of diabetes with outcome of STEMI patients as diabetes is associated with increased mortality after thrombolysis in case of ST-segment Elevation Myocardial Infarction, there arises a necessity to revise new treatment modalities and revised reperfusion methods. In another study it was proved that fibrinolysis may be less effective in diabetic patients. Angeja et al showed that micro vascular flow reduced in diabetic patients post-fibrinolysis therapy. Maybe, it is due to increased aggregation of platelets and its reduced ability to induce endothelium-mediated vasodilation. There is a possibility that PCI can be a better option of treatment in diabetics presenting with ST-segment elevation MI. Moreover, other associated risk factors and recovery at the left ventricular level are also to be considered as far as long term outcome for diabetics is talked about. Various prevention like vigorous glycaemic control, strict management of hyperlipidaemia also plays a vital role in good prognosis of diabetes patients.

In the present study, we have our own limitations regarding age, sex, geographical location and other risk factors, which could not be assessed properly in order to clearly point out the cause leading to mortality. for that multi-variate analysis is to be performed. During acute phase of myocardial infarction, there are chances of stress hyperglycemia, which may give misleading records of hyperglycemia, but it can be certainly differentiated after the acute phase of infarction passes, which takes almost 7 days and by that time the patient is discharged from the hospital. This comes as a major limitation of the study. Moreover our study is a single centre study with limited sample size.

**Conclusions**

Overall, morbidity and mortality of diabetic patients with Acute Myocardial Infarction was found to be greater as compared to non-diabetics; post thrombolysis. Post thrombolization, frequency of various complications are more in failed ST-resolution then successful reperfusion, in both diabetic and non-diabetic populations. In diabetes with acute myocardial infarction, abnormality in vascular flow may contribute to the poorer outcome.

**References**