A COMPARATIVE STUDY OF THROMBOLYSIS OUTCOME IN PATIENTS WITH ST-SEGMENT ELEVATED MYOCARDIAL INFARCTION WITH AND WITHOUT DIABETES MELLITUS

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Abstract

Diabetes mellitus is a multifactorial metabolic disorder and causes life-threatening medical emergency of ST-segment elevation myocardial infarction (STEMI) resulting in the blockage of coronary artery leading to myocardial ischemia and subsequent necrosis. Diagnosing STEMI through ECG is a reliable and cost effective as soon a patient is admitted in emergency room. Thrombolysis outcomes of ST-segment resolution in elevated ST-segment myocardial infarction patients with and without diabetes might reduce the mortality and morbidity. Therefore, the study finding may significantly contribute to the prognosis between diabetes and non-diabetes STEMI patients. The total sample size was 100 patients with ST-segment elevated myocardial infarction. There were 60 patients with diabetes and 40 patients without diabetes. Thorough investigation was done through ECG, CK-MB, Troponin-I, RBS, HbA1C, LFT, RFT, CBC, PT/INR and Lipid profile. It was observed that failed thrombolysis represented by lesser than 30% ST resolution was higher among the diabetic STEMI patients when compared to non-diabetes and STEMI patients. Successful thrombolysis (>70% ST resolution) was more in non-diabetic than diabetic STEMI patients. Majority of the subjects belonged to 51-60 years of age group followed by 61-70 years and 41-50 years age group. The study population consisted of 60 males and 40 females. As per the site of MI, anterior wall constituted more frequency in both diabetic and non-diabetic groups, followed by inferior wall comes second and anteroseptal constitutes the least. Chest pain was the most common mode of presentation, present in 95% cases associated with sweating in 86% cases, breathlessness seen in 25% cases. Syncope was seen in 10% cases and palpitation in 5% cases. Frequency of in-hospital complications was more in failed ST resolution compared to complete

ST resolution, in both diabetics and non-diabetics, post thrombolysis. In conclusion, diabetic patients were more prone to risks of failed ST resolution, adverse outcome; irregular microvascular stream that may contribute to more unfortunate results saw in patients with diabetes and intense myocardial localized necrosis.

Key Words: Thrombolysis, St-Segment elevation , Myocardial Infarction, Diabetes Mellitus

Introduction

Diabetes mellitus is a multifactorial metabolic disorder which has become a hub network for the origin of other risky comorbidities and one such lethal, life-threatening medical emergency is ST-segment elevation myocardial infarction (STEMI) resulting in the blockage of coronary artery leading to myocardial ischemia and subsequent necrosis.[1, 2] In some hospital case studies, the occurrence of STEMI is also observed in non-diabetic patients which projects a significant mortality and morbidity.[3] Hathi et al[4] studied post-fibrinolytic therapy and found that 71.15% of diabetic patients were more prevalent than 25.26% non-diabetic and no mortality was noticed in non-diabetic patients. Similarly, Michael et al[5] found a higher prevalence by 18.4% in diabetic patients with STEMI and stated a significantly higher risk of in-hospital death and may increase upto 5 years after post-treatment.

It is known that, diagnosing STEMI through ECG is reliable and cost effective as soon a patient is admitted in emergency room. ECG taken at 90 minutes after thrombolysis is a reliable indicator of the effect of thrombolytic drug. This percentage of ST resolution correlates with the success of thrombolytic therapy. ST segment elevation is a marker of myocardial injury; T wave is a marker of ischemia. After prompt thrombolysis, the elevated ST segment returns towards baseline. This can be identified by serial ECG monitoring.[6] Although, there is an inconsistent and conflicting outcome of thrombolysis effectiveness, in our study, we aim to fill the research gap by addressing the thrombolysis outcomes of ST-segment resolution in elevated ST-segment myocardial infarction patients having and not having diabetes which might reduce the mortality and morbidity. Therefore, the study finding may significantly contribute to the prognosis between diabetes and non-diabetes STEMI patients.[6]

Methodology

This was a Retrospective study conducted in Patients admitted with the following criteria between 2022-2024

Sample Size

The study population was calculated by using G-power with 80% of the power and 5% of the significance level. The total sample size was determined to be 100 patients with ST-segment

elevation myocardial infarction. There were 60 patients with diabetes and 40 patients without diabetes.

Inclusion and Exclusion criteria

The study subjects were chosen as per the inclusion and exclusion criteria:

Inclusion criteria

· ECG changes i.e.ST-segment elevation >2mm (0.2mv) in chest leads V2 and V3 or >1mm (0.1 mv) in at least two contiguous in rest of the chest leads and limb leads with either one of the following. [7, 8]
· Elevated CPK-MB levels more than twice the reference values.
· Positive Troponin-I test.
· These patients should be present within 12 hours from the onset of chest pain and given streptokinase as a thrombolytic agent.

Exclusion criteria

· Patients presented after 12 hours of chest pain
· Patients with primary chronic kidney disease
· Patients suffering mortality before the diagnosis of diabetes mellitus.

Study procedure

After patients were selected as per inclusion and exclusion criteria. A detailed demographic and clinical history was collected, complete physical examination and routine and appropriate investigations were gathered for all patients. The following parameters were checked in patients:
- Exact time of beginning of chest torment, its introduction and nature was noted through the history. Patients' ECG was searched for ST-fragment height.
- The fragment demonstrating most extreme rise was recorded in millimeters.

· ECG was rehashed following an hour and a half of commencement of thrombolytic treatment and the lead with the most extreme ST-fragment height was watched for ST-resolution.[8, 9]
- Here we characterize goals of ST-portion when the height has decreased to >50%.
- The history of the patients about diabetes condition was taken.
- Routine development and registration of all the vitals and RBS was done every day and noted.

Investigations

Thorough investigation was done through ECG, CK-MB, TROPONIN-I, RBS, HBA1C, LFT, RFT, CBC, PT/INR and LIPID PROFILE

Case definition

Known case of diabetes mellitus or newly diagnosed with diabetes by the following criteria:

Criteria for the Diagnosis of Diabetes Mellitus
- Symptoms of diabetes plus random blood glucose concentration ≥11.1 mmol/L (200 mg/dL) or
- Fasting plasma glucose ≥7.0 mmol/L (126 mg/dL) or
- Hemoglobin A1c ≥ 6.5% or
- 2-h plasma glucose ≥11.1 mmol/L (200 mg/dL) during an oral glucose tolerance test

Statistical analysis

Patient's data was entered into Microsoft Excel and the statistical analysis was conducted through SPSS version 21.0. Quantitative (Numerical variables) were present in the form of mean and SD, whereas, Qualitative (Categorical variables) were present in the form of frequency and percentage. Student t-test was used for comparing the mean values between the 2 groups whereas chi-square test was applied for comparing the frequency. The difference was said to be significant when p-value was less than 0.05.

Results

A total of 100 patients were included in the study comprising 60 diabetic patients of which males were 40 and females were 20 and 40 non-diabetes, male and female group each had 20 patients. More frequency of patients 44 (44.0%) were found in age group between 51-60 years. When patients were diagnosed for the location of MI, anterior wall constitutes majority in diabetic 35 (58.3%) and non-diabetic group 17 (42.5%), followed by inferior wall in diabetic 18 (30.0%) and non-diabetic group 14 (35.0%) and anteroseptal constitutes the least 7(11.7%) in diabetic patients and 9 (22.5%) in non-diabetic patients. Further, 95% of patients showed chest pain symptoms followed by sweating in 86%, 25% had breathlessness, 10% had syncope and 5% experienced palpitation. 75% of patients had habit of smoking, 52% had hypertension and 35% were diabetic, past history of angina was seen in 16% cases and family history of IHD was seen in 8% of patients.

Complete ST resolution was seen among 47.0% of cases, partial resolution was seen among 21.0% and no resolution among 32.0% of cases. Comparision of the ST fragment goals among diabetic and nondiabetic myocardial dead tissue patients was done by utilizing Chi square test, it was discovered that bombed thrombolysis (less than 30% goals) was more in diabetic patients than non-diabetics (p-value = 0.004) which was critical while effective thrombolysis (more than 70%) more in non-diabetics than diabetics (p-value was 0.020; noteworthy).

In diabetic MI patients (n=60), the quantity of individuals with effective thrombolysis (more than

70% ST goals) was 11 (18%), though bombed thrombolysis (less than 30% ST) was 40 (67%), p esteem was 0.001, which is noteworthy. In non-diabetic MI patients (n=40), the quantity of individuals with fruitful thrombolysis (more than 70% ST) was 21 (52%), though bombed thrombolysis (less than 30% ST goals) was 7 (17.5%), p-esteem was 0.038 which was additionally critical. Mortality was found to be significantly more among diabetic patients 5(8.3%) compared to non-diabetic 1(2.5%) and found Chi-square value to be 3.459, and p-value = 0.045. The occurrence of adverse events was found to be significantly more among diabetics compared to non-diabetics.

Discussion

A well-recognized, effective treatment during acute myocardial infarction is I.V. Streptokinase and for cardiovascular mortality, it has been beneficial effect. Early and successful reperfusion is the aim of thrombolysis. When the reperfusion is incomplete, left ventricular dysfunction occurs and the risk of mortality increases.

The ongoing process of infarction as well as the metabolic derangement (due to ischemia) of the remaining viable cells must be reversed. Serial monitoring of the reperfusion status, using ECG is an ideal method and is also cost effective. It tells much about the myocardial perfusion than epicardial perfusion, in fact, myocardial perfusion is a better factor which should be established at an earliest time, so that myocardial death can be prevented.

Various risk factors contribute to coronary heart disease. Hyperglycemia is an important major contributor for accentuation of coronary atherosclerosis. As assessed by previous studies, the efficacy of thrombolytic therapy is established beyond doubt, both angiographically as well as electrocardiographically.

The main purpose of this study is to show that diabetes as an independent factor affects the thrombolytic outcome after STEMI. This study assessed the outcome with the help of ECG as a simple tool.

In patients without diabetes, efficacy was good; it means that success rate of thrombolysis was more; failure rate was less. But, in a diabetic patient presenting with STEMI, who were thrombolysed with streptokinase, because of presence of unfavourable, as well as extensive plaque pathology, the efficacy was poor; failure rate was more. So, PCI may be a better option for diabetes presenting with Myocardial Infarction.

Since there was an extensive disease involving vessels at multiple levels or involving multiple vessels, it was also found in many studies that CABG would be a better option finally for diabetic myocardial infarction patients.

In diagnosing diabetes for the first time after presentation, stress hyperglycemia should be excluded. Most patients have elevated blood sugar levels at initial presentation with myocardial infarction because of stress induced factors. Once the patient's condition stabilizes or at a time before discharge, the diagnosis of diabetes mellitus should be made.

Age wise distribution

Author	Year of study	Mean age
Sezer, Nasanci, Umman et al.	2004	58.2±11.2 years
Bhatial et al	2004	62.7±12.0 years
Present study	2024	58.45±8.97 years

Effect on Thrombolysis

The negative capacity of diabetes resulting after STEMI had been describing before. Since dead people remaining especially more of in patients with high sugar levels after STEMI, it was essential to characterize ideal treating systems, including strategy for again supply of blood treatment, in this community.[10]

In the study by Khan et al[11], it was demonstrated that reperfusion bombed in a huge extent of diabetic patients with STEMI in examination with non-diabetic people (86% versus 16%). Comparative results were done by Zairis et al,[12] they demonstrated that Destruction of fibrin clot might be less powerful in diabetic patients. Angeja et al[13] demonstrated that microvascular stream was diminished in diabetic patients after destruction of fibrin clot. Conceivably, this was related with expanded platelet collection and decreased capacity to prompt endothelium-interceded vasodilation.[14] The higher danger of antagonistic occasions might be brought about by improved thrombogenicity and disabled destruction of fibrin clot.[10]

In our own investigation, it was discovered that bombed degrading thrombus (lesser than 30% goals) was more in high sugar level population than non-diabetics (p-value was 0.004) which was noteworthy though effective degrading thrombus (>70% goals) was more in non- high sugar level population than high sugar level population. This was similar like the investigations done by Hathi et al[15] and Anandkat[L1] , ST-fragment goals in non-diabetic patients was found in 180 patients out of 186 and in diabetics it was found in 174 patients out of 208 and Masoomi et al[16], complete ST-goals happened in 31.60% of high sugar level population and 51.00% of non- high sugar level

population, individually (p lesser than 0.05). The frequency of halfway ST-goals in high sugar level population and non- high sugar level population was 40.50% and 40.00%, though 27.80% of high sugar level population gathering and 9.00% of non- high sugar level population gathering indicated fizzled ST goals.

This critical changing in ST-goals between non-high sugar level population and high sugar level population gathering was comparative with an investigation, which indicated huge distinction among diabetic and non-diabetic patients in connection to finish (34.10% versus 68.20%; p<0.001) and inadequate (65.9% versus 31.8%; p<0.001) resolution.[17]

In the examination done by Khan et al[11], in non-diabetic, myocardial dead tissue, 84% patients indicated total goals and 16% demonstrated bombed goals. Yet, if there should arise an occurrence of diabetic myocardial dead tissue, 13.8% patients indicated total goals and 86% demonstrated bombed goals.

The accomplice studying done by Selvin et al[18] and Grundy SM et al[19] on seven thousand four hundred thirty five patients with type 2 high sugar level population has demonstrated that 1.00% expansion HbA1c was related with 18.00% expansion in the danger of heart related illness. The planned populace studying done by Khaw et al[20] and Folsom AR et al[21] on ten thousand 232 subject's has demonstrated that afterwards change for systolic pulse, cholesterol level, weight list, midsection to-hip proportion, smoking, and past myocardial localized necrosis or stroke, there was a 21% expansion in cardiovascular occasions for each 1% increment in HbA1c level above 5%.

PCI can be a superior option in diabetics giving intense MI. In any case, the long haul result of these patients relies upon the degree of coronary ailment and leftover left ventricular capacity, just as the nearness of other hazard factors.[22] Hence, forceful auxiliary preventive estimates, for example, tight glycaemic control and lipid bringing down might be similarly as significant as the method of reperfusion treatment for these patients. In this way, due consideration is required for the more desirable administration of high sugar level heart's dead tissue patients. This should, in any case, be enhanced with further treatments and techniques coordinated towards the numerous variations from the norm that are related with diabetes, for example, endothelial brokenness, dysglycaemia and coagulation and fibrinolytic unsettling influences.

Complications

Our results showed the frequency of complications were more among diabetics than non-diabetics which was in alignment to the investigation by Khan et al[11], the occurring of complications among Non-diabetics was 32.9% compared to 79.8% in diabetics (p<0.001), which was substantially higher in the latter. This discovering hence builds up an immediate connection amongst diabetes and the recurrence of complications, as reflected by less complete ST segment resolution in diabetics in our study (86%).

In current investigation we noticed that there was a noteworthy association between diabetic status and fizzled ST goals as for the event of in-medical clinic intermittent ischemia (p<0.05). Repetitive chest torment was the most well-known entanglement saw in this examination. A studying supports our outcomes demonstrated that there was a noteworthy association between high sugar level status and treating system regarding the event of in-emergency clinic intermittent ischaemia.[23] In that review, 29.50% high sugar level and 23.10% non- high sugar level created repetitive ischemia after destruction of fibrin clot,(p<0.05). As appeared by one more investigation, high sugar level patients might be having a more noteworthy lingering sore in the infarctioning related course after treating with fibrin degrading drugs, bringing about a higher pace of intermittent ischaemia.[24]

In our outcomes we saw that the connection between diabetic status and fizzled ST goals regarding the improvement of cardiovascular breakdown was huge (p < 0.05). Cardiovascular breakdown is the significant determinant for guess after myocardial localized necrosis. Since certain patients never had an echocardiography this clinic admission to preclude earlier cardiovascular breakdown, so any sign of cardiovascular breakdown post thrombolysis was considered as another improvement. Our outcomes are bolstered by the discoveries of an investigation which indicated that in-clinic cardiovascular breakdown was progressively basic among diabetics after destruction of fibrin clot.[23] In that review, 9% diabetics and 4.3% non-diabetics created cardiovascular breakdown (p<0.05).

Mortality

In current study, Mortality was found to be significantly more among diabetics (8.3%) compared to non-diabetics (2.5%). In the study by Khan et al[11], mortality in diabetic group (only patients with failed ST resolution) was 6.4 % compared to 0% in non-diabetic group (P=0.014). A study supporting these findings was carried out by Timmer JR et al[25] As per their outcomes, diabetes was related with expanded thirty-day death chances. Diabetic mortality was 12.40% and non-diabetic mortality 6.90% after thrombolysis at thirty day end point.

There are a few organically conceivable components that may represent the finding that interminable hyperglycemia is related with ACS. High sugar level periods assume a significant job in the enactment of oxidative pressure and overproduction of mitochondrial superoxide, which trigger different metabolic pathways of glucose-intervened vascular harm.[10, 14]

Conclusion

The present study was done to compare the thrombolysis outcomes of ST-segment resolution in ST-segment elevation myocardial infarction patients with and without diabetes. It was noticed that diabetic patients are more prone to risks of failed ST resolution, adverse outcome; irregular microvascular stream may contribute in any event to some degree to the more unfortunate results

saw in patients with diabetes and intense myocardial localized necrosis.

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