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A Study on Thrombolytic Effect of Streptokinase Infusion between Diabetic and Non-Diabetic Myocardial Infarction Patients with ECG as A Tool

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Abstract

Introduction: A myocardial infarction (MI), commonly known as a heart attack, is the result of a sudden interruption in the blood flow to the heart muscle. This is frequently caused by a blood clot forming within the coronary arteries. Acute myocardial infarction (AMI) is a major health hazard that causes over a million deaths annually in the US and affects up to 3 million people globally. Thrombolytic therapy, such streptokinase, is used to break up blood clots and improve blood flow, which stops ischemia injury. Injectable streptokinase is used to activate plasminogen in a nonenzymatic manner.

Material And Method: This study examined thrombolytic outcomes in 120 patients with ST elevation myocardial infarction (STEMI) using a prospective interventional trial design. Patients were grouped according to gender and diabetes status. A thorough statistical analysis was carried out, looking at the relationship between gender and diabetes status and thrombolytic outcomes. Measurements such as glucose levels, ECG results, and random blood sugar were examined.

Result: There were notable differences in ST segment resolution between MI patients with diabetes and those without. Of the 70 diabetic MI patients, 61.42% had failed thrombolysis (less than 30% ST resolution), whereas 21.42% had successfully completed thrombolysis (more than 70% resolution) (p=0.003). Compared to diabetics, non-diabetic MI patients (n=50) had a greater success rate (44%) and a higher percentage of failed thrombolysis (24%; p=0.049). Anterior wall MI was more common in both groups, followed by inferior wall MI,

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while anteroseptal MI was less common. Men with diabetes (n = 45) demonstrated 23 failed, 10 partial, and 12 effective resolutions; women with diabetes (n = 25) demonstrated 11 failed, 9 partial, and 5 successful resolutions. Non-diabetic females (n=25) had only two instances of unsuccessful resolution, compared to three among non-diabetic males (n=25).

Conclusion: When comparing the thrombolytic effects of streptokinase, patients with diabetes had a higher incidence of unsuccessful thrombolysis (less than 30% ST resolution) than their non-diabetic counterparts. On the other hand, non-diabetic STEMI patients are more likely to have effective thrombolysis (>70% ST resolution). This highlights the effect of type 2 diabetes on the results of thrombolysis. Given the documented difficulties in establishing successful thrombolysis in this subgroup, percutaneous coronary intervention may therefore be preferred to thrombolysis in diabetic STEMI cases.

Key words: Myocardial infarction, ECG, thrombolytic, streptokinase, diabetic and non-diabetic

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Introduction

A myocardial infarction (MI), commonly known as a heart attack,(1) is a serious health problem caused by an abrupt cessation of blood flow to the heart muscle.(2) This generally happens as a result of coronary artery blockage, which is frequently brought on by blood clot formation. This obstruction causes the cardiac tissue to get insufficient oxygen, which causes irreparable damage and tissue death known as myocardial infarction.(3)**.** A heart attack manifests as pain or discomfort in the chest(4), which might spread to the shoulder, arm, back, neck, or jaw. Many people report feeling as though they are under pressure, crushing, or squeezing. It acts as an alert system for the cardiac muscle's reduced oxygenation and blood flow. It's important to remember, though, that every person may experience a heart attack in a different way.A myocardial infarction can cause a number of other symptoms in addition to chest pain. Breathlessness is a common side effect that indicates the heart's ineffective blood pumping capacity. Other well-known heart attack warning signs include nausea, dizziness, cold sweats, extreme exhaustion, and a lowered consciousness level. The WHO used symptoms, abnormalities in the electrocardiogram (ECG), and cardiac enzymes to identify MI in investigations of illness prevalence. Myocardial infarction' is one of the leading health problems in the world.(5)

Over a million individuals die in the US from AMI each year, and the condition affects up to 3 million people globally.(6)

Thrombolytic therapy, also known as fibrinolytic treatment,(7) is a medical intervention that promotes vascular patency by dissolving intravascular clots that may cause haemorrhage. One important physiological reaction that reduces bleeding from severe or small vascular injuries is thrombosis.(8) Fibrinolysis and inherent antithrombotic characteristics regulate the physiological hemostatic response. It is intended for thrombus formation to be restricted to specific regions of tissue damage. An intravascular thrombus that does not cause harm and obstructs blood flow is deemed abnormal. Intravascular thrombus formation can result from any type of hypercoagulable condition, whether hereditary or acquired. When an aberrant thrombus forms, it can either separate or move to block the vascular lumen downstream or spread until the arterial lumen is completely blocked.(9)

A thrombolytic drug called streptokinase is used to dissolve clots in certain instances of arterial thromboembolism, pulmonary embolism, and MI. Plasminogen is activated through a nonenzymatic process.(10) Injections into veins are used to provide streptokinase.(11) Streptokinase frequently causes allergic responses, low blood pressure, nausea, and bleeding as adverse effects. It is crucial to remember that streptokinase is a bacterial substance to

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which the body can develop an immunity. As a result, it is advised against using this drug again for four days following the initial administration because it may not work as well and may trigger an allergic reaction.(12)

Aims and objectives

To examine the thrombolytic effect of streptokinase infusion between diabetic and non-diabetic myocardial infarction patients with ECG as a tool.

Materials and Methods

In order to examine the thrombolytic outcomes in patients diagnosed with ST elevation myocardial infarction, this study used a prospective interventional strategy. Based on their gender and diabetes status, 120 patients who had been hospitalized to the coronary care unit were the subject of the study.

Population of the study

This study involved 120 individuals who had been diagnosed with myocardial infarction and admitted to the coronary care unit. Out of 120 individuals, 50 do not have diabetes and 70 have the disease. There are 50 females and 70 male in the study. In the case of men, 45 have diabetes and 25 do not; in the case of women, 25 have diabetes and 25 do not.

Inclusion criteria

- STEMI patients who arrive at the hospital within 12 hours of experiencing chest pain

Exclusion criteria

- Patients presenting late after 12 hours of chest pain
- Individuals who have experienced prior MI.
- Individuals who upon admission just had stress hyperglycemia.

Study Protocol

- The study includes patients who have been diagnosed with ST elevation myocardial infarction.
- Blood glucose levels are measured at admission.
- Electrocardiogram collected at arrival and 90 minutes after a dose of streptokinase.
- Fasting and postprandial glucose levels are documented for all patients either on the morning after admission or once the patients' condition has stabilized.
- The results are subsequently examined and evaluated.

Design of study: Prospective interventional study

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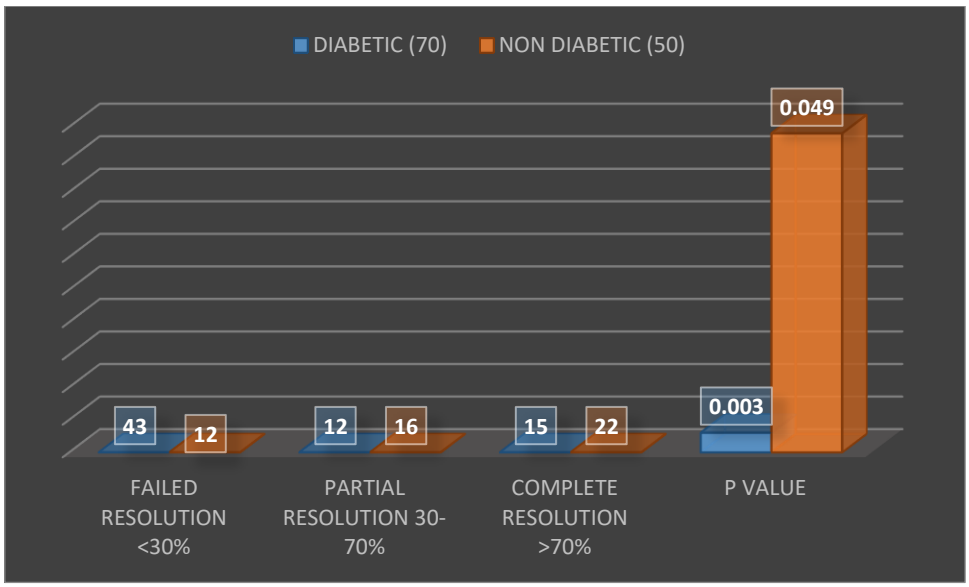
Results

Table 1: ST segment resolution in study population

	Failed resolution <30%	Partial resolution 30-70%	Complete resolution >70%	P value
Diabetic (70)	43 (61.42%)	12 (17.14%)	15 (21.42%)	0.003
Non-diabetic (50)	12 (24%)	16 (32%)	22 (44%)	0.049
Total (120)	55	28	37	
'P' value	0.005		0.04	

On comparing the ST segment resolution among Diabetic and non-diabetic myocardial infarction patients, by using Chi square test, it is found that failed thrombolysis (<30% resolution) is more in diabetics than non-diabetics (p value is 0.0045) which is significant whereas successful thrombolysis (>70% resolution) is more in non-diabetics than diabetics (p value is 0.04; significant).

Graph: 1 Graphical Representation of ST segment resolution in study population



In diabetic MI patients (n=70), the number of people with successful thrombolysis (>70% ST resolution) is 15 (21.42%), whereas failed thrombolysis (< 30% ST resolution) is 43 (61.42%). p value is 0.003, which is significant.

In non-diabetic MI patients (n=50), the number of people with successful thrombolysis (>70% ST resolution) is 22 (44%), whereas failed thrombolysis (< 30% ST resolution) is 12 (24%). p value is 0.049, which is significant.

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Table: 2 Age Group percentage of Study population.

Age group (in years)	Percentage of study population
31-40	25
41-50	20
51-60	15
61-70	20
Over 71	20
Total	100%

The above table discusses the age chart of the population of study. In 31-40 age group, the percentage is 25%. In 41-50 year Age group, the Percentage is 20%. In 51-60 Year Age group, the percentage is 15%. In 61-70 years age group, the percentage is 20%. In over 71 year's age group, the percentage is 20%.

Graph: 2 Graphical representation of Age Group percentage of Study population.

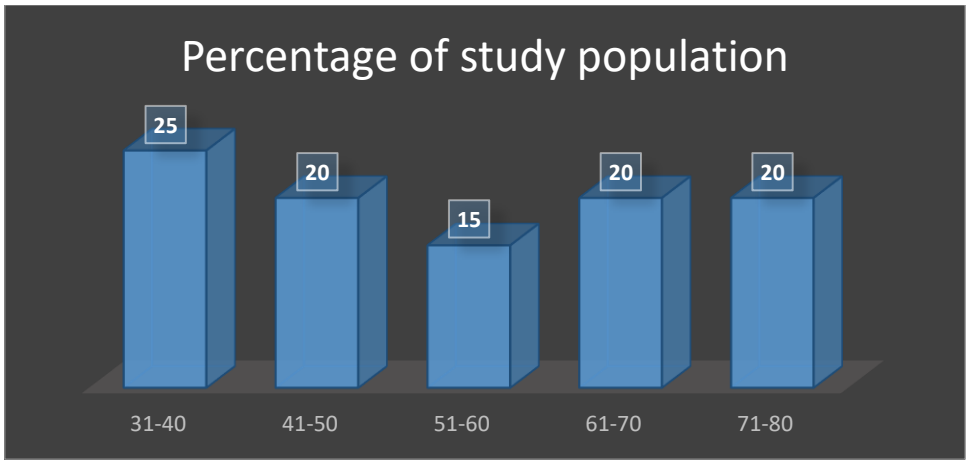

Table: 3 Gender wise Distribution of Diabetic and Non Diabetic Patient

	Male	Female
Diabetic	45	25
Non-Diabetic	25	25
Total	70	50

The above table discusses the Gender wiseDistribution of Diabetic and Non Diabetic Patient. In Male Group, There are 45 diabetic and 25 non-diabetic Patient. In Female Group, There are 25 diabetic and 25 Non-Diabetic.

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Graph: 3 Graphical representation of Gender wise Distribution of Diabetic and Non Diabetic Patient

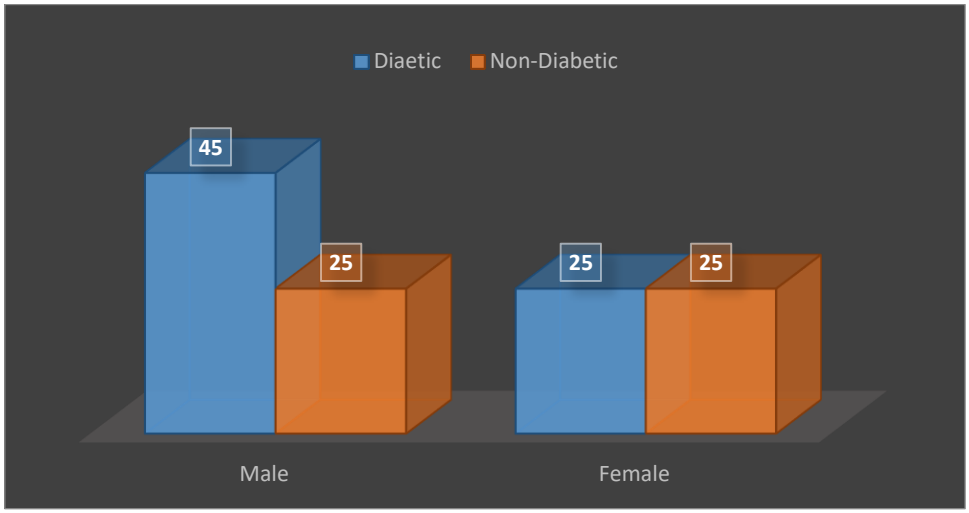

Table 4: Location of MI

Diabetic status/ location of MI	Diabetic	Non-diabetic
Anteroseptal	21	13
Anterior wall	27	23
Inferior wall	22	14

Among the location of MI, anterior wall constitutes majority in both diabetic and non-diabetic groups. Inferior wall comes second and anteroseptal constitutes the least.

Graph: 4 Graphical representation ofLocation of MI

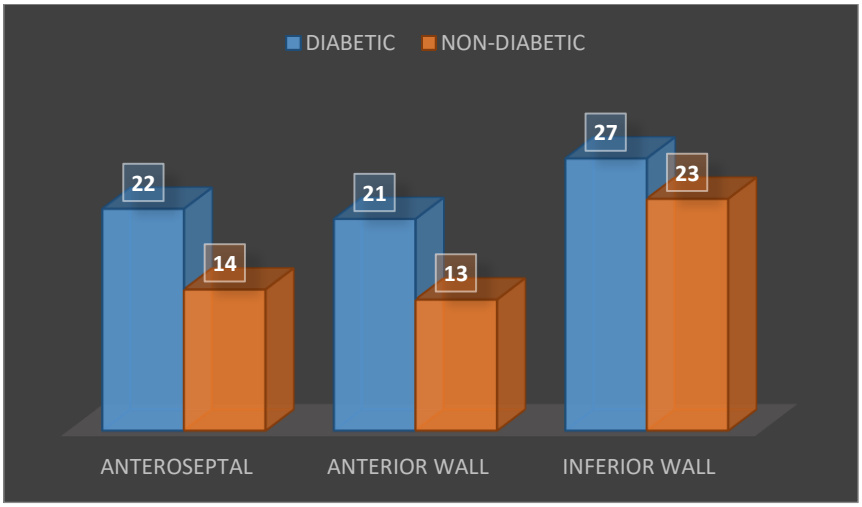

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Table 5: ST Resolution in sub categories-sex and diabetic status

	Complete resolution	Partial resolution	Failed resolution	Total
Diabetic males	12	10	23	45
Diabetic females	5	9	11	25

Among diabetics subjects (N=70), 45 are males and 25 are females. Among diabetic males, 23 patient had failed resolution, 10 had partial resolution and 12 had successful resolution. Among diabetic females, 11 had failed resolution, 9 had partial resolution, and 5 had successful resolution.

Graph: 5 Graphical representation of ST Resolution in sub categories-sex and diabetic status

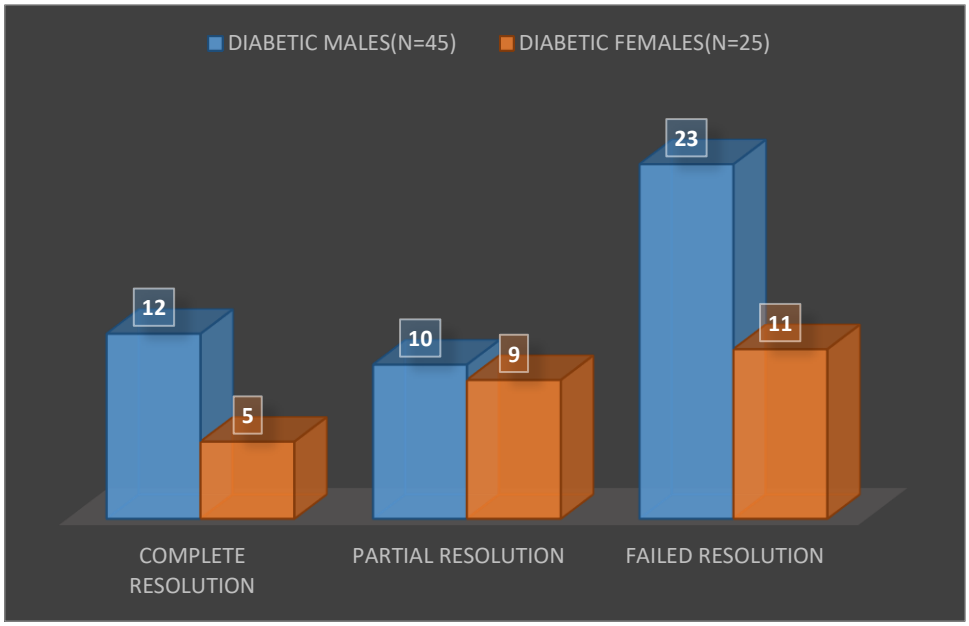

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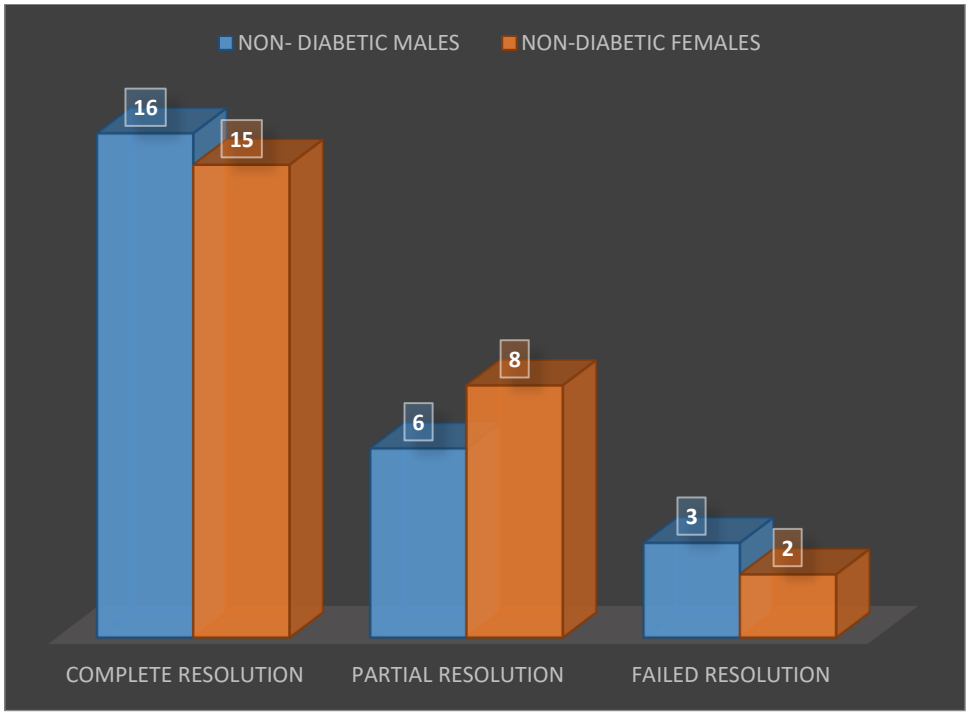
Table 6: ST resolution in sub categories-sex and diabetic status

	Complete resolution	Partial resolution	Failed resolution	Total
Non- diabetic males	16	6	3	25
Non-diabetic females	15	8	2	25

Among non-diabetics subjects (N=50), 25 are males and 25 are females. Among non - diabetic males, 16 had complete resolution, 6 had partial resolution and only 3 had failed resolution. Among non-diabetic females, 15 had complete resolution, 8 had partial resolution and only 2 had failed resolution.

Graph: 6 Graphical representation of ST resolution in sub categories-sex and diabetic status



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Discussion

Given its advantages in reducing cardiovascular mortality, intravenous streptokinase has gained widespread recognition as an efficacious treatment for acute myocardial infarction (MI). In this case, successful reperfusion continues to be the major goal of thrombolysis. A higher risk of death may result from left ventricular dysfunction in situations where reperfusion is insufficient. Reversal must occur quickly due to the continuous infarction process and metabolic disturbances brought on by ischemia in living cells.

It turns out that the best and most economical way to determine the reperfusion state is to use serial electrocardiogram (ECG) monitoring. ECG is a more valuable source of information about myocardial perfusion than epicardial perfusion alone. In order to stop myocardial death, myocardial perfusion must be established quickly.

There are several risk factors for coronary heart disease, and one of the main ones that accentuates coronary atherosclerosis is hyperglycemia. This investigation attempts to show that diabetes influences the thrombolytic outcome following an ECG-measured ST-elevation myocardial infarction (STEMI) as an independent factor. Research is mostly focused on the effectiveness of thrombolytic agents, specifically Streptokinase.

Thrombolytic efficacy is strong (higher success rate, lower failure rate) in patients without diabetes. Unfortunately, the presence of extensive and unfavorable plaque pathology reduces the efficiency of streptokinase thrombolysis in diabetic patients with STEMI, increasing the failure rate. As a result, for diabetics who present with myocardial infarction, percutaneous coronary intervention (PCI) may prove to be a better choice. Additionally, research indicates that for patients with substantial and multilevel vascular involvement, coronary artery bypass grafting (CABG) would be a better option.

In order to rule out stress-induced hyperglycemia, the diagnosis of diabetes upon MI presentation must be made carefully. Since stress is frequently the cause of elevated blood sugar levels during the first presentation, diabetes mellitus should not be diagnosed until the patient's condition has stabilized or before discharge. Although studies show that glucose-insulin-potassium (GIK) infusion is an effective treatment for stress-induced hyperglycemia, it can nevertheless have negative consequences at first.

A strong focus on risk factor control, encompassing dietary and lifestyle adjustments, has been credited with the decline in cardiovascular events over the previous few decades. The successful reduction of chronic cardiovascular problems is emphasized through the use of a multifaceted strategy. In conclusion, this study intends to assess the effectiveness of

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streptokinase infusion in various patient groups and offer insights into the thrombolytic outcomes in diabetic and non-diabetic MI patients using ECG as a tool.

Our Study finds out that failed thrombolysis (<30% resolution) is more in diabetics than non-diabetics (p value is 0.0045) which is significant whereas successful thrombolysis (>70% resolution) is more in non-diabetics than diabetics (p value is 0.04; significant).

While A study done by Masoomi et al., (13) finds out that 31.6% of individuals with diabetes and 51.0% of patients without diabetes had a complete ST-resolution ($p < 0.001$). Forty.5% of patients with diabetes and 40.0% of individuals without diabetes showed signs of partial ST-resolution. 9.0% of individuals without diabetes and 27.8% of patients with diabetes experienced failed ST-resolution.

Another study done by Chowdhury et al., A (14) In their study result suggest that, every patient received an injection of streptokinase. Following the delivery of streptokinase for 90 minutes, the resolution (reduction) of the elevated ST segment was assessed. Those without diabetes had significantly greater rates of successful reperfusion (≥70% ST-resolution) than those with diabetes ($p<0.001$), while those with diabetes had significantly higher rates of failure reperfusion (<30% ST resolution) ($p<0.001$). We can conclude that patients with acute myocardial infarction who also have diabetes mellitus may have different thrombolytic outcomes.

Conclusion

When comparing diabetic and non-diabetic individuals with ST-elevation myocardial infarction (STEMI), there are significant differences in the thrombolytic efficacy of streptokinase. Different trends in the success and failure rates of thrombolysis reveal the influence of type 2 diabetes mellitus on the treatment of acute myocardial infarction. Diabetes-related STEMI patients had a higher failure rate (less than 30% ST resolution) after thrombolysis than their non-diabetic counterparts, who have a higher success rate (more than 70% ST resolution). This shows that it may be difficult to get good thrombolytic outcomes in patients with diabetes STEMI. On the other hand, patients with STEMI who are not diabetic typically see better results from thrombolytic therapy. PCI is one of the recommended alternative therapeutic procedures since diabetics have a higher risk of thrombolysis failure. Given the difficulties in achieving successful thrombolysis in diabetic patients, the study suggests PCI as a possibly more viable and effective therapy option for diabetic ST-elevation myocardial infarction cases. The optimum course of treatment for acute STEMI should take into account the patient's diabetes state, with medical professionals stressing the need for

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customized treatment strategies based on diabetes status and its possible influence on thrombolytic outcomes.

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