

## EFFICACY OF STREPTOKINASE IN DIABETIC AND NON-DIABETIC PATIENTS PRESENTING WITH ACUTE ST ELEVATION MYOCARDIAL INFARCTION

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### **Contribution**

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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### **ABSTRACT**

**Objective:** To determine the efficacy of streptokinase in diabetic versus non-diabetic patients presenting with acute ST Elevation Myocardial Infarction (STEMI).

**Methodology:** This cross sectional study was conducted at Department of Cardiology, Chaudry Pervaiz Elahi Institute of Cardiology, Multan from 16<sup>th</sup> October 2012 to 15<sup>th</sup> April 2013. Patients with acute STEMI with in 12 hrs of chest pain without contraindications to fibrinolytic therapy (streptokinase) were included. ECG was done before and at 90 minutes after the start of streptokinase. ST-segment resolution equal to or more than 70% at 90 minutes ECG, was taken in terms of successful reperfusion. The data was analyzed by using software SPSS version 10. The quantitative variables were presented as mean and standard deviation while qualitative variables as frequency and percentage. Chi square test was used to estimate significance and p-value of <0.05 was considered significant.

**Results:** Out of 244 patients, 197(80.7%) were non-diabetics and 47(19.3%) were diabetics. Among the 47 diabetic patients, streptokinase was effective in 16 patients and it was not effective in 31 patients. So efficacy of streptokinase in diabetic patients was 12.4%. Among the 197 non diabetic patients streptokinase was effective in 113 patients and not effective in 84 patients. The percentage showing effectiveness for streptokinase was 57.3%. Chi square test showed a p-value less than 0.004, which shows a significant difference between efficacy of streptokinase among diabetic and non diabetic patients.

**Conclusion:** This study shows that streptokinase was significantly more efficacious in non-diabetics as compare to diabetic patients presenting with acute STEMI.

**Key Words:** ST Segment Elevation Myocardial Infarction, Streptokinase, Diabetes Mellitus

## INTRODUCTION

Coronary artery disease (CAD) particularly myocardial infarction secondary to atherosclerosis of coronary arteries remains the leading cause of morbidity and mortality worldwide including Pakistan.<sup>1</sup> Acute myocardial infarction is the most important form of coronary artery disease and is the major cause of death in industrialized countries.<sup>2</sup>

A substantial number of Pakistanis suffer from first MI between relatively young ages of 40-45 years and rather small but a good population of them die of MI in the form of sudden death or later on due to the complications of MI. A community study from Karachi revealed a prevalence rate of 37/1000 of adults and is responsible for the 47% of the cardiac mortality in Pakistan.<sup>3</sup> Myocardial infarction is the necrosis of the myocytes due to interruption of blood supply. MI can be of anterior, inferior, lateral or posterior walls depending upon the vessel supplying the area. The inferior MI is considered to have a better prognosis than anterior MI.<sup>4</sup>

Diabetes mellitus is a metabolic disorder which increases the rate of atherosclerosis progression of vascular occlusion.<sup>5</sup> The risk of myocardial infarction is 2-4 times higher in diabetics.<sup>6</sup> The aim of thrombolysis in acute MI is early and complete myocardial reperfusion.<sup>7</sup> Analysis of ST-segment resolution on ECG, after fibrinolytic therapy, in cases of ST elevation Myocardial Infarction offers an attractive and cost effective solution to assess coronary reperfusion. Whereas coronary angiogram is a marker for epicardial reperfusion. Although successful thrombolysis of the epicardial vessel is necessary for good prognosis, but the micro-vascular flow more strongly correlates with the outcome. ST segment is therefore a better indicator of prognosis, and provides information, which cannot be assessed on basis of coronary angiogram alone.<sup>8</sup>

Myocardial Infarction causes higher morbidity and mortality among diabetics.<sup>9</sup> Zairis et al, reported less complete resolution of ST elevation in diabetics as compare to non-diabetics.<sup>10</sup> Chaudhry et al, Compared the efficacy of streptokinase between diabetic and non-diabetic patients presenting with acute ST Elevation Myocardial Infarction. This study confirmed more complete ST-resolution in non-diabetic patients as compared to diabetic patients(non-diabetic group 48.4% vs. diabetic group 19.7%;  $p < 0.001$ ).<sup>11</sup>

We conducted this study to determine the efficacy of streptokinase in diabetic versus nondiabetic patients presenting with acute ST Elevation Myocardial Infarction in our local set up.

## METHODOLOGY

This cross sectional study was conducted at Department of

Cardiology, Chaudry Pervaiz Elahi Institute of Cardiology, Multan from 16<sup>th</sup> October 2012 to 15<sup>th</sup> April 2013. Sample was collected by non-probability purposive technique. Patients of acute ST-segment elevation myocardial infarction, diabetics (of more than 5 years duration of diabetes) and non-diabetics presenting within 12 hours of chest pain of both gender and age 35-80 years. Patients with history of previous myocardial infarction, bundle branch block on ECG, comorbid conditions (like renal failure, malignancy) and patients with contraindication to streptokinase (like intracranial hemorrhage, aortic dissection, active bleeding) were excluded from the study. Patients with acute STEMI were given streptokinase in a dose of 1.5 million IU. Twelve-lead ECG was recorded before start of streptokinase and at 90 minutes after start of streptokinase. A careful history was taken for the presence or absence of diabetes (defined as fasting blood sugar of more than 126 mg/dl) and duration of diabetes mellitus. The ST-segment elevation resolution was calculated as the initial sum of ST-segment elevation minus the sum of ST-segment elevation on the second ECG divided by the initial sum of ST-segment elevation and expressed as percentage. Assessment and information including all the variables of age, gender and time interval from onset of chest pain to streptokinase was noted. The outcome variable that is the efficacy of streptokinase (in terms of successful reperfusion Yes, No) was noted.

Data was analyzed with SPSS version 10.0. Quantitative variables were age and time interval from onset of chest pain to streptokinase and they were calculated by taking mean and standard deviation. Qualitative variables were gender and it was calculated by taking frequency and percentage. Frequency for the outcome variable i.e. the efficacy of streptokinase (in terms of successful reperfusion) was calculated. Stratification of age, diabetics and non-diabetics, gender and time interval from onset of chest pain to streptokinase were done to control the effect modifiers. Chi-square test was applied to compare the efficacy of streptokinase in diabetics versus non-diabetics.  $P$ -value  $< 0.05$  was considered as significant.

## RESULTS

Among two hundred and forty four patients, 170 (69.7%) were male and 74 (30.3%) were females. The age varied between 35-80 years (mean=54.40). Time interval from onset of chest pain to streptokinase varied between ½-12 hours (mean=5.01hr) (Table 1). 197 (80.7%) were non-diabetics and 47 (19.3%) were diabetic patients (Table 2).

Out of 244 patients, Streptokinase was efficacious in 129 (52.9%) patients and was not efficacious in 115 (47.1%) patients (Table 3). Among the diabetic patients which were 47, streptokinase was effective in 16 patients and it was not effective in 31 patients. So efficacy of streptokinase in

**Table 1: Distribution of Study Variables Among Acute ST Elevation Myocardial Infarction Patients**

Study Variable		Frequency (%)
Age (mean $\pm$ SD) years		54.40 $\pm$ 1.11
Gender	Male	170(69.7%)
	Female	74(30.3%)
Mean time interval from onset of chest pain to streptokinase (hours) $\pm$ SD		5.01 $\pm$ 3.09

diabetic patients was 12.4. Among the 197 non diabetic patients streptokinase was effective in 113 patients and not effective in 84 patients. The percentage showing effectiveness for streptokinase was 57.3%. Chi square test showed a p-value less than 0.004, which shows a significant difference between efficacy of streptokinase among diabetic and non diabetic patients (Table 4).

## DISCUSSION

Among risk factors for coronary artery disease, diabetes is a major contributor, not only to the development of coronary artery disease but also to outcome following various manifestations of the disease.<sup>12</sup> Several studies have shown that diabetes mellitus significantly effects the efficacy of streptokinase in patients presenting with acute ST elevation myocardial infarction.<sup>13</sup> Chowdhury et al, compare the efficacy of streptokinase between diabetic and non-diabetic patients presenting with acute ST Elevation Myocardial Infarction, confirmed more complete ST-resolution in non-diabetic patients as compared to diabetic patients, showing that diabetes mellitus might affect the thrombolytic outcome of acute myocardial infarction patients with diabetes mellitus.<sup>11</sup> Samir et al, reported efficacy of streptokinase in diabetics vs non-diabetics as 18.8% vs. 62.5% by ECG criteria.<sup>14</sup>

Zairis et al, showed significant difference between diabetic and non-diabetic patient in relation to complete (34.1% vs. 68.2%;  $p < 0.001$ ) ST segment resolution.<sup>10</sup> In Pakistan

**Table 2: Distribution of Cases by Presence of Diabetes Mellitus (N=244)**

Presence of Diabetes Mellitus	Frequency	Percentage
Non-Diabetics	197	80.7%
Diabetics	47	19.3%
Total	244	100.0

**Table 3: Distribution of Study Cases by Efficacy of Streptokinase**

Efficacy of streptokinase	Frequency	Percentage
Yes	129	52.9%
No	115	47.1%
Total	244	100.0

small studies are available suggesting increase mortality and worse in hospital outcome in diabetics as compared to the normal population.<sup>13</sup> In our study, 244 patients were included. out of 244 patients, 197(80.7%) were non-diabetics and 47(19.3%) were diabetics, whereas in Chowdhury et al, study out of 187 patients, 126(67.37%) were non-diabetics and 61(32.6%) were diabetics. Streptokinase was given to all the patients. ECG was done before the start of Streptokinase and at 90 minutes. Criteria for efficacy of streptokinase (in terms of successful reperfusion) was, ST segment resolution equal or more than 70% at 90 minutes ECG. This study showed that streptokinase was significantly more efficacious in non-diabetic as compare to diabetic patients (non-diabetic 87.59% vs. diabetic 12.40%;  $p < 0.001$ ). Chowdhury et al, study, showed efficacy of streptokinase was between diabetics and non-diabetic patients as (non-diabetic 48.4% vs. diabetic 19.7%;  $p < 0.001$ ).<sup>11</sup> It is uncertain whether this difference in efficacy of streptokinase is due to endothelial dysfunction, dysglycemia and coagulation and fibrinolytic disturbances in diabetic patients. But decrease efficacy is associated with increased mortality due to a lower rate of successful thrombolysis, increased re-occlusion after successful thrombolysis, greater ventricular injury or more adverse clinical profile in diabetic patients.<sup>15</sup>

These results emphasize that, despite the established benefit of fibrinolytic therapy in acute myocardial infarction, a significant proportion of diabetic patients do not achieve complete reperfusion within 90 min of starting thrombolytic therapy. So, due attention is required for the better management of diabetic myocardial infarction patients. This

**Table 4: Streptokinase Efficacy in Diabetics and Non-Diabetics (N=244)**

Variables	Effectiveness of Streptokinase		Percentage of Effectiveness	P-value
	Effective	Non-Effective		
Diabetes status				
Diabetics	16	31	12.4%	< 0.0040
Non Diabetics	113	84	57.4%	
Total	129	115		

should, however, be supplemented with further therapies and strategies directed towards the many abnormalities that are associated with diabetes, such as endothelial dysfunction, dysglycemia and coagulation and fibrinolytic disturbances.

## CONCLUSION

This study shows that streptokinase was efficacious in patients presenting with acute ST elevation myocardial infarction and streptokinase was significantly more efficacious in non-diabetics as compared to diabetic patients. This suggests that other modalities of reperfusion such as primary PCI should be used in diabetic patients presenting with acute ST elevation myocardial infarction.

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