Original Research Article

Effectiveness of thrombolytic therapy in patients with acute myocardial infarction within 12 hours of symptoms

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ABSTRACT

Background: Atherosclerotic coronary artery disease particularly myocardial infarction is the leading cause of morbidity and mortality all over the world and its incidence is also on the rise in Pakistan. This study was done to assess the effectiveness of thrombolytic therapy in patients with acute myocardial infarction and comparison between diabetics and non- diabetics.

Methods: This cross sectional study was conducted at Department of Cardiology, Bahawal Victoria Hospital, Bahawalpur from January to June 2019. Total 380 patients of aged 30-70 years either male or female with diagnosis of acute ST-elevation myocardial infarction presenting within 12 hours of the onset of chest pain were selected. Patients were given thrombolytic therapy with Streptokinase 1.5 MIU over 1 hour and post therapy, efficacy was assessed.

Results: Mean age of the patients was 51.37±10.08 years. Mean duration of diabetes mellitus was 5.99±3.47 years. Duration of chest pain ranged from 1 hour to 12 hours with mean duration of 4.66±2.98 hours. Out of 380 patients of MI, treatment was found effective in 202 (53.2%) patients. Female gender, type of MI, and duration of chest pain were significantly associated with reduced efficacy (p value < 0.05). Presence of hypertension, smoking, dyslipidemia or family history of MI did not alter the efficacy significantly (p>0.05) while patients having diabetes had significantly reduced efficacy (p value < 0.001).

Conclusions: There is reduced effectiveness of thrombolytic therapy in diabetic patients with ST elevation myocardial infarction.

Keywords: Diabetes mellitus, ST-elevation myocardial infarction, ST-segment resolution, Thrombolytic therapy

INTRODUCTION

Atherosclerotic coronary artery disease particularly myocardial infarction is the leading cause of morbidity and mortality all over the world and its incidence is also on the rise in Pakistan.[1,2] It is estimated that one in five adults Pakistan is suffering from concealed coronary artery disease. Similarly, the prevalence of type 2 diabetes mellitus is also increasing and it is estimated that the total number of people with diabetes mellitus will reach 366 million by 2030. The number of people affected by diabetes mellitus in Pakistan will reach 11.5 million in 2025.[3]

Diabetes mellitus increases the rate of progression of atherosclerosis. The incidence of acute myocardial infarction is 2-4 times higher in diabetics. Even when promptly treated with thrombolytic therapy, the outcome of diabetic patients with acute ST segment elevation myocardial infarction is worse as compared to non-

diabetics, manifested as more post-thrombolysis left ventricular dysfunction and worse prognosis.[2] Recently it has been suggested that diabetes mellitus interferes with the efficacy of intravenous thrombolysis as measured by angiographic and electrocardiographic criteria.[4]

Partial or failed reperfusion is associated with elevated risk of complications.[5]

Success of thrombolytic therapy can be assessed either by coronary angiography or by measuring the resolution of ST segment elevation on electrocardiography. ST segment resolution is a simple and convenient measure of success of thrombolytic therapy.[6]

So a study was planned to evaluate the efficacy of thrombolytic therapy in patients of acute ST elevation myocardial infarction with and without diabetes mellitus in our region. This will provide data regarding effectiveness of thrombolytic therapy in patients of myocardial infarction in our region and may help modification of treatment protocols for effective reperfusion in diabetic patients with acute ST elevation myocardial infarction and comparison between diabetics and non- diabetics.

METHODS

This cross sectional study was conducted at Department of Cardiology, Bahawal Victoria Hospital, Bahawalpur from January to June 2019. Approval from Institutional Ethical Committee was taken for this research. Informed consent was sought from every patients/guardians for this study.

Inclusion criteria

- Age 30-70 years
- Male or female
- Diagnosis of acute ST-elevation myocardial infarction presenting within 12 hours of the onset of chest pain.

Exclusion criteria

- Previous history of myocardial infarction
- Previous history of exposure to thrombolytics
- Bundle branch block on ECG
- Contra-indications to thrombolytic therapy e.g. active bleeding, CNS neoplasm, head trauma.
- Hemorrhagic stroke any time in the past
- Ischemic stroke in last 3 months
- Co-morbidities like renal failure or malignancy diagnosed on previous medical record

A total of 380 patients as per inclusion and exclusion criteria were selected. The diagnosis of ST-elevation myocardial infarction required ST segment elevation ≥ 2 mm on in precordial ECG leads or ≥ 1 mm in limb leads

with at least one of the following criteria; a characteristic chest pain or discomfort lasting ≥ 30 minutes.

Patients were given thrombolytic therapy with Streptokinase 1.5 MIU over 1 hour and post therapy. ECG was done after 90 minutes. ST segment resolution $\geq 70\%$ was considered as effective therapy positive.

Positive effectiveness was labelled to be present or not. ST-segment elevation resolution was calculated as the sum of ST-segment elevation on initial ECG minus the sum of ST-segment elevation on second ECG recorded 90 minutes after the thrombolytic therapy divided by the initial ST segment elevation and was expressed as percentage.

The information about patient's age, gender, history of diabetes mellitus, hypertension, smoking, dyslipidemia, family history and duration of chest pain was recorded on pre-designed proforma. Diabetes mellitus was labeled as diagnosed cases of diabetes mellitus or history of diabetes mellitus for more than 2 years duration on therapy.

The collected data was analyzed with the help of SPSS version 22. Mean and standard deviation were calculated for quantitative variables like age and duration of diabetes mellitus and duration of chest pain (hours). Categorical data like gender, history of diabetes mellitus, hypertension, smoking, dyslipidemia, family history and type of myocardial infarction and effectiveness were presented as frequencies and percentages.

Comparison between diabetics and non-diabetics for effectiveness of thrombolytic therapy was done with chi square test at p value <0.05. Effect modifiers like age, gender, hypertension, smoking, duration of symptoms, dyslipidemia, family history of MI and type of myocardial infarction were controlled through stratification. Post stratification chi square test was applied at *p* value < 0.05 level of significance.

RESULTS

Mean age of the patients was 51.37±10.08 years. Mean duration of diabetes mellitus was 5.99±3.47 years. Duration of chest pain ranged from 1 hour to 12 hours with mean duration of 4.66±2.98 hours. Out of 380 patients of MI, treatment was found effective in 202 (53.2%) patients.

Stratification of patients characteristics with respect to effectiveness of thrombolytic therapy. Female gender, type of MI, and duration of chest pain were significantly associated with reduced efficacy (p value<0.05) while age did not have any significant association with efficacy (p value>0.05) (Table 1). Stratification for risk factors with respect to effectiveness of thrombolytic therapy. Presence of hypertension, smoking, dyslipidemia or family history of MI did not alter the efficacy

significantly (p>0.05) while patients having diabetes had

significantly reduced efficacy (p value <0.001) (Table 2).

Table 1: Stratification of patients characteristics with respect to effectiveness of thrombolytic therapy.

Characteristics		Effectiveness		p value
		Yes (n=202)	No (n=178)	
Age Groups (years)	30-40	49 (24.26%)	28 (15.73%)	0.147
	41-50	71 (35.15%)	65 (36.52%)	
	51-60	51 (25.25%)	52 (29.21%)	
	61-70	31 (15.35%)	33 (18.54%)	
Gender	Male	172 (85.15%)	137 (76.97%)	0.041
	Female	30 (14.85%)	41 (23.03%)	
Type of MI	Anterior wall MI	104 (51.49%)	115 (64.60%)	0.024
	Inferior wall MI	94 (46.53%)	62 (34.83%)	
	Lateral wall MI	4 (1.98%)	1 (0.56%)	
Duration of chest pain (hours)	1-3	119 (58.91%)	54 (30.34%)	<0.001
	4-6	62 (30.69%)	60 (33.71%)	
	7-9	18 (8.91%)	32 (17.98%)	
	10-12	3 (1.49%)	32 (17.98%)	

Table 2: Stratification for risk factors with respect to effectiveness of thrombolytic therapy

Risk factors		Effectiveness		p value
		Yes (n=202)	No (n=178)	
Hypertension	Yes	106 (51.20%)	101 (48.80%)	0.405
	No	96 (55.50%)	77 (44.50%)	
Smoking	Yes	108 (55.67%)	86 (44.32%)	0.316
	No	94 (50.53%)	92 (49.46%)	
Dyslipidemia	Yes	20 (44.44%)	25 (55.55%)	0.212
	No	182 (54.32%)	153 (45.67%)	
Family History of MI	Yes	53 (60.91%)	34 (39.08%)	0.098
	No	149 (50.85%)	144 (49.14%)	
Diabetes Mellitus	Yes	73 (36.1%)	20 (11.2%)	<0.001
	No	105 (63.9%)	182 (88.8%)	

DISCUSSION

This study showed that patients with diagnosis of acute myocardial infarction who present in cardiac emergency within twelve hours of onset of typical symptoms consistent with acute myocardial infarction and receive thrombolytic therapy have variable response to the therapy. Effectiveness of Streptokinase (a thrombolytic agent) is reliably estimated by ST segment resolution on 12 lead ECG, taken 90 minutes, after the infusion of Streptokinase. ST resolution is indirect measure of coronary blood flow restoration and tissue reperfusion and has valuable prognostic significance.

A study by Gill BA et al has reported a significantly lower efficacy of thrombolytic therapy in diabetic vs.[7] non-diabetics (12.4% vs. 57.3%, *p* value < 0.004). A study by Khan MA et al showed reduced effectiveness of thrombolytic therapy in diabetics vs. non diabetics (13.8% vs.84%).[5] Another study showed significant proportion of diabetic patient with STEMI showed lower efficacy of thrombolytic therapy in comparison with non-diabetic persons (12.0% vs.42.0%).[8] Study conducted by Ibrahim Shah successful reperfusion (≥ 70% ST-resolution) was significantly higher in non-diabetic than diabetic patients (66.7% vs. 49.1%; p< 0.0001).[9] Wide range of effectiveness in diabetics and non- diabetics seen.[2-4] This study showed 63.9% effectiveness in non-diabetics and 36.1% effectiveness among diabetics. The difference behind this may be poor socioeconomic status, level of education, and lack of proper medical advice for pre-morbid conditions like diabetes mellitus, hypertension and dyslipidemia.[10] Similarly lack of awareness of smoking hazards greatly contributes to development of cardiovascular events.[11]

In the present study, females showed significantly less effectiveness of thrombolytic therapy. This may be due to

less attention paid to the females in this society. Similarly, late presentation is also an important indicator of poor effectiveness. The reason may be prolonged travel from remote areas and lack of rapid transport system to the healthcare facility. In This study, maximum benefit of thrombolytic therapy was observed within three hours of presentation. It was observed that patients with inferior wall and lateral wall myocardial infarction showed more effectiveness of thrombolytic therapy, the reason may be less demand of oxygen and nutrients and small area of myocardium at risk. Smokers showed slightly more effectiveness of thrombolytic therapy, possibly due to effective collateral circulation that significantly supplies at risk myocardium after occlusion of the main vessel of that myocardium. Similarly, patients with positive family history showed slightly more effectiveness. The reason could be development of ischemic heart disease at young age, rapid recognition of symptoms, and more awareness of the disease due to direct and indirect family education and awareness. Patients in our study, with diabetes mellitus and dyslipidemia showed reduced effectiveness. The reason is complex patho-physiological mechanism involved in atherosclerosis process, formation of lipid rich plaques, more intense inflammatory response and development of coronary artery disease.[12,13]

CONCLUSION

There is reduced effectiveness of thrombolytic therapy in diabetic patients with ST elevation myocardial infarction. Effectiveness of thrombolytic therapy in patients with acute myocardial infarction depends on demographics like age, gender, family history, co-morbid conditions like diabetes, hypertension, dyslipidemia and habits like smoking. Effectiveness was more in relatively younger patients, male gender, early presentation, small infarction and normal glycemic status.

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