THE INPATIENT OUTCOME OF THROMBOLYSIS FOR AN ACUTE ST-ELEV ATION MYOCARDIAL INFARCTION IN THE CORONARY CARE UNIT OF AYUB TEACHING HOSPITAL

Aftab Ahmad[1], Mohsin Khan[2], Mohammad Imran Khan[3], Sardar Adnan Saif[4], Umair Sharif Mughal[5], Zia Qamar[6], Abdur Rehman[7]

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[1]Resident Department of Cardiology, Ayub Teaching Hospital, Abbottabad
[3]Associate Professor, Department of Cardiology and Chair person Medicine and allied, Ayub Teaching Hospital, Abbottabad
[4]Resident Department of Cardiology, Ayub Teaching Hospital, Abbottabad
[5]Resident, Department of Pulmonology, Ayub Teaching Hospital, Abbottabad
[6]Resident, Department of Pulmonology, Ayub Teaching Hospital, Abbottabad
[7]Resident, Medical Unit B, Ayub Teaching Hospital, Abbottabad

Correspondence

[2]Mohsin Khan, Resident, Department of Pulmonology, Ayub Teaching Hospital, Abbottabad
: +92-306-5531722
: mohsinkhan1464@yahoo.com

ABSTRACT

OBJECTIVES

This study aimed to determine the outcomes, clinical sequelae, and clinical characteristics of patients with pharmacological thrombolysis (lytic therapy) after acute ST-elevated myocardial infarction.

METHODOLOGY

This prospective cohort study was conducted in the Department of Interventional Cardiology from July 2022 to February 2025. The outcome of patients presenting with ST-elevated MI was stratified into successful thrombolysis and failed thrombolysis based on ECG and symptoms, which will be assessed after 2 hours of a Standard dose of Streptokinase. In both arms of the study, complications, sentinel events, hospital stay, and outcome were recorded. The coronary catheterization and 2-D echo findings will also be recorded. The data will be analyzed using SPSS version 21, and a p-value < 0.05 will be considered statistically significant.

RESULTS

Out of 1050 patients, a total of 779 individuals were included in the current study. The mean age of the studied cohort was 61 ± 9 years. We observed failed thrombolysis in 28% (215) of patients. On 2D echo, the most common hypokinetic wall was the inferior wall in both groups, and the difference was significant (p = 0.00). The frequencies of AKI, shock, and TPM in failed thrombolysis were 46%, 33%, and 5%, respectively, which were significantly higher than in the successful thrombolysis group. The LAD was the most common stenotic artery, and the difference was non-significant (p = 0.12). The SVCAD rate was 2% in the successful thrombolysis group and 6.5% in the failed thrombolysis group, with a significant difference (p = 0.00).

CONCLUSION

The success rate of thrombolysis was significantly poor in diabetic, hypertensive, ischemic heart disease, and dyslipidemia patients. The NIV use and ICU admission were high in patients with successful thrombolysis.

KEYWORDS: *Failed thrombolysis, thrombolysis in myocardial infarction (TIMI), NIV non-invasive ventilation, Severe coronary artery disease (SVCAD), Left anterior descending (LAD).*

INTRODUCTION

In developing countries like Pakistan, coronary artery disease (CAD) is a significant health challenge that contributes significantly to mortality and morbidity.[1,2] The CAD, especially acute coronary syndrome (ACS), is the leading cause of death around the globe, contributing 16.7 million deaths every year. The World Health Organization predicted 25 million deaths per year in 2020 related to CAD, whereas in a developing country like Pakistan, estimated deaths caused by CAD are more than 100,000 per year.[3] Around 25% to 35% of all patients who suffer myocardial infarction (MI) die due to ventricular fibrillation before the medical treatment is initiated.[3] A recent study done in Pakistan claimed Ventricular tachycardia as the most common arrhythmia in post-MI patients.[4] Milestone studies, such as GUSTO-1 and ISIS-2, have shown considerable results of thrombolysis and provided the basis for current therapeutic practices.[5,6] A study by the fibrinolytic therapy trialists (FTT) group has shown that 20 to 30% deaths per 1000 patients are prevented by thrombolysis with reduction in mortality of 25%, however 90 minutes arterial patency rate after Streptokinase was only attained in 50 to 60% and thrombolysis in MI grade 3 flow from angiographical study was only attained in 30% of patients.[6] Primary percutaneous coronary intervention (PCI) and pharmacological thrombolysis are crucial methods for thrombolysis and restoring blood flow.

Pharmacological thrombolysis is an alternative when primary PCI facilities are not available. In developing countries like Pakistan, pharmacological reperfusion remains the primary strategy due to the lack of PCI facilities. Among the early management of ACS, thrombolysis forms the foundation and has transformed the area of cardiac care. However, the effectiveness of thrombolysis varies among patients, and as a result, examples of failed thrombolysis (FT) occur. FT is a worry in STEMI pharmacological perfusion as it is associated with the worst outcomes, like early mortality, arrhythmias, and ventricular dysfunction. Around the globe, different studies have shown uneven rates of FT in STEMI, ranging from 10 to 56.8% for both fibrin-specific (Alteplase and Tenecteplase) and non-fibrin-specific (streptokinase) thrombolytic agents.[5] Various factors determine the outcome of thromboly sis. Some of the factors identified by certain studies as predictors of anterior location STEMI include preexisting diabetes and hypertension, higher Killip class, higher total leukocyte count, hyperglycemia, and a higher thrombolysis in myocardial infarction (TIMI) score of 3. Additionally, the longer the door-to-needle time and the time from symptom onset to thrombolysis, the worse the outcome. Age is also another risk factor and confounder in determining the success rate of thrombolysis, as STEMI symptoms are often subtle in octogenarian patients.[7] Despite advancements in medical science, the management of ACS remains an active area of research, with a focus on developing improved therapeutic interventions and outcomes. This has evoked the need for a deeper exploration of the underlying factors and outcomes of this clinical challenge. A previous study states that there is no structured policy for managing FT, and many doctors still follow a conservative approach.[8] In the above context, the current study focuses on exploring the profile of patients who experienced failed thrombolysis in a tertiary care hospital in Abbottabad.

METHODOLOGY

This was a prospective cohort study conducted in the interventional cardiology and cardiac care unit of Ayub Medical Teaching Institute, Abbottabad. The cohort comprised STEMI patients treated with Streptokinase and followed for inpatient hospital outcomes and complications. The study was conducted from July 2022 to November 2024. The non-probability consecutive sampling of eligible STEMI patients treated prospectively with Streptokinase was used for data collection. Ethical approval was obtained from the research cell of the institute with code no: Ref. No. RC-EA-2024/053. The data were entered into a predesigned written proforma after obtaining written consent from the patients or their nearest blood relatives. All patients presented with acute ST-elevated myocardial infarction were assessed for meeting the inclusion criteria. Patients who met the criteria were added and followed until they were discharged from the hospital. The diagnosis of acute ST-elevated Myocardial infarction was made on the standard 12-lead ECG. Inclusion criteria: Patients presented with ST-elevated Myocardial infarction will be assessed for pharmacological thrombolysis. After excluding relative and absolute contraindication, a written consent for pharmacological thrombolysis will be obtained. The response to pharmacological thrombolysis will be stratified into either successful (cohort 1) or unsuccessful resolution (cohort 2). The successful resolution is defined as an improvement in acute chest pain of up to 80% on the Visual Analog Pain Scale, with the ST segment returning to baseline after 2 hours of administering Streptokinase. Unsuccessful thrombolysis is defined as a lack of improvement in pain on the visual analog scale (greater than 80%) after 2 hours of pharmacological thrombolysis (Streptokinase, 1.5 MU over 60 minutes) or failure to resolve ST elevation by 50% or greater on ECG after 90 minutes of thrombolysis. We will label this patient as having a poor failed thrombolysis. In a limited setting, only patients who were stratified in a cohort of failed thrombolysis are considered for rescue PCI. The pain is graded on a visual analog scale. The patients who received an incomplete dose of Streptokinase had non-ST-elevated MI, absolute contraindication of pharmacological thrombolysis, and those who refused to be a part of the study. The rescue PCI was performed unless contraindicated. The sociodemographic variables, in-hospital complications, end-organ assessment, sentinel events, predominant artery occluded during PCI, echocardiographic findings, and discharge status were recorded in patients with failed thrombolysis. The numeric data was presented in the form of mean, standard deviation, and range, while the quantitative data was presented in the form of frequencies and percentages. Multiple logistic regression is used to determine the significance of the thrombolysis outcome (successful vs. failed) as the dependent variable. The data were analyzed using SPSS version 21, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

Almost 1050 patients presented with myocardial infarction, among whom 779 patients (n=779) received Streptokinase. Of the 576 (74%) patients, 26% are female, with a male-to-female ratio of 3:1. In 28% (215) of patients, the resolution is poor after pharmacological thrombolysis and belongs to cohort 2.

The details are shown in Table 01.

Table 1: Comparative Statistics of Patients with Good (Cohort 1) and Poor Resolution (Cohort 02) After Streptokinase

Characteristics		Frequency (%)		Odds ratio	CI (95%)		P-values
		Cohort 1 (n=564)	Cohort 2 (n=215)		Lower bound	Upper bound	
Gender	Male	422(75%)	154(72%)	0.7	0.186	2.92	0.36
	Female	142(25%)	61(28%)				
Diabetic	166(29%)	95(44%)	4.2	1.0	17.3	0.000	Diabetic
Hypertensive	294(52%)	134(62%)	1.05	0.29	3.42	0.006	Hypertensive
IHD	76(13%)	54(25%)	0.070	0.015	0.31	0.000	IHD
Dyslipidemia	06(1%)	07(3%)	0.001	-0.005	0.056	0.04	Dyslipidemia
ADHF	44(8%)	104(48%)	0.027	0.001	0.905	0.000	ADHF
Shock*	68(12%)	70(33%)	3.1	0.000	0.09	0.000	Shock*
Inotropic	70(12%)	74(34%)	-	-	-	0.000	Inotropic use**
Diuretic use	40(7%)	102(47%)	0.86	0.05	15.0	0.000	Diuretic use
Rescue PCI	20(3.5%)	16(7%)	1.03	0.05	1.09	0.001	Rescue PCI
NIV	38(7%)	02(1%)	1.21	0.00	0.01	0.000	NIV
ICU	30(5%)	02(1%)	0.012	0.00	0.5	0.002	ICU
Enoxaparin**	00(0%)	36(17%)	-	-	-	0.000	Enoxaparin**
AKI	28(5%)	100(46.5%)	0.001	-0.005	-0.34	0.000	AKI
CPR	32(6%)	24(11%)	0.084	-0.000	-0.01	0.008	CPR
Defibrillator use	32(6%)	22(10%)	6.2	2.6	14	0.031	Defibrillator use
TPM	06(1%)	10(5%)	2	0.001	4.2	0.003	TPM
Hypokinesia	Anterior	198(35%)	32(15%)	2.1	-4.0	-2.1	0.000
	Anterolateral	122(22%)	26(12%)				
	Antero-apical	08(1.4%)	44(20.4%)				
	Inferior	214(38%)	44(20.4%)				
	Global	04(0.7%)	04(2%)				
Stenotic artery	LAD	20(3.5%)	18(8.3%)	0.012	-1.0	1.5	0.126
	LCX	08(1.4%)	06(3%)				
	RCA	06(1%)	12(6%)				
Angiography	MVCAD	02(0.3%)	08(4%)	0.008	0.001	0.04	0.000
	DVCAD	06(1%)	12(6%)				
	TVCAD	00(0%)	04(2%)				
	SVCAD	12(2%)	14(6.5%)				

*Cardiogenic shock, ** because of missing value CI & OR not computed.

The comparison statistics are detailed in Table 01. The mean age of patients presenting with MI was 62±9 years, with an age range of 31 to 80 years. The mean systolic blood pressure at the time of presentation was 119±27.5, and the mean diastolic blood pressure was 74.4±15. The mean pulse at the time of presentation was 82±8. Many patients get complicated during admission 19% (148) develop acute decompensated heart failure (ADHF), 18% (138) cardiogenic shock, 128 (16%) develop AKI, CPR done in 56 (7.2%) of patients, 54 patients (6.9%) received defibrillator 4% needs ICU admission, 5% need NIV, TPM was placed in 16(2%) of patients. During the hospital stay (n = 62), 8% of patients died; the details are shown in Figure 01.

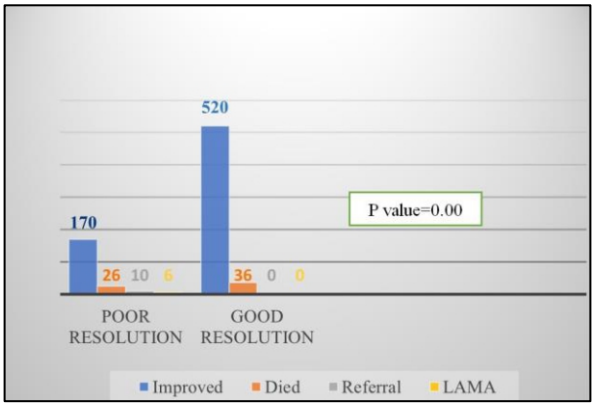

Figure 1: Discharge Status of Patients

DISCUSSION

In the present study, we observed a failure rate of 28% for thrombolysis. Cardiac complication, including shock and heart failure, was the most common complication. The most common non-cardiac complication was AKI. We have observed that ADHF, shock, inotropic use, diuretic use, rescue PCI, enoxaparin use, AKI, CPR, defibrillator use, and TPM were significantly more prevalent in cohort 2. However, surprisingly, the use of NIV and ICU admission was higher in cohort 1, and the difference was statistically significant. Diabetes, IHD, HTN, and dyslipidemia are significant risk factors for poor outcomes, increased mortality, and failed thrombolysis. The overall mortality was 8%. When we compared the data with a national study done in LRH Peshawar, we observed a difference in the failure rate of thrombolysis (32%).[9] The difference could be due to the high prevalence of anterior wall MI in our study. One study reported that the rate of failed thrombolysis in anterior wall MI is 57% and the other highlighted the higher degree of adverse outcome in anterior wall MI patients.[10,11,15] An International study conducted in a Malaysian cohort reported a failure rate of thrombolysis of up to 13.3%.[12] A study done by Iqbal et al. in Karachi reported that the failed thrombolysis group has a high prevalence of heart failure (21%) and cardiogenic shock (13.5%).[13]

These figures are almost in concordance with our observation, with a minor difference that could be due to other underlying comorbidities in our cohort. A comparative study conducted at AFIC Rawalpindi and KTH Peshawar reported that the majority of group B (thrombolysis) participants are diabetic and hypertensive, which aligns with our study.[13] The factors are associated with failed thrombolysis and are responsible for extensive coronary artery disease and severe occlusion.[15,16] The in-hospital mortality is much lower in our hospital than reported before, despite the high probability of poor prognostic factors in our cohort, like age, AWMI, comorbidities, etc. Khan SB et al. reported a mortality rate of 9.4%, while Iqbal N et al. reported a rate of 18.5%.[17,18] The difference could be the larger sample size of our study. This comparative study provides an in-depth examination of the impact, effects, complications, and outcomes of thrombolysis.

LIMITATIONS

The time critical for patients with myocardial infarction and its impact on thrombolysis will not be assessed in this study. The limited data from angiography were recorded**.** The follow-up record was not maintained due to a lack of resources. The stratification of arterial flow (TIMI flow) was not recorded during angiography. The study focused on complications in cohort 2, while overlooking other complications in cohort 1, such as bleeding.

CONCLUSIONS

Complications like AKI, shock, and Acute decompensated heart failure are significantly high in patients with failed thrombolysis, while the study revealed that the duration of stay in ICU and NIV use were significantly higher in cohort 1. The risk of intervention, such as TPM, increased 4-fold, and rescue PCI was increased 2-fold in cohort 2. Comorbidities like diabetes, ischemic heart disease, hypertension, and dyslipidemia increased the failure of lytic therapy (thrombolysis).

CONFLICT OF INTEREST: None

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AUTHORS CONTRIBUTION

Aftab Ahmad *- Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
Mohsin Khan *- Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript; Final Approval*
Mohammad Imran Khan *- Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
Sardar Adnan Saif *- Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
Umair Sharif Mughal *- Concept & Design; Data Acquisition; Drafting Manuscript; Critical Revision; Final Approval*
Zia Qamar *- Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*
Abdur Rehman *- Concept & Design; Data Acquisition; Drafting Manuscript; Final Approval*

The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.