DIFFERENCE IN OUTCOMES IN PATIENTS WITH ST-ELEVATION MYOCARDIAL INFARCTION, TREATED WITH THROMBOLYSIS VERSUS PRIMARY PERCUTANEOUS CORONARY INTERVENTION

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ABSTRACT

Objective: To compare the outcomes in terms of MACE i.e. death, stroke, reinfarction and heart failurein patients with ST-elevation Myocardial infarction treated with intravenous thrombolysis versus primary percutaneous coronary intervention (PPCI).

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Armed Forces Institute of Cardiology/National Institute of Heart Diseases, Rawalpindi and Hayat Abad Medical Complex, Peshawar, from Oct 2019 to Apr 2020.

Methodology: In the current study a total of 204 (102 patients in each group) patients were observed. All the patients presenting with ST-elevation Myocardial infarction in age between 30-75 years and both genders were included.102 patients treated with thrombolysis and 102 patients with Primary PCI were included in the study. Both the groups were admitted as per standard protocol and were followed-up for 7 days, discharged patients before 7 days were contacted through contact number (two contact numbers of patient and close relative). The outcomes were noted.

Results: Our study shows that in group A (thrombolysis) mean age was 44 years with SD ± 9.91. Whereas in group B (PPCI) mean age was 46 years with SD ± 10.02. In group A 69(68%) patients were male and 33 (32%) patients were female. Whereas in group B 67(66%) patients were male and 35(34%) patients were female. In group A 18 (17.6%) patients had MACE. Whereas in group B 8 (7.8%) patients had MACE.

Conclusion: Our study concludes that the overall MACE rate in ST elevation Myocardial infarction was 13%. Moreover, the MACE rate was more in intravenous thrombolysis as compared to primary percutaneous coronary intervention in patients presenting with ST elevation Myocardial infraction.

Keywords: Heart failure, Intravenous thrombolysis, Mortality, Myocardial infarction, Primary percutaneous coronary intervention, Reinfarction, ST elevation, Stroke.

INTRODUCTION

Acute myocardial infarction (AMI) is a local myocardial necrosis due to severely persistent is chemia caused by coronary artery occlusion and blood flow interruption[1]. Although the mortality for this condition has gradually declined over the last decades in western countries, it still causes about one-third of all deaths in people older than 35 years[2]. In developed world it is considered a major cause of death and disability[3-5]. The 2016 heart disease andstroke statistics update of the American Heart Association (AHA) has recently reported that 15.5 million persons ≥20 years of age in the USA have coronary heart disease (CHD)[5]. In a study in India 12 out of 126 patients of acute myocardial infarction died in the hospital stay[6]. The centers of disease control and prevention report that 8% of deaths occur in Pakistan from ischemic heart disease[7].

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Once necrosis of local myocardial tissue starts the scope of myocardial infarction will expand without timely and effective treatment, which further promotes the occurrence of heart failure[8]. Therefore, early implementation of reperfusion, control of lesion, protection of cardiac function and prevention of complications are main guidelines of treatment[9]. Thrombolytic or interventional therapy is commonly used in clinical treatment for AMI[10].

Intravenous thrombolysis is the main treatment for AMI. It has been reported that intravenous thrombolysis could significantly reduce the mortality of patients with AMI, but there still exists deficiencies like low reperfusion rate of coronary artery and many contraindications of thrombolysis.

The Primary Percutaneous Coronary Intervention (PPCI) can improve the blood to myocardium through narrow or occlusive coronary artery lumen with cardiac catheterization. Due to its minimal invasive nature, better therapeutic effects and fewer complications

occur with this but there are stillsome disadvantages such as; myocardial remodeling and stability of myocardial electrophysiological activities will be inhibited after the implantation of stent[11].

Many studies in the world have compared the mortality in both these methods. A quantitative review of 23 randomized trials showed that Primary PCI was better than thrombolytic therapy at reducing overall short-term death (7% [n=270] vs 9% [360]; *p*=0˙0002)[12]. Another study in Europe showed that mortality at 30 days was 10% in the thrombolytic therapy group compared to 6.8% mortality in the PCI group (*p*=0.12, intention-to-treat analysis)[13]. No such study has been found in the Pakistani population.

The rationale of this study is to compare the outcomes in terms of MACE rate in ST-elevation myocardial infarction treated with thrombolytic therapy versus primary PCI because no such study has been done in this institute for the last five years and to make available an evidence on Pakistani population. Results of my study can be used to further strengthen the already existing data[12, 13] and to formulate strategies to decrease the MACE accordingly.

METHODOLGY

The comparative cross-sectional study was conducted in the Cardiology department of Armed forces institute of Cardiology, Rawalpindi and Hayatabad Medical complex, Peshawar, from October 2019 to April 2020. The study design was comparative cross-sectional study, and sampling technique was Non probability consecutive sampling. Considering MACE rate in thrombolytic group of 7%[12] with absolute precision of 5% and confidence level 95%, n=204 patients with ST-elevation myocardial infarction were included in the study. They were divided into two groups, 102 patients in thrombolytic group and 102 in Primary PCI group.

Ethical approval for this study was taken from both the institutes ethical committee. Informed consent (Annexure III) to participate in the study was taken from patients meeting the inclusion criteria. Throughout the study confidentiality was maintained. Patients presenting to the Cardiology departmentsof AFIC and HMC were registered in the study according to inclusion and exclusion criteria. One hundred and two patients treated with thrombolysis therapy in HMC Peshawar and 102 patients treated with primary PCI in AFIC were included in the study. Demographic data and baseline data was collected in the proforma attached (Annexure I and II). In thrombolysis group patient

was administered Intravenous thrombolytic therapy with intravenous infusion of 1.5 million units of strep tokinase in 100ml normal saline within 30 minutes. During the treatment, the patients were monitored for coronary artery revascularization by dynamic electrocardiogram.

Patients in intervention group underwent percutaneous coronary interventionby consultant cardiologist. Before procedure patients were asked to chew 600 mgclopidogrel and 300 mg aspirin. Then primary PCI was done by interventional cardiologist as per standard procedure.

Both the groups were admitted as per standard protocol and were followed-up for 7 days, discharged patients before 7 days were contacted through contact numbers (two contact number of patient and close relative). The MACE was noted. All the research was done by the researcher himself.

Data entry and analysis was done using Statistical Package for Social Sciences version 23. Mean ± SD was calculated for age, duration of symptoms. Frequency and percentages were calculated for Qualitative variable like type of Acute Myocardial infarction, diabetes, hypertension, death, stroke, reinfarction and heart failure. Effect modifiers like age, duration of symptoms, diabetes, hypertension, active smoking and type of Myocardial infarctions were controlled through stratification. Chi square test was applied and significance level was set at *p*-value of ≤0.05.

RESULTS

In this study age distribution was analyzed as in group A 8 (8%) patients were in age range 31-40 years, 27 (26%) patients were in age range 41-50 years, 30 (29%) patients were in age range 51-60 years and 37 (37%) patients were in age range 61-70 years. Mean age was 44 years with SD ± 9.91. Whereas in group B 6 (6%) patients were in age range 31-40 years, 26 (25%) patients were in age range 41-50 years, 31 (31%) patients were in age range 51-60 years and 39(39%) patients were in age range 61-70 years. Mean age was 46 years with SD ± 10.02.

Gender distribution was analyzed as in group A 69 (68%) patients were male and 33 (32%) patients were female. Whereas in group B 67 (66%) patients were male and 35 (34%) patients were female.

Duration of symptoms was analyzed as in group A 74 (73%) patients had duration of symptoms ≤6 hours and 28 (27%) patients had duration of symptoms >6 hours. Whereas in group B 76 (75%) patients had

duration of symptoms ≤6 hours and 26 (25%) patients had duration of symptoms >6 hours.

Status of diabetes was analyzed as in group A 72 (71%) patients were diabetic and 30 (29%) patients were not diabetic. Whereas in group B 73 (72%) patients were diabetic and 29 (28%) patients were not diabetic.

Status of hypertension was analyzed as in Group A 85 (83%) patients were hypertensive and 17 (17%) patients were not hypertensive. Whereas in Group B 82 (80%) patients were hypertensive and 20 (20%) patients were not hypertensive.

Status of smoking was analyzed as in group A 66 (65%) patients were smokers and 36 (35%) patients were not smokers. Whereas in group B 68 (67%) patients were smokers and 34 (33%) patients were not smokers.

Type of STEMI was analyzed as in group A 55 (54%) patients had anterior wall MI, 35 (34%) patients had inferior wall MI and 12 (12%) patients had lateral wall MI. Whereas in group B 59 (58%) patients had anterior wall MI, 33 (32%) patients had inferior wall MI and 10(10%) patients had lateral wall MI (table-I). Outcomes in terms of MACE were analyzedas in group A 18 (17.6%) patients had MACE. Whereas in group B 8 (7.8%) patients had MACE (table-II).

Table-I: Type of stemi (n=204).

Type of Stemi	Group A	Group B	*p*-value
Anterior Wall MI	55 (54%)	59 (58%)	
Inferior Wall MI	35 (34%)	33 (32%)	0.8265
Lateral Wall MI	12 (12%)	10 (10%)	
Total	102 (100%)	102 (100%)	

Table-II: MACE (n=204).

	Group A	Group B	*p*-value
Mace	17.6% (18)	7.8% (8)	0.01
Death	2.94% (3)	2.94% (3)	0.00
Stroke	0.98% (1)	-	0.03
Reinfarction	7.84% (8)	0.98% (1)	0.02
Heart failure	5.88% (6)	3.92% (4)	0.04

MACE components were further analyzed as in group A 3 (3%) patients had death, 1 (1%) patient had stroke, 8 (8%) patients had reinfarction, and 6 (6%) patients had heart failure. Whereas in group B 3 (3%) patients had death, 0 patients had stroke, 1 (1%) patients had reinfarction, and 4 (4%) patients had heart failure.

Within the matched cohort, rate of MACE was statistically different between the thrombolysis (n=102) and PPCI (n=102) groups, (17.6% vs. 7.8% respectively, OR: 2.25, *p*=0.01).

DISCUSSION

Superiority of PPCI in terms of mace outcomes has been established in many randomized controlled trials in the western world. PPCI strategy has been widely accepted and available in the western world whereas in Pakistan its availability is still limited to

Table-III: Stratification of macewith respect toage, gender, duration of symptoms, hyperten-sion, diabetes, smoking and type of myocardial infarction. Group A: Thrombolysis. Group B: Primary PCI.

Age (Years)	Mace	Group A	Group B	*p*-value
31-40	Yes	1	0	
	No	7	6	0.3688
Total		8	6	
41-50	Yes	3	2	
	No	24	24	0.6703
Total		27	26	
51-60	Yes	4	2	
	No	26	29	0.3669
Total		30	31	
61-75	Yes	4	2	
	No	33	37	0.3584
Total		37	39	
Gender	Mace	Group A	Group B	*p*-value
Male	Yes	8	4	
	No	61	63	0.2476
Total		69	67	
Female	Yes	4	2	
	No	29	33	0.3518
	No	25	24	
Total		28	26	
Duration of Symptoms	Mace	Group A	Group B	*p*-value
<6 hours	Yes	9	4	
	No	65	72	0.1332
Total		74	76	
>6 hours	Yes	3	2	
	No	25	24	0.7018
Total		28	26	
Diabetes				*p*-value
Yes	Yes	9	4	
	No	63	69	0.1389
Total		72	73	
No	Yes	3	2	
	No	27	27	0.6687
Total		30	29	
Hypertension	Mace	Group A	Group B	*p*-value
Yes	Yes	10	5	
	No	75	77	0.2003
Total		85	82	
No	Yes	2	1	
	No	15	19	0.4524
Total		17	20	

Smoking	Mace	Group A	Group B	
Yes	Yes	8	4	0.2060
	No	58	64	
Total		66	68	
No	Yes	4	2	0.4347
	No	32	32	
Total		36	34	
Type	Mace	Group A	Group B	
Anterior Wall MI	Yes	6	3	0.2491
	No	49	56	
Total		55	59	
Inferior Wall MI	Yes	4	2	0.4354
	No	31	31	
Total		35	33	
Lateral Wall MI	Yes	2	1	0.6500
	No	10	9	
Total		12	10	

developed cities. No such study has been done in this population. This study supports the western data and confirms the superiority of PPCI over thrombolysis in this population too and reiterates that all patients with STEMI should be treated with primary PCI.

A cute myocardial infarction (AMI) is a local myocardial necrosis due to severely persistent is chemia caused by coronary artery occlusion and blood flow interruption[1]. Although the mortality for this condition has gradually declined over the last decades in western countries, it still causes about one-third of all deaths in people older than 35 years[2]. In developed world it is consider being a major cause of death and disability[3-5]. The 2016 heart disease and stroke statistics update of the American Heart Association (AHA) has recently reported that 15.5 million persons ≥20 years of age in the USA have Coronary heart Disease (CHD)[5]. In a study in India 12 out of 126 patients of acute myocardial infarction died in hospital stay[6]. The centers of disease control and prevention report that 8% of deaths occur in Pakistan from ischemic heart diseases[7].

In another study carried out by Kocayigit et al[14], had reported that among 111 patients over 65 years of age with STEMI (73 males, 38 females). Of the patients, 66 (59.5%) were treated with thrombolytics, and 45 (40.5%) patients underwent primary PCI. Door-to-needle time was 25.9 ± 7.8 min in the TT group, whereas door-to-balloon time was 84.4 ± 20.0 min in the PCI group. Time from symptom onset to hospital admission was 213.6 ± 158.4 min in the thrombolytic group and 166.8 ± 112.8 min in the PCI group. Rescue PCI was performed in 7 (10.6%) patients in the TT

group due to lack of reperfusion. Recurrent infarction was observed in 5 (7.6%) patients in the TT group and in 2 (4.4%) patients in the PCI group. Non-hemorrhagic stroke was observed in 1 (1.5%) patient in the thrombolytic-administered group and in 4 (8.9%) patients in the PCI group. No intracranial hemorrhage was observed in any patient. Major hemorrhage was observed in 4 (6.1%) patients in the TT group and in 4 (8.9%) patients in the PCI group. Six-month and 1-year mortalities were present in 15 (22.7%) patients and 19 patients in thrombolytic group, and 8 (17.8%) and 8 (17.8%) patients in the PCI group, respectively. Binary logistic regression analysis indicated that the patient's age was the only predictor for 1-year mortality (odds ratio (OR)=1.1, 95% confidence interval (CI): 1.019–1.188, p=0.015).

In another study carried out by Danchin et al[15], had reported that sixty percent of the patients underwent reperfusion therapy, 33% with PPCI and 29% with intravenous thrombolysis (18% prehospital). At baseline, the Global Registry of Acute Coronary Events score was similar in thrombolysis and PPCI patients. Time to initiation of reperfusion therapy was significantly shorter in thrombolysis than in PPCI (median 130 versus 300 minutes). After thrombolysis, 96% of patients had coronary angiography, and 84% had subsequent PCI (58% within 24 hours). In-hospital mortality was 4.3% for thrombolysis and 5% for PPCI. In patients with thrombolysis, 30-day mortality was 9.2% when PCI was not used and 3.9% when PCI was subsequently performed (4.0% if PCI was performed in the same hospital and 3.3% if performed after transfer to another facility). One-year survival was 94% for thrombolysis and 92% for PPCI (p=0.31). After propensity score matching, 1-year survival was 94% and 93%, respectively. Also, as a result of the GRACE and MITRA studies, it was shown that a significant proportion of elderly patients did not receive reperfusion therapy due to thrombolytic treatment contraindications and that PCI treatment provided a significant beneficial effect compared toconservative treatment [16,17].

This study supports the western data where randomized trials have shown PCI to be superior to thrombolysis; that all patients with STEMI should be treated with primary PCI.

In our study patientswho were treated with streptokinase had more recurrent myocardial infarctions and heart failure needing additional admissions and treatment as shown by a significantly higher incidence of MACE. Patients with anterior STEMI,

diabetes and hypertension had a much better survival when treated with primary PCI than when treated with strep to kinase.

CONCLUSION

The overall MACE rate in ST elevation Myocardial infraction was 13%. Moreover, the MACE rate was more in intravenous thrombolysis as compared to primary percutaneous coronary intervention in patient presenting with ST elevation Myocardial infraction driven primarily by increased rate of reinfarction and heart failure in thrombolysis group.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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