

In-Hospital Outcome of Early Versus Late Coronary Intervention in Patients Undergoing Thrombolysis after Acute Myocardial Infarction

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ABSTRACT

Objective: To determine the In-hospital outcome of early versus late coronary intervention in patients undergoing thrombolysis after acute myocardial infarction (STEMI).

Study Design: Analytical cross-sectional study.

Place and Duration of Study: Department of Cardiology, Punjab Institute of Cardiology, Lahore Pakistan, from Jul 2021 to Dec 2021.

Methodology: Total of (n=100) patients regardless of gender between 30-80 years of age, presented with acute ST-elevated myocardial infarction (STEMI) at emergency room of PIC, Lahore and undergo thrombolysis with a thrombolytic agent after taking the informed consents were selected by a consecutive sampling technique. The demographic information which includes (name, age, gender, H/O diabetes, duration of STEMI) was noted. Then patients were randomly divided in two groups (Group A & B). In Group-A, patients were undergone PCI within 24 hours of thrombolysis. In Group-B, patients were undergone PCI after 24 hours of thrombolysis. Then all patients were followed-up in coronary care units for 07 days. If re-infarction occurs or patient was died during hospital stay, it was recorded. All the information was noted in a preformed structured proforma.

Results: Out of 100 patients, 10 % (n=10) were in age group of 30-45 years and 90 % (n=90) were in age group of 46-80 years. The mean age was calculated as 60.16 ± 7.13 years. There were 90 (90 %) males whereas 10 (10 %) were females. The frequency of Re-Infarction in early Intervention group was 2(2%) and in late Intervention group it was 10%. ($p<0.05$). The frequency of mortality in early Intervention group was 2 (2%) and in late Intervention group it was 10%. ($p<0.05$).

Conclusion: Frequency of re-infarction as well as mortality was comparatively low in Intervention group. Therefore, the immediate restoring the patency of occluded coronary arteries can prevent or decrease myocardial damage due to acute myocardial infarction and henceforth, decrease morbidity and mortality.

Keywords: Acute myocardial infarction, Re-infarction, Primary percutaneous coronary intervention, Thrombolysis.

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INTRODUCTION

Acute Coronary Syndrome, including ST-elevation myocardial infarction (STEMI), affect millions of subjects each year and are a main cause of high morbidity and mortality worldwide. The previous studies concluded that the initial pre-hospital treatment after STEMI provided by the rescue and emergency medical services (EMS) can significantly reduce the morbidity and mortality and in the long run improve the final outcomes.¹ A very effective management strategy, the Primary Percutaneous Coronary Intervention (PCI) is followed in order to restore the patency of the thrombus laden occluded coronary arteries and salvaging the ischemic myocardium in comparison with the

thrombolytic therapy. As a result the left ventricular ejection fraction (LVEF) is preserved and final outcome is better in patients who presented with acute myocardial infarction.^{2,3}

According to guidelines, Pharmacoinvasive treatment strategy is recommended in patients with acute STEMI, presenting at the emergency department of non Primary PCI centres, which include immediate fibrinolytic therapy with a fibrinolytic agent followed by a subsequent coronary angiography and if required rescue PCI in case of failed thrombolysis. Improving clinical outcomes after fibrinolysis is of great importance for many patients worldwide for whom early treatment with primary PCI is not possible.^{4,5}

The given study was aimed to determine the In-hospital outcome of early versus late coronary inter-

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vention in patients undergoing thrombolysis after acute STEMI. The literature has been widely reviewed and it revealed that there are more chances of adverse in-hospital outcome in late intervention group as compared to early intervention group. But insignificant results have been showed in literature. Moreover, there is no local information available so far which direct us to determine the extent of problem with delayed coronary intervention. So, this research study was aimed to find the evidence for local community and to implement the results in the local community. This study will guide us in planning and making better preventive and management protocols in order to lessen the high morbidity and mortality due to ACS. The study was aimed to compare the in-hospital outcome of early versus late coronary intervention in patients undergoing thrombolysis after acute myocardial infarction (STEMI).

METHODOLOGY

This was a analytical cross-sectional study, conducted at Department of Cardiology, Punjab Institute of Cardiology (PIC), Lahore from July 2021 to December 2021 (IERB Letter # PIC Lahore, Date 01-09-2021) Non probability, consecutive sampling technique was applied to collect data.

Sample Size: By keeping 95% confidence level, 5% margin of error and taking expected percentage of in-hospital mortality i.e., 1.9% with early intervention while 2.6% with late intervention,⁶ after thrombolysis for acute STEMI; the sample size was calculated was 39 but one hundred cases (n=100) were selected to improve the power of study.

Inclusion Criteria: A total of 100 patients of both genders between 30-80 years of age, diagnosed with acute myocardial infarction (STEMI) at emergency department of the hospital were included in the study.

Exclusion Criteria: Patients with previous history of myocardial infarction, PCI/CABG, valvular heart disease or undergone any valvular procedure, cardiac tumor were excluded. Moreover, patients with comorbid conditions including chronic renal disease, chronic liver disease, intracranial aneurysm, brain arteriovenous malformation, respiratory failure, cardiogenic shock, blood disorders, and any other organ malignancy were also excluded.

Acute myocardial infarction was considered when 2 of following 3 criteria met: typical or atypical chest pain radiating to the left shoulder, left or right arm, back or jaw and lasting for >15 minutes duration,

specific cardiac enzymes elevation >reference range set by the pathology lab and onset of new ST-T-wave changes or new Q waves on electrocardiography (ECG).

After taking the approval of research study from the Institutional Ethical Review board committee, 100 patients, diagnosed with acute myocardial infarction (STEMI) in the emergency room of cardiology department, fulfilling the inclusion criteria were included in the study after explaining the mechanism of thrombolysis with a thrombolytic agent in detail and fully informed written consents. Thrombolysis with a thrombolytic agent treatment strategy was followed after getting the Informed consents. Blood samples were taken before undergoing thrombolysis. The demographic information of the hundred patients which include (name, age, gender, H/O diabetes, duration of STEMI) was noted. Then patients were randomly divided in two groups (Group A & B). In Group-A, patients were undergone PCI within 24 hours of thrombolysis. In Group-B, patients were undergone PCI after 24 hours of thrombolysis. Then all patients were followed-up in coronary care units for 7 days. If re-infarction occurs or patient was died during hospital stay, then it was recorded. All the information was noted in a preformed structured proforma. "Statistical Package for Social Sciences" (SPSS) version. 21 was used to enter and analyze the collected data. Mean and standard deviation was calculated for quantitative variables like age and duration of STEMI. Frequency and percentage was find out for categorical variables like gender, diabetes and in-hospital outcome (re-infarction and mortality). Chi-square test was applied to compare in-hospital outcome in both groups. *p*-value ≤ 0.05 was taken as significant at 95% CI and 5% margin of error.

RESULTS

After fulfilling the inclusion and exclusion criteria, one hundred patients were selected to compare the in-hospital outcome of early versus late coronary intervention after undergoing thrombolysis for acute myocardial infarction (STEMI).

The age distribution of the patients was done, it showed that out of 100 patients, 10% (n=10) were in age group of 30-45 years and 90% (n=90) were in age group of 46-80 years. The mean age was calculated as 60.16 ± 7.13 years. The Gender distribution of the patients was done, it showed that 90% (n=90) were males whereas 10% (n=10) were females. The distribution of Diabetes Mellitus was done among 100 patients, and it

Acute Myocardial Infarction (STEMI)

showed that out of 100 patients, 25% (n=25) had Diabetes while 75 had no Diabetes. The distribution of the duration of STEMI among 100 patients was done; it showed that the mean duration of STEMI was 03.75 ± 2.19 (Table-I).

Table-I: Demographic distribution of patients (n = 100)

| Variable | (Mean \pm SD)/ n(%) |
|--------------------|------------------------|
| Age (Years) | |
| 30-45 | 10(10%) |
| 46-80 | 90(90%) |
| Gender | |
| Males | 90(90%) |
| Females | 10(10%) |
| Diabetes | |
| Yes | 25(25%) |
| No | 75(75%) |
| Age (years) | 60.16 ± 7.13 Years |

The frequency of re-infarction and mortality were same in both groups (Early Intervention and Late Intervention) i.e. 12 (12%). (Table-II)

Table-II: Descriptive statistics of Re-Infarction and Mortality (n = 100)

| Variables | | n(%) |
|---------------|-----|---------|
| Re-infarction | Yes | 12(12%) |
| | No | 88(88%) |
| Mortality | Yes | 12(12%) |
| | No | 88(88%) |

The frequency of Re-Infarction in Early intervention group was 2(02%) and in late intervention group it was 10(10%). The comparison of both groups early intervention versus late Intervention for Re-Infarction using Chi-Square test was done and it shows that *p*-value < 0.05 which is significant (Table-III).

Table-III: Comparison of both Groups for Re-Infarction and Mortality

| | | Groups | | Total | <i>p</i> -value |
|---------------|-------|-----------------------------|----------------------------|-------|-----------------|
| | | Early Intervention n=100 | Late Intervention n=100 | | |
| Re-Infarction | Yes | 02 | 10 | 12 | < 0.042 |
| | No | 54 | 34 | 88 | |
| | Total | 56 | 44 | 100 | |
| Mortality | Yes | 02 | 10 | 12 | < 0.042 |
| | No | 54 | 34 | 88 | |
| | Total | 56 | 44 | 100 | |

The frequency of mortality in early intervention group was 2(2%) and in late intervention group it was 10(10%) (*p*-value < 0.05). The comparison of both groups early intervention versus late intervention for mortality using Chi-Square test was done and it shows that *p*-value < 0.05 which is significant (Table-III).

DISCUSSION

Acute myocardial infarction, also known as a 'heart attack' occurs when oxygenated blood flow through the coronary arteries to the myocardium is abruptly interrupted, causing myocardial ischemia and if it persists for long duration of time it results in death of the myocardium. Most of the time it is caused by the atherosclerotic plaque rupture with coronary artery occlusion due to secondary thrombosis, resulting in myocardial injury that depends on the area of myocardium supplied by the culprit coronary artery (LAD, LCX or RCA), duration of occlusion and the presence of collaterals. The most effective treatment strategy in the world is Percutaneous Coronary Intervention (PCI) because it restores the patency of the atherosclerotic and thrombus laden occluded coronary arteries and thus salvaging the ischemic myocardium.⁷

Acute myocardial infarction is considered as a main cause of high morbidity and mortality in the United States of America (USA) and other first world countries. The annual incidence of acute myocardial infarction in the United States is approximately 600,000 new attacks and 250,000 recurrent attacks.⁸ The average age at first heart attack is 65 years for males and 73 years for females.⁷ Approximately 75% of patients who presented to the hospitals in USA with acute coronary syndrome (ACS) have an acute ST-elevation myocardial infarction.⁹

In this research study, the age distribution was done and it showed that out of 100 patients, 10% (n=10) were in age group of 30-45 years and 90% (n=90) were in age group of 46-75 years. The mean age was calculated as 60.16 ± 7.13 years. There were 90% (n=90) males whereas 10% (n=10) were females. This study compares both groups for re-infarction and mortality. The frequency of re-infarction in early intervention group was 2% and in late intervention group it was 10% (*p*-value < 0.05). The frequency of mortality in early intervention group was 2% and in late intervention group it was 10% (*p*-value < 0.05).

One study found that in-hospital mortality was 10.2% with early intervention while 24% with late intervention (*p* < 0.05) and re-infarction was 6.4% with early intervention and 7.8% with late intervention (*p* > 0.05) in patients of acute STEMI undergoing thrombolysis.⁵ Another study also found that in-hospital mortality was 1.9% with early intervention while 2.6% with late intervention (*p* > 0.05) and re-infarction was 2.7% with early intervention and 2.9% with late intervention (*p* > 0.05) in patients of acute STEMI undergoing thrombolysis.⁶

The decline in the 30 day mortality rate after acute STEMI can be attributed to the improvement in emergency medical services, implementation of effective reperfusion strategies and widespread use of secondary preventive pharmacological therapies and as well as cardiac rehabilitation services before discharge from the coronary care units.¹⁰⁻¹²

In the European world, the incidence of acute STEMI has been declining over the last decade.^{13,14} However unlike European world, in the United States the main leading etiology of death for both genders and people of most racial and ethnic groups is the heart disease. In USA, one person (n=1) dies every 37 seconds due to cardiovascular disease. Every year about 660,000 people died from heart disease in the United States - that is 1 in every 4 deaths.¹⁵ The heart disease put heavy burden on the economy of United States and it costs about \$362 billion each year from 2016 to 2021.¹⁶ This includes the cost of emergency services, health care services, life saving procedures, medicines, researches on new drugs and working productivity loss due to illness or death.

Nevertheless, over the past 25 years the in-hospital mortality following acute coronary syndrome has fallen from around 24% to nearer 3%, at least in part due to easy and timely access of the patients to the tertiary care cardiology hospitals and set ups and as well as the management strategy followed by the Interventional cardiologists in accordance with the International guidelines.^{17,18} Adoption of evidence-based treatment in Ireland and Scotland was associated with a decrease in morbidity and mortality over the last 20 years.¹⁹ In patients presenting at the emergency room with typical chest pain history along with the ECG changes, the treatment without any delay should be started immediately and patient is shifted to the catheterization lab for urgent primary PCI without any wait for the laboratory reports. The immediate restoring the patency of occluded coronary arteries can prevent or decrease myocardial damage due to acute myocardial infarction and henceforth decrease morbidity and mortality.

LIMITATIONS OF STUDY

As the study was single centered and sample size was small, so the results cannot be generalized to the population.

CONCLUSION

This research study compares the In-hospital outcome of early versus late coronary Intervention in patients undergoing thrombolysis after acute myocardial infarction (STEMI). This study concluded that the frequency of

reinfarction in early intervention group was 02% and in the late intervention group it was 10% and frequency of mortality in early intervention group was 02% and in the late intervention group it was 10%. There was significant difference in both groups. Hence, therefore, guidelines directed treatment therapies and management protocols to deal with the acute coronary syndrome should be followed in order to lessen the morbidity and mortality due to acute myocardial infarction (STEMI).

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Conflict of Interest: None.

Author's Contribution:

Following authors have made substantial contributions to the manuscript as under:

MNT: Manuscript writing, concept and editing
NAS: Intellectual contribution, concept and final approval
MHR: Study design, drafting the manuscript and critical review
AN: Proof reading, Intellectual contribution, final approval
MS: Data management, data collect & manuscript writing
ARJ: Formatting, critical review and data collection/entry
NA: Drafting the manuscript, proof reading & critical review
AN: Analysis, manuscript writing and proof reading
SNYB: Data collection, data analysis and review of article
AAC: Review of article, formatting and critical review

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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