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MEASURING ADVERSE CARDIOVASCULAR OUTCOMES (MACE) IN DIABETIC VS NONDIABETIC PRIMARY PCI (PPCI) PATIENTS SUFFERING FROM STEMI IN PIC, LAHORE

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ABSTRACT:

INTRODUCTION: *All over the world, particularly in developing countries, coronary artery disease (CADs) is a major cause of significant morbidity and mortality. Primary PCI (PPCI) is the standard of emergency care in patients suffering from STEMI. The major adverse cardiovascular outcomes (MACE) may be different in patients with or without diabetes.*

AIMS & OBJECTIVE: *This article aims at comparing major adverse cardiovascular outcomes in diabetic and nondiabetic STEMI patients going through PPCI.*

MATERIAL & METHODS: *This descriptive case series was carried-out at Emergency Department, Punjab Institute of Cardiology (PIC), Lahore. A total of 245 patients were included out of which 85 were with and 160 were without diabetes. Post-PPCI in-hospital outcomes were recorded: mortality, cerebrovascular accident, acute and subacute stent thrombosis, heart failure, acute kidney injury and arrhythmias.*

RESULTS: *Patients with mean age of 50.3 ± 9.7 years; mean BMI of 28.0 ± 2.0 kg/m2, risk factors included hypertension (n=73), family history of IHD (n=23) and smoking (n=81). Post-PPCI in hospital outcomes in 85 diabetics were as follows: mortality 0, heart failure in 1 (1.18%), acute stent thrombosis 0; acute kidney injury in 8 patients (9.41%). Among 160 patients without diabetes, post PPCI outcomes were as follows: mortality 2 (1.25%), heart failure 4 (2.5%), acute stent thrombosis 1 (0.6%) and acute kidney injury 6 (3.75%). The only significant association among PPCI following STEMI and in-hospital outcomes was with acute kidney injury (P = 0.069).*

CONCLUSION: *Primary percutaneous intervention for acute STEMI is feasible in our setup and is associated with high success rate, low mortality rate and low complication rates in diabetic patients, except that incidence of acute kidney injury was significantly more in diabetic patients.*

KEY WORDS: *Primary PCI, acute STEMI, MACE.*

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INTRODUCTION:

Cardiovascular disease is the predominant cause of morbidity and mortality in all parts of the world, in both the developed and developing countries. The year 2013 witnessed more than 54 million deaths globally and 32% of these deaths were ascribable to CVDs.[1] ST-elevation MI (STEMI), a type of ischemic heart disease (IHD) is the most dreadful presentation of Acute coronary syndromes (ACS) with great chances of complications and sudden cardiac death rates. Acute management of STEMI has recently been revised and updated all over the world.[2,3]

Primary percutaneous intervention (PPCI) has revolutionized the reperfusion method and outcome in STEMI patients over this past decade [4,5] with more than a million procedures being performed in the U.S. per annum.[6] Primary PCI has witnessed statistically significant reductions in mortality, re-infarction and stroke rates.[4] Not many studies regarding PPCI have been conducted in Pakistan, particularly in public sector hospitals. No matter how few they are, almost all report high success rates with this modality of intervention (>98%) as well as exemplary (>94%) survivals.[7]

Coronary artery disease (CAD) prevalence is on the rise in Pakistan and burdens our health-care costs and patient turn-out in cardiovascular emergency units.[7,8] Trend of PPCI should be promoted and more data should be made available for better management of patients as well as reduce the likelihood of complications.

Due to successful utilization of primary and secondary prevention strategies for acute STEMI, its incidence has decreased worldwide with a significant reduction in mortality. Primary PCI remains the goal standard and focuses to improve time-to-treatment, techniques and devices for the procedure, pharmacological therapy and home care post-discharge.[10]

In STEMI, patient's age at the time of presentation, delay in the start of treatment, mode of reperfusion therapy, history of previous myocardial infarction (MI), diabetes, chronic kidney disease (CKD) and the total number of diseased coronary arteries, are some of the most powerful predictors of adverse outcomes.[10,11]

During the previous decade, primary PCI has largely replaced the traditional thrombolysis as revascularization technique for STEMI patients, however, performing primary PCI effective timeframes is daunting, worldwide. Long delays in transferring patients to the catheter laboratory can occur, resulting in detrimental outcomes for patients.[12]

In various studies, recurrence of STEMI, history and future risk of stroke, death have been found to be strongly associated with presence of comorbid conditions like diabetes, peripheral arterial disease, heart failure and chronic kidney disease as risk factors. Such results are indicative of the need for providing better treatment options to patient groups with these high-risk factors.[13-15]

This study focuses on acute management of diabetic and nondiabetic STEMI patients i.e., primary PCI (PPCI) as an emergency modality of management. The aim of study is to compare in-hospital outcomes of PPCI after STEMI among diabetic and non-diabetic patients, in an effort to improve the procedure outcomes and have a better understanding of the need of having "individualized" treatment options for patients having diabetes.

Acute kidney injury would have been diagnosed as an increase in basal serum creatinine of > 0.5 mg/dL during the period between two to seven days after performing the procedure.

MATERIAL AND METHODS:

This study was conducted from 27-06-2019 to 26-12-2019 in Emergency Department, Punjab Institute of Cardiology, Lahore. Sample size taken was 245 which was calculated by taking 95% confidence interval with 3% margin of error with expected proportion of cardiac failure in patients with acute STEMI subjected to PPCI which was 6.1%. Adults aged 18-65 with Acute STEMI, LV ejection fraction ≥35%, patients from both genders and able to give consent were included in the study. Patients who had received fibrinolysis for index STEMI, patients in cardiogenic shock, chronic renal failure and not able to give consent were excluded from the study.

DATA COLLECTION:

After approval from the hospital ethical committee, demographic details (age, gender, co-morbid illnesses, previous cardiac catheterizations, etc.) were recorded. A comprehensive history regarding the cardiovascular and other comorbid illnesses were taken and a detailed physical examination with special emphasis on CVS was performed. A predesigned proforma was used to enter the information of each patient individually. Post-PPCI in-hospital outcomes recorded were mortality, cerebrovascular accident (using CT brain), acute and subacute stent thrombosis (using coronary angiography), heart failure (clinically and on echo), acute kidney injury (RFTs) & arrhythmias (ECG).

DATA ANALYSIS:

Data analysis was performed using SPSS version 22. Age was presented as mean and SD. Gender, occupation, diabetic or nondiabetic and post-PCI hospital outcome (Mortality, Heart failure, stent thrombosis, acute kidney injury were presented

Table 1: Mean age and BMI of the patients included in the study

Age (Year)	Number	Percentage
25-45	82	33.5%
46-65	163	66.5%
Total	**245**	**100.0%**
Mean ± SD	50.3 ± 9.7	
BMI (kg/m²)	**Number**	**Percentage**
≤ 30	198	80.8%
≥ 30.1	47	19.2%
Total	**245**	**100.0%**
Mean ± SD	28.0 ± 2.0	

Table 2: Stratification for diabetic vs non-diabetic patients with regards to in-hospital outcomes of PPCI following STEMI (mortality, heart failure, acute stent thrombosis and acute kidney injury)

PPCI outcome in question	Yes	No	Total	P value
Mortality				
Diabetic patients	0	85	85	P=0.301
Non-diabetic patients	2	158	160	
Total	2	243	245	
Heart failure				P=0.486
Diabetic patients	1	84	85	
Non-diabetic patients	4	156	160	
Total	**5**	**240**	**245**	
Acute stent thrombosis				P=0.465
Diabetic patients	0	85	85	
Non-diabetic patients	1	159	160	
Total	**1**	**244**	**245**	
Acute kidney injury				P=0.069
Diabetic patients	8	77	85	
Non-diabetic patients	6	154	160	
Total	**14**	**231**	**245**	

as frequency & percentage. Data were stratified for age, gender BMI & DM (BSR >200mg/dl. Chi square test was applied by taking p-value ≤0.05 as significant.

RESULTS:

The mean age was just over 50.3±9.7 years and Mean BMI of the patients was 28.0±2.0 kg/m2 (table 1). 85 patients (34.7%) were diabetic and 160 (65.3%) patients were nondiabetic. Post PPCI in-hospital outcomes were as follows: mortality 0, heart failure in 1 (1.18%), acute stent thrombosis 0 & acute kidney injury in 8 patients (9.41%). Among 160 nondiabetic patients, post PPCI outcomes were as follows: mortality 2 (1.25%), heart failure 4 (2.5%), acute stent thrombosis 1 (0.6%) and acute kidney injury 6 (3.75%). As a post-procedural complication, acute kidney injury was found to be significantly associated with both diabetic as well as nondiabetic patient groups.

DISCUSSION:

Acute STEMI is the most common and the most dangerous manifestation of coronary artery disease (CAD) resulting in significantly high cardiovascular morbidity and mortality.[16] Primary percutaneous coronary intervention (PPCI), if carried out within the stipulated time, is now considered as optimal strategy for its emergency management.[9] It achieves swift and more consistent reperfusion with low possibility of occurrence of complications when compared to pharmacological thrombolysis.[17] The purpose of performing primary PCI is to make timely reperfusion of the ischemic myocardium possible, by intervening with the infarct-related artery within 12 hours after beginning of the manifestation of very first symptoms, prior to the start of any thrombolytic therapy. 9 Its superior efficacy and safety over in-hospital fibrinolysis has been demonstrated by several randomized clinical trials, rendering PPCI labelled as the "gold standard" for STEMI treatment worldwide. [9,18]

Mortality, in question as one of the major adverse cardiovascular outcomes in STEMI, is influenced by not one but many factors including age, Killip class, time delay to treatment, mode of treatment, history of prior MI attacks, diabetes mellitus, kidney disease, number of diseased coronary arteries, ejection fraction and pharmacotherapy.

The mean age of patients in this study 50.3±9.7 year was more than a decade lesser than the western population.[19,20] It is a well-known fact that has previously been established that acute MI occurs at an early age in South Asian population.[21] There possible reasons for earlier occurrence of CAD in Pakistan are multifactorial: lifestyle factors, genetic predisposition, higher prevalence of abdominal obesity, diet, dyslipidemia e.g. higher apolipoprotein (Apo)B/ApoA1 ratio etc.[22]

Unfortunately, not many studies have been conducted in Pakistan to find out the association of in-hospital adverse outcomes of diabetic and non-diabetic patients post-PPCI for STEMI. In this study, a number of in-hospital outcomes of PPCI for the treatment of STEMI were observed in 245 patients (both male and female), 85 of whom were diabetic and 160 were non-diabetic. Association of diabetes and adverse in-hospital outcomes (mortality, heart failure, acute stent thrombosis and acute kidney injury) was observed.

Overall no in-hospital mortality was seen out of 85 diabetic patients while only 2 out of the rest of 160 (1.25%) nondiabetic patients died after PPCI for STEMI was performed. So, the association was found to be insignificant (P = 0.301). Previously, mortality was reported 7.7% in a study carried out by Peiyuan et al.[4]

Heart failure was observed in only 1 out of 85 diabetic patients while 4 out of 160 nondiabetic patients developed heart failure post-PPCI. The association of diabetes promoting the development of heart failure after PPCI was not found to be significant (P = 0.486).

None of the diabetic patients developed acute stent thrombosis while 1 out of 160 nondiabetic patients were observed to developed acute stent thrombosis diagnosis during their hospital stay after undergoing PPCI after STEMI. So, insignificant association was found between being diabetic and development of acute stent thrombosis (P = 0.465).

8 out 85 diabetic patients (9.4%) while 6 out of 160 (3.75%) nondiabetic patients exhibited manifestations of acute kidney injury after PPCI was performed while patients were in hospital recovering. A significant (P = 0.069) association was found between diabetes interfering with favorable PPCI outcomes especially pertaining to development of acute kidney injury. Previously, Rehman et al [3] in their study, reported kidney injury in 2-15% which is consistent with our findings.

STUDY LIMITATIONS:

Despite the fact that in this study we established a link between MACE and female gender, there were a few limitations:

1. In our study, we excluded patients with established CKD who are likely to experience more adverse outcomes compared with general population. Main reason for this was unavailability of proper nephrology backup for tackling high chances

of developing Contrast Induced Nephropathy (CIN).

2. The patient population ranged from 18-65 years because in our gradually growing setup, we are encountered with certain inevitable limitation of resources including the availability of stents and heavy patient turnout in the ER department due to which we have to triage the patients of relatively younger age groups to provide maximal judicious use of available resources.

3. We were unavailable to include patients with cardiogenic shock who, according to the literature and practical experience world over, should receive pPCI as the modality of choice for reperfusion in acute STEMI. Again, this situation often demands insertion of IABP (Intra-Aortic Balloon Pump) which is frequently unavailable. Hence, putting the patients on a disadvantage in terms of delayed reperfusion.

CONCLUSION:

Primary percutaneous intervention for acute STEMI is feasible in our setup and is associated with high success rate, low mortality rate and low complication rates in diabetic patients, except that incidence of acute kidney injury was significantly more in diabetic patients.

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