In hospital outcomes of primary percutaneous intervention in patients presenting with acute myocardial infarction in Saudi Arabia – A single center study

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Introduction

The aim of acute treatment of ST elevation myocardial infarction (STEMI) is restoration of myocardial perfusion by recanalization of the occluded infarct related vessel. Early reperfusion is associated with better outcomes. Thrombolytic therapy and primary percutaneous coronary intervention (PPCI) are used as reperfusion strategies (1). Several randomized trials and meta-analyses have shown that primary angioplasty is superior to thrombolysis in the treatment of STEMI in terms of death, reinfarction, and stroke (2-10). Although Primary percutaneous coronary intervention (PPCI) has been recognized as the treatment of choice for patients with (STEMI) widespread availability and access remains limited in Saudi Arabia. The Gulf Registry of Acute Coronary Events (Gulf RACE 2) from 6 Gulf countries including Saudi Arabia showed only 198 patients (10.8% of those treated with PPCI in a STEMI cohort of 1832 patients. The in-hospital mortality was 2.8% in 108 (54.5%) patients who were treated within 90 minutes of medical contact (11). Optimal results of primary PCI are obtained if the procedure is performed in a timely manner (within 90 minutes from medical contact) at a high-volume center by expert operators (12).

King Faisal Cardiac Center (KFCC) is one of the primary centers which perform primary PCI as treatment for STEMI 24 hours 7 days a week in Jeddah, Saudi Arabia. To the best of our knowledge local outcome data in this group of patients are limited. The objective of this study is to ascertain the mode of presentation, describe patient’s clinical and angiographic characteristics and determine in hospital outcomes of patients presenting to KFCC with ST elevation MI who were treated with PPCI.

Patients and Methods

This is a cross-sectional retrospective study. Data of consecutive patients above the age of 18 years hospitalized or presenting to emergency department with acute cardiac chest pain within 24 hours with ECG changes demonstrating ST-segment elevation of more than 1mm in more than 2 contiguous leads or new left bundle branch block who were treated with PPCI and had final discharge diagnosis of STEMI during the period from January 2015 till December 2016 were analyzed.

Patient who were transferred from other hospitals, those who received thrombolytics prior to percutaneous intervention in addition to those who died prior to intervention and Patients who had other causes of ST segment elevation who were taken to the catheterization laboratory for possible PCI and had other diagnosis and finally post CABG patients were all excluded.

Information collected included, age, gender, history of diabetes (defined as a fasting glucose >126 mg/dl or on treatment), hyperlipidemia (fasting cholesterol >200 mg/dl or on treatment), hypertension (systolic blood pressure >140/90 mmHg or on treatment), smoking, left ventricular function (using echocardiography), presence of cardiogenic shock (defined as a systolic blood pressure of < 90 mmHg or requirement of inotropes to maintain a SBP >90 mmHg). Angiographic and procedural details (culprit vessel, number of diseased vessels and use of stents). Hospital charts reviewed for further information including need of intubation, electrocardiogram (ECG) ST segment analysis and laboratory data includes hemoglobin, serum creatinine and cardiac enzymes etc. Timing variables have been ascertained including...
Characteristics of patients undergoing PPCI for STEMI

TABLE 1

| Variables                       | Statistics       |
|---------------------------------|------------------|
| Age, mean (SD)                  | 57.9 (±11.8)     |
| Male                            | 66 (86%)         |
| DM                              | 49 (64%)         |
| Hypertension                    | 39 (51%)         |
| Dyslipidemia                    | 32 (41.6%)       |
| FH of Premature IHD             | 1 (1%)           |
| Prior ASA use                   | 22 (29%)         |
| CKD                             | 6 (8%)           |
| Smoking                         | 32 (41.6%)       |
| Presenting Complaints, n (%)    |                  |
| Chest pain                      | 75 (97%)         |
| SOB                             | 15 (19%)         |
| Syncope                         | 2 (3%)           |
| Cardiac arrest                  | 1 (1%)           |
| Atypical                        | 3 (4%)           |
| Time from pain Onset to presentation, n (%) |
| Within 1 Hour                   | 5 (6%)           |
| >1 to 6 Hours                   | 29 (38%)         |
| >6 to 12 Hours                  | 37 (48%)         |
| >12 Hours                       | 6 (8%)           |

Angiographic and procedural characteristics

TABLE 2

| Variables                        | n (%)             |
|----------------------------------|-------------------|
| Extent of CAD                    |                   |
| 1VD                              | 37 (48.1%)        |
| 2VD                              | 24 (31.2%)        |
| 3VD                              | 16 (20.8%)        |
| Culprit Artery                   |                   |
| LAD                              | 37 (48%)          |
| RCA                              | 21 (27%)          |
| LCX                              | 9 (12%)           |
| OM                               | 7 (9%)            |
| Others**                         | 3 (4%)            |
| Radial Approach                  | 27 (35%)          |
| Femoral Approach                 | 48 (62%)          |
| Switch (from radial to femoral)  | 2 (3%)            |
| Stent                            | 74 (96%)          |
| Drug eluting stent               | 67 (87%)          |
| Baremetal stents                 | 7 (9%)            |
| Balloon only                     | 2 (3%)            |
| Thrombectomy                     | 21 (27%)          |
| Number of Stents, Median (IQR)   | 1 (IQR: 1- 2)     |
| 2b3a inhibitor                   | 34 (44.1%)        |
| Complications                    |                   |
| No Reflow                        | 10 (13%)          |
| Hematoma                         | 4 (5%)            |
| Acute stent thrombosis           | 1 (1.29%)         |
| Cardiogenic Shock                | 3 (3.8%)          |
| VT/VF                            | 6 (7.7%)          |
| Failed PCI                       | 1 (1.29%)         |
| Contrast Nephropathy             | 4 (5.1%)          |
| Dialysis                         | 1 (1.29%)         |
| Coronary Dissection              | 1 (1.29%)         |
| Balloon Pump                     | 6 (7.7%)          |
| Temporary Pacemaker              | 1 (1.29%)         |
| Ventilation                      | 2 (2.5%)          |
| Inotropes                        | 7 (9%)            |
| In hospital Mortality            | 4 (5.1%)          | *(95% CI 0.12 to 10.3%)*

**Others: PDA (n=1), Diagonal (n=1) and Ramus (n=1)

IABP (Intra-aortic balloon pump)
DISCUSSION
The study aimed to ascertain the clinical profile of STEMI cohort presenting to KFCC, a tertiary center in Jeddah Saudi Arabia and describe their outcomes.

Our patients were predominantly males 86% with females constituting only 14%. This is similar to what was reported in literature (13,14).

The patients mean age was 57.9. Diabetes mellitus, hypertension and dyslipidemia were prevalent in this cohort of STEMI patients this is similar to what was reported by Alhabib of Saudi population in the space registry (15). Early presentation of STEMI patient remains a public health concern Only 6% of patients have arrived to Emergency department in the first hour while the majority 48% sought medical advice beyond 6 hours. Lack of awareness of the seriousness of symptoms is a major factor of the delayed presentation other factors could include lack of methods of transportation, inaccurate initial diagnosis and lack of universal healthcare system.

The mean door to balloon time was 85 minutes. Only 62% of patients had door to balloon time within 90 minutes this was an improvement for our center from 54 % during the year 2015 (16). Yet there is a huge potential for improvement through driving certain quality metrics to meet the international standards and guidelines.

There was a low percentage of patient undergoing radial approach PCI. We think this is probably due to low comfort level of operators to adopt this approach in high risk patients another reason is being a low volume center (17). Angiographic success was achieved in 97% similar to recent trends of success. Drug eluting stents was used in 87% while only 7 patients received baremettal stents this was due to large culprit vessel and high bleeding risk. In hospital mortality was 5.1% comparable to international rates which showed in hospital mortality of 5.2% in second national registry of myocardial infarction (NRMI-12) and 3% in ASSENT 4trial (18,19).

Four patients died out of 77 (two due to cardiogenic shock, one due ventricular septal rupture and one due stent thrombosis complicating spiral dissection). Our study albeit small yet it revealed major lessons These includes, poor public awareness of the importance of early presentation when suffering from chest pain, small number of patients undergoing PCI. Low percentage of patient achieving door to balloon time less than 90 minutes. On the other hand, we have demonstrated an excellent safety and in hospital outcomes of PPCI When done in a timely fashion. KFCC performs on average 38 STEMI per year and according to a report based on the National Registry of Myocardial Infarction (NRMI) database, Magid et al. (20) reported that mortality at discharge of patients treated with primary PCI was 6.2% at hospitals performing a low volume of PCI (<16 cases per year), 4.5 % at intermediate-volume hospitals (17-48 cases per year), and 3.4 % at high-volume hospitals (>49 cases per year).

LIMITATIONS
Retrospective, observational and small number of patients is a clear limitation, yet this is a real-world data from a tertiary center that performs PCI 24/7 reflecting the daily clinical practice. Another limitation is the study design of reporting only in hospital outcomes due to loss of follow up of many patients. Availability of long term follow up would have added to the significance of this single center study.

CONCLUSION
Despite being an intermediate volume center our data showed a comparable safety profile of PPCI to international data. Efforts to enhance public awareness and improve availability and access to PPCI should be adopted in Saudi Arabia.

FINANCIAL DISCLOSURES
None of the authors have any declared conflicts of interest.

ACKNOWLEDGMENT
We would like to thank the quality department and the cathereterization laboratory team for their help and special thanks to Mrs. Yumn yasir catheterization laboratory manager and Mrs. Intisar Abdallah and medical records department for extending their great help.

REFERENCES
1. De Luca G, Suryapranata H, Marino P. Reperfusion strategies in acute Elevation myocardial infarction: An overview of current status. Prog Cardiovasc Dis 2008;50:152-92.
2. Andersen HR, Rasmussen K, Thuesen L, et al. A comparison of coronary angioplasty with fibrinolytic therapy in acute myocardial infarction. N Engl J Med 2003;349:733-42.
3. Boersma E. Does time matter? A pooled analysis of randomized clinical trials comparing primary percutaneous coronary intervention and in-hos. Eur Heart J 2006;27:779-88.
4. Keeley EC, Grines CL. Primary angioplasty versus intravenous thrombolytic therapy for acute myocardial infarction: A quantitative review of 23 randomized trials. Lancet 2003;361:13-20.
5. Khattab AA, Abdel-Wahab M, Rother C, et al. Multivessel stenting during primary percutaneous coronary intervention for acute myocardial infarction. A single-center experience. Clin Res Cardiol 2008;99:32-8.
6. Boden WE, Eagle K, Granger CB. Reperfusion strategies in acute STsegment elevation myocardial infarction: A comprehensive review of contemporary management options. J Am Coll Cardiol 2007;50:917-29.
7. Xavier D, Pais P, Devereaux PJ, et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): A prospective analysis of registry data. Lancet 2008;371:1435-42.
8. Timmer JR, Ottervanger JP, De Boer MJ, et al. Primary percutaneous coronary intervention compared with fibrinolysis for myocardial infarction in diabetes mellitus: results from the primary coronary angioplasty vs. thrombolysis 2 trial. Arch Intern Med 2007;167:1353-9.
9. O’Gara, ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction A Report of the American College of Cardiology Foundation American Heart Association Task Force on Practice Guideline. JACC 2013;61(4):e78-140.
10. Cannon CP. Evolving management of ST-segment elevation myocardial infarction: An update on recent data. Am J Cardiol 2006;98:10Q-21Q.
11. Sheikh A, Al-Habib K, Hersi A, et al. Quality of care in primary percutaneous coronary intervention for acute ST-segment elevation myocardial infarction: Gulf RACE 2 experience. Ann Saudi Med 2014;34(6):482-7.
12. Dubey G. Primary percutaneous coronary intervention for acute ST elevation myocardial infarction: Outcomes and determinants of outcomes: A tertiary care center study from North India, Indian Heart J 2016.
13. Xavier D, Pais P, Devereaux PJ, et al. Treatment and outcomes of acute coronary syndromes in India (CREATE): A prospective analysis of registry data. Lancet 2008;371:1435-42.
14. Sadowski M, Gasior M, Gierlotka M, et al. Gender-related differences in mortality after ST-segment elevation myocardial infarction: A large multicentre National Registry. EuroIntervention 2011;6:1068-72.
15. Alhabih KF. Baseline characteristics, management practices, and in-hospital outcomes of patients with acute coronary syndromes: Results of the Saudi project for assessment of coronary events (SPACE) registry. Journal of the Saudi Heart Association 2011;23(4):233-9.
16. Al-Bugami S, Al-Rahimi J, Al-Malki A, et al. ST-segment elevation myocardial infarction: Door to balloon time improvement project. Cardiol Res 2016;7(4):152-6.
17. Fanaroff AC, Zakrovsy P, Dai D, et al. Outcomes of PCI in relation to procedural characteristics and operator volumes in the United States. JAAC 201:2913-24.
18. Tiefenbrun AJ, Handra NC, French WJ, et al. Clinical experience with primary percutaneous transluminal coronary angioplasty compared with alteplase (recombinant tissue-type plasminogen activator) in patients with acute myocardial infarction: a report from the Second National Registry of Myocardial Infarction (NRMI-2). J Am Coll Cardiol 1998;31:1240-5.
19. Assessment of the Safety and Efficacy of a New Treatment Strategy with Percutaneous Coronary Intervention (ASSENT-4 PCI) investigators. Primary Versus tetrodeplase-facilitated percutaneous coronary intervention in patients with ST-segment elevation acute myocardial infarction (ASSENT-4 PCI): randomized trial. Lancet 2006;367:569-78.

20. Magid DJ, Calonge BN, Rumsfeld JS, et al. National Registry of Myocardial Infarction 2 and 3 Investigators. Relation between hospital primary angioplasty volume and mortality for patients with acute MI treated with primary angioplasty vs. thrombolytic therapy. JAMA 2000;284:3131-8.