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Angiographic profile and outcomes of Pakistani women with ST elevation myocardial infarction

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Abstract

Objective: To evaluate the angiographic profile and outcome of primary percutaneous coronary intervention in female patients with acute myocardial infarction.

Method: The cross-sectional study was conducted at the National Institute of Cardiovascular Diseases, Karachi, from July 1, 2017, to March 31, 2018, and comprised female patients presenting with acute myocardial infarction who underwent primary percutaneous coronary intervention and got enrolled in the National Cardiovascular Data Registry. Follow-up calls were made 1 year post-intervention and outcomes were noted. Data was analysed using SPSS 21.

Results: Of the 522 female patients with a mean age of 57.41±11.14 years, 334(64%) were hypertensive, 202(38.7%) diabetic, 16(3.1%) had a family history of coronary artery disease, and 9(1.7%) were smokers. Single-vessel disease was observed in 183(35.1%) patients, and three-vessel disease in 144(27.6%). Post-procedure thrombolysis in myocardial infarction flow (0-II) was observed in 29(5.6%) patients, bleeding in 2(0.4%), and in-hospital mortality was in 22(4.2%).

Telephonic follow-up was successfully conducted in 436(87.5%) of the discharged patients, and, of them 15(3.4%) had expired and recurrence was reported by 10(2.3%) patients and 8(80%) of them underwent re-intervention.

Conclusion: More than half the female patients had multi-vessel disease and bifurcation lesion was observed in more than three-fourth of the sample.

Key Words: Coronary artery disease, Women, Percutaneous coronary intervention, Acute myocardial infarction, Angiography, Pakistan.

Introduction

The female gender was presumed to have a protective effect against coronary artery disease (CAD) in the reproductive age group, leading to the development of ischemic heart disease (IHD) 7-10 years later than men. Oestrogen is said to be protective against an increased level of low-density lipoprotein (LDL) and triglycerides (TG).[1,2]

Worldwide, cardiovascular diseases (CVDs) cause more deaths in women than all types of cancers combined, accounting for about 1 in every 5 female deaths in 2017 in the United States alone.[3] About 1 in 30 Asian women aged >20 years has CAD.[4]

Constant efforts are made to reduce disease burden globally as well as at regional levels. Women are unique because they have atypical chest pain, delayed presentation, higher numbers of risk factors, different plaque composition and poor clinical outcome.[5] Primary percutaneous coronary intervention (PCI) has been established as the gold standard treatment for both men and women with ST elevation myocardial infarction (STEMI) when fulfilling the criteria.[6]

Although a lot of research in the developed world has been done to compare men and women in terms of their short-term and long-term outcomes with signs and symptoms, clinical presentation and angiographic profiles, women remain under-represented when studies are carried out.[7-11] Symptoms of ischemic

angina pain or CAD are usually distinct in women than their male counterparts. Women are also less likely to receive optimal treatment for certain heart conditions.

Evidence suggests women presenting with typical symptoms of acute coronary syndrome (ACS) with angina Canadian cardiovascular society classification IV (CCS IV) are more likely to have obstructive CAD found in angiography. Similarly, diabetes in females poses an added risk for CAD compared to males. Type II diabetes mellitus (T2DM) is found to be associated with poor prognosis and worse outcome in women.[12] Indian women presenting with myocardial infarction (MI) have diabetes, hypertension (HTN) and obesity as major risk factors, with the highest incidence among those aged 71-80 years.[13]

To the best of our knowledge, no prior women-specific dataset is available in Pakistan. The current was planned to fill the gap by evaluating the angiographic profile and outcome of primary PCI in female patients with acute MI.

Patients and Methods

The cross-sectional study was conducted at the National Institute of Cardiovascular Diseases (NICVD), Karachi, from July 1, 2017, to March 31, 2018. After approval from the institutional ethics review committee, data was extracted from a prospectively collected hospital-based registry with consecutive inclusion of patients. Those included were female patients aged 18-75 years presenting with acute MI who underwent primary PCI <12 hours of symptom onset, and who got themselves enrolled in the National Cardiovascular Data Registry (NCDR)[14]. Prior to inclusion in NCDR, informed consent was obtained and those who refused to give consent were automatically excluded from any subsequent analysis. Pharmacological management during hospital stay as well as medical management at discharge were according to the American Heart Association (AHA) and European Society of Cardiology (ESC) management of STEMI guidelines 2017.[6]

All the primary PCI procedures were performed by consultant cardiologists. Culprit artery was attempted in the index hospitalisation and for patients with multi-vessels disease (MVD), subsequent staged PCI was planned. Bifurcating lesions were managed with the major strategy of one-stent technique with final kissing balloon (FKB) inflation with provisional backup of second stenting, if required.

The variables and details of the proforma used for data collection are already defined.[14] Data regarding demographic characteristics, angiographic profile, and in-hospital outcomes and complications were retrieved from the online NCDT portal[14]. All the patients were referred to in-house cardiac rehabilitation centre, and smokers were counselled regarding smoking cessation. Follow-up calls were made to all the discharged patients with their verbal consent to obtain the outcome of primary PCI after one year.

The sample size for the study was estimated using the World Health Organisation (WHO) calculator version 2.0[15], with expected hospital mortality rate of 10%[16], 95% confidence level and 3% margin of error. In view of the observational nature of the study, the required sample size was inflated by a judgmental proportion of 30% to account for the design effect. The study duration was dependent on fulfilling the sample size requirement.

Data was analysed using SPSS 21. Descriptive statistics, such as frequencies and percentages, mean ± standard deviation (SD) or median and interquartile range (IQR) were calculated as required. Chi-square test, independent sample t-test and Mann–Whitney U test were applied, as appropriate, for comparisons. $P<0.05$ was taken as statistically significant.

Results

Of the 522 female patients with a mean age of 57.41±11.14 years, 27(5.2%) were aged <40 years, 165(31.6%) were obese, 334(64%) were hypertensive, 202(38.7%) were diabetic, 16(3.1%) had a family history of CAD, and 9(1.7%)

were smokers. Prior history of MI was found in 15(2.9%) patients and prior history PCI in 6(1.1%) (Table 1).

Single-vessel disease (SVD) was found in 183(35.1%) patients, two-vessel in 186(35.6%), and three-vessel in 144(27.6%). Bifurcation lesion was observed in 123(23.6%) patients, and thrombus was present in 411(78.7%) patients. Pre-procedure t$_{\text{hrombolysis in myocardial infarction}}$ (TIMI) flow was 0 in 310(59.4%) patients. Mean pre-procedural left ventricular ejection fraction (LVEF) was 42.73±10.05% and post-procedure LVEF within 24 hours post-procedure was 45.42±11.49% (Table 2).

Post-procedure TIMI flow (0-II) was observed in 29(5.6%) patients, bleeding complication in 2(0.4%), and in-hospital mortality in 22(4.2%) cases (Table 3). In 4(18.2%) of the mortality cases, the age was >65 years (Table 4).

Telephonic follow-up was successful in 436(87.2%) patients out of 500 discharged patients. Loss to follow-up cases were 64(12.8%), and in 55(85.9%) of those case, the contact number was either 'switched off' or 'not available", while the remaining 9(14.1%) contact numbers were wrong numbers.

Mean follow-up duration was 377±69 days. Among the successfully followed patients, 15(3.4%) had expired, 10(2.3%) had MI recurrence, 8(1.8%) underwent re-intervention, 6(1.1%) underwent coronary artery bypass grafting surgery (CABG), and bleeding and cerebrovascular accidents (CVAs) were reported by 1(0.2%) patient each. Among the 15 post-discharge mortality case, 3(20%) were aged >65 years (Table 5).

There was no statistically significant association of clinical and angiographic characteristics with in-hospital and post-discharge mortality except bifurcating lesions, which was found to be associated with increased in-hospital mortality and decreased post-discharge mortality ($p<0.05$).

Discussion

The majority of patients in the current study were in the middle age group (71%) which is in contrast with literature that shows women get MI 10 years

later than the average age of men having MI.[2] This is alarming and needs further research to identify the changing trend in women and its cause especially in our part of the world. Hypertension, diabetes and raised body mass index (BMI) are part of standard modifiable cardiovascular risks factors, (SMuRFs) extensively studied earlier[17], and were found to be higher in the current study. Other less known risk factors, like dyslipidemia, family history of CAD and smoking, were also negative in the sample, like previous similar studies.[18] The female gender is more likely to present in emergency departments either with atypical symptoms or because of unawareness regarding symptoms despite having underlying MI.[19] Majority of the current sample (43%) also presented with absence of typical MI symptoms despite having ST elevation on electrocardiogram (ECG). This may explain one reason of delay in seeking medical care in this patient group.[20]

MVD was found more frequent in the current study (>50%), which is similar to another Pakistani study.[21] We found negligible cases having left main as the culprit artery, which was also seen in an earlier study[22] which reported frequency of left main as 1.01%. In-hospital mortality was 4.2% in the current data, while it was significantly variable owing to percentage representation of females in different studies.[23,24] One-year follow-up mortality was 3.4% which is similar as reported earlier.[25]

Angiographic findings, like multi-vessel involvement, presence of thrombus and bifurcating lesions signifying increased lesion complexity, were associated with in-hospital and 1-year mortality which are comparable to prior evidence.[26,27] An improved hospital record and strict follow-up strategy are needed for monitoring the changing trends and for bring about improvement in cardiac health of Pakistani women population.

The current study has limitations that need consideration. Unlike majority of studies done on similar samples, the current study had no male comparison group. Also, time variables were not taken into consideration. Besides, similar

to other observational registries, the current study carries a risk of selection bias, non-randomised data, and missing or incomplete information. ACS patients who died before or shortly after admission were not included, and the same was the case with patients who did not have coronary angioplasty but were given medical treatment or referred for CABG. Though the study cite is a high-volume tertiary care cardiac centre, results may not be generalisable.

Conclusion

More than half of the female patients presenting with acute MI had MVD, and bifurcation lesion was observed in more than three-fourth of them. Early and short-term outcomes of primary PCI in the study population were comparable with low mortality, re-infarction and re-intervention rates.

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289 **Table 1: Baseline Characteristics**

Characteristics	Total (n = 522)
Age (years)	
Mean ± SD	57.41 ± 11.14 years
18 to 40 years	27(5.2%)
41 to 65 years	371(71.1%)
More than 65 years	124(23.8%)
Body Mass Index (BMI)	
Mean ± SD	25.86 ± 4.74 kg/m^2
Underweight (<18.5 kg/m^2)	26(5%)
Healthy (18.5 to 22.9 kg/m^2)	117(22.4%)
Overweight (23 to 27.49 kg/m^2)	214(41%)
Obese (≥ 27.5 kg/m^2)	165(31.6%)
Risk Profile	
Diabetes	202(38.7%)
Hypertension	334(64%)
Family History of CAD	16(3.1%)
Smoker	9(1.7%)
Dyslipidemia	5(1%)
Current Dialysis	1(0.2%)
Prior myocardial infarction	15(2.9%)
Prior heart failure	1(0.2%)
Prior PCI	6(1.1%)
Prior CVD	7(1.3%)
Prior PAD	1(0.2%)
Chronic Lung Disease	5(1%)
Angina Classification in past 2 weeks	
CCS I	25(4.8%)
CCS II	70(13.4%)
CCS III	103(19.7%)
CCS IV	100(19.2%)
No symptoms, no angina	224(42.9%)

290 SD: Standard deviation, CAD: Coronary artery disease, PCI: Percutaneous coronary
291 intervention, CVD: Cardiovascular disease, PAD: Peripheral artery disease, CCS: Canadian
292 cardiovascular society classification.

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296 **Table 2: Angiographic Characteristics**

Characteristics	Total (n = 522)
Number of Diseased Vessels	

Normal angiogram	9(1.7%)
Single vessel disease	183(35.1%)
Two-vessel disease	186(35.6%)
Three-vessel disease	144(27.6%)
Infarct Related Artery	
Left anterior descending artery (LAD)	266(51%)
Right coronary artery (RCA)	198(37.9%)
Circumflex artery (CIRC)	52(10%)
Posterior descending artery (PDA)	1(0.2%)
Ramus intermedius	3(0.6%)
Left main artery (LM)	2(0.4%)
Bifurcation Lesion	
No	399(76.4%)
Yes	123(23.6%)
Dominance	
Co-dominant	24(4.6%)
Left	42(8%)
Right	451(86.4%)
Information not available	5(1%)
Thrombus Present	
No	111(21.3%)
Yes	411(78.7%)
Pre procedure TIMI flow	
TIMI - 0	310(59.4%)
TIMI - 1	49(9.4%)
TIMI - 2	87(16.7%)
TIMI - 3	76(14.6%)
Pre-procedural left ventricular ejection fraction (LVEF)	
Mean ± SD	42.73 ± 10.05%
Information not available	281(53.8%)
Stenosis (pre procedural)	95.73 ± 7.09%

SD: Standard deviation, TIMI: Thrombolysis in myocardial infarction

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Table 3: In-hospital outcome of primary percutaneous coronary intervention (**PCI).**

Characteristics	**Total (n = 522)**
Access Site	
Femoral	378(72.4%)
Radial	144(27.6%)

Contrast Volume	138.4 ± 46.43 ml
Fluoroscopic Time	13.83 ± 7.21 minutes
Post procedure TIMI flow	
TIMI - 0	2(0.4%)
TIMI - 1	7(1.3%)
TIMI - 2	20(3.8%)
TIMI - 3	493(94.4%)
In-hospital Outcome	
Bleeding Complication	2(0.4%)
Emergency CABG	0(0%)
Mortality	22(4.2%)

TIMI: Thrombolysis in myocardial infarction, CABG: Coronary artery bypass grafting.

Table 4: In-hospital mortality

Characteristics	**Alive (n = 500)**	**Deceased (n = 22)**	**P-value**
Age ≥ 65 years	133(26.6%)	4(18.2%)	0.38
Obese (≥ 27.5 kg/m^2)	154(30.8%)	11(50%)	0.058
Hypertension	323(64.6%)	11(50%)	0.163
Diabetes	193(38.6%)	9(40.9%)	0.828
CCS III or IV (P2W)	193(38.6%)	10(45.5%)	0.519
Multi Vessels Diseased	314(62.8%)	16(72.7%)	0.345
Bifurcating Lesions	113(22.6%)	10(45.5%)	0.013*
No Flow	293(58.6%)	17(77.3%)	0.081

CCS: Canadian cardiovascular society classification

Table 5: Post-discharge mortality.

Characteristics	**Alive (n = 421)**	**Deceased (n = 15)**	**P-value**
Age ≥ 65 years	112(26.6%)	3(20%)	0.568
Obese (≥ 27.5 kg/m2)	132(31.4%)	2(13.3%)	0.137
Hypertension	270(64.1%)	9(60%)	0.743
Diabetes	159(37.8%)	6(40%)	0.861
CCS III or IV (P2W)	162(38.5%)	3(20%)	0.147
Multi Vessels Diseased	270(64.1%)	8(53.3%)	0.393
Bifurcating Lesions	103(24.5%)	0(0%)	0.028*
No Flow	247(58.7%)	10(66.7%)	0.536

CCS: Canadian cardiovascular society classification