

FREQUENCY OF RIGHT VENTRICULAR INFARCTION AND IN-HOSPITAL OUTCOME AFTER PRIMARY PERCUTANEOUS CORONARY INTERVENTION (PPCI) IN ACUTE INFERIOR MYOCARDIAL INFARCTION (MI)

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ABSTRACT

Objective: To determine the frequency of Right Ventricle infarction and in-hospital outcome after primary percutaneous coronary intervention in patients with acute inferior MI.

Study Design: Descriptive Cross Sectional Study.

Place and Duration of Study: Armed Forces Institute of Cardiology/National Institute of Heart Diseases, from Dec 2018 to Jun, 2019.

Methodology: Non-probability consecutive sampling technique was used. Permission was sought from hospital ethical committee and informed consent was taken from participants of the study. Patients presenting with acute inferior MI who underwent Primary Percutaneous Coronary Intervention were assessed for presence of Right Ventricle infarct. All the patients' data and variables of the study was recorded in the data collection sheet. Patients underwent venous blood sampling for Complete blood count, Renal function tests, Liver function tests, Blood glucose random, Troponin-I, cardiac enzymes and Coagulation profile at presentation in emergency department.

Results: Total 261 patients were included according to the inclusion criteria of the study. Mean age (years) in the study was 58.0 ± 12.59 whereas there were 183 (70.1) male and 78 (29.9) female patients who were included in the study. Frequency of right ventricular infarction and in-hospital outcome (mortality) after Primary Percutaneous Coronary Intervention in patients with acute inferior MI was assessed in the study which was 73 (28.0) and 20 (7.7) respectively.

Conclusion: The study concluded that frequency of in-hospital mortality is substantial due to major adverse cardiac events in patients with right ventricle infarction.

Keywords: Acute Myocardial Infarction, Right Ventricular Infarction, ST Elevation.

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INTRODUCTION

Myocardial infarction is a segmental disease of myocardium with a focal occlusion of one of three large coronary arteries (CA) or its branches during any particular event resulting in impairment of contractility restricted to the affected segment^{1,2}. Major cause of myocardial infarction (MI) is atherosclerotic coronary artery disease (CAD). It contributes to arterial stenosis, increased tendency for rupture of plaque and development of clot. Until recently, MI was considered a disease of left ventricle (LV) only. Right ventricular infarctions (RVIs) are frequently associated with extensive inferior-posterior myocardial infarctions.

The diagnosis of RVI should always be considered in patients who have an inferior wall myocardial infarction. The signs and symptoms of RVI are similar to those of left ventricular infarction. Clinically, the triad of hypotension, elevated jugular venous pressure (JVP), and clear lung fields is recognized as a marker of RVI in patients with acute infero-posterior wall infarction^{3,4}. The presence of acute ST segment elevation in the right precordial leads (V3R to V6R), is highly reliable in the diagnosis of RVI. ST segment elevation >0.1 mV in the right precordial leads, especially V4R, is observed in 60-90% of patients with acute RVMIs⁵. It correlates with reduced right ventricle (RV) ejection fraction and is strongly associated with major complications and in-hospital mortality^{6,7}. Early recognition of RVI is critical for redu-

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cing mortality and complications associated with this cardiac injury. Inferior myocardial infarction with RVI has a high mortality rate of 25% to 30% as compared with only 6% for inferior infarctions not involving the right ventricle. Dysrhythmias such as bradycardia, high-degree atrioventricular block, and atrial fibrillation are associated with approximately 50% of RV Infarctions⁷. Lempereur *et al* confirmed the presence of female predominance in developing RV infarction⁸. Goldstein *et al* has predicted in-hospital mortality of 14 percent in patients presenting with RV infarct⁹. Early detection, along with hemodynamic support, rapid reperfusion therapy, and knowledge of the potential complications, can help improve the outcome of patients with RVI. RV involvement portends a worse prognosis to uncomplicated inferior MI, with hemodynamic and electrophysiological complications increasing in-hospital morbidity and mortality. Very few local studies were conducted so far. A study conducted at National Institute of Cardiovascular Diseases Karachi reported 34% prevalence of RVM¹⁰. This study aims at documenting the frequency and outcomes in terms of major adverse cardiac events (MACE) and associated risk factors, which play a significant role on the adverse cardiovascular events associated with RV infarct.

METHODOLOGY

This descriptive cross sectional study was carried out at Armed Forces Institute of Cardiology/National Institute of Heart Diseases from 27th Dec, 2018 to 27th Jun, 2019. A Non-probability consecutive sampling technique was used. Hospital ethical committee approved the study and all participants gave their informed written consent. All the patients presenting with acute inferior MI who underwent Primary Percutaneous Coronary Intervention (PPCI) were considered for the study. Researchers assessed for presence of Right Ventricle (RV) infarct which was defined as ST segment elevation of >1mm in chest lead V4R, along with hypotension and a systolic blood pressure of <90 mmHg at presentation. Outcome was measured as occurrence of MACE (Major Adverse Cardiovascular Events)

i.e. non-fatal MI, stroke and death occurring within 72 hours of hospital admission or prior to discharge. Patients with previous history of MI, PCI, Coronary Artery Bypass Grafting (CBAG), thrombolysis and not willing for PPCI were excluded from the study. All the patients' data and variables of the study were recorded in the data collection sheet. Patients underwent venous blood sampling for Complete blood count (CBC), Renal function tests (RFT's), Liver function tests (LFT's), Blood glucose random (BSR), Troponin-I, cardiac enzymes and Coagulation profile at presentation in emergency department. Fasting Lipid profile was collected within 24 hours of admission. Troponin-I was collected 6 hour post PPCI and at the time of recurrent symptoms or ECG findings consistent with recurrent MI. After PPCI, patient stayed for at least 24 hours in a monitored post-catheterization ward. Patients were followed up for in-hospital MACE. In-hospital MI was defined by elevation of cardiac troponin values >5 times the upper reference limit in patients with normal baseline values or a rise of cardiac troponin values >20% if the baseline values were elevated. Stroke was defined as an acute episode of focal or global neurological dysfunction caused by brain, spinal cord, or retinal vascular injury as a result of hemorrhage or infarction which was confirmed by computerized tomography (CT) scan of Brain. All genders aged between 30 and 75 with first MI who underwent PPCI were included in the study keeping in consideration the culprit vessel and all the comorbid conditions. Statistical analysis was performed using statistical software SPSS23. Mean and standard deviation was calculated for quantitative variable i.e. age, Troponin-I. Frequency and percentage was calculated for qualitative variable i.e. gender, MACE (death, stroke, non-fatal MI), diabetes, dyslipidemia, hypertension, RV infarct, vessel involvement. Post stratification chi-square test was applied. A *p*-value less than 0.05 was significant.

RESULTS

Total 261 patients were included according to the inclusion criteria of the study. There were

183 (70.1%) male and 78 (29.9%) female patients. Mean age in the study was 58.0 ± 12.59 years with

Table-I: Frequency of RV infarct after PPCI in patients With acute inferior MI.

	Frequency	Percentage
Yes	73	28.0
No	188	72.0
Total	261	100.0

Table-II: Frequency of in-hospital outcome after PPCI in patients with acute inferior MI.

	Frequency	Percentage
Non-fatal MI	8	3.1
Death	20	7.7
Stroke	10	3.8
Nil	223	85.4
Total	261	100.0

a range from 30 to 75 years. Mean troponin-I levels of patients were 0.41 ± 0.16 . Fifty two (19.9%) patients had Diabetes Mellitus (DM), dyslipidemia was present in 54 (20.7%) and

Table-III: Clinical characteristics and their association with RV infarction.

Clinical Characteristics		Right Ventricle(RV) Infarct			<i>p</i> -value
		Present	Absent	Total	
Age Group	<50	16(21.9%)	38(20.2%)	54(20.7%)	0.760
	>50	57(78.1%)	150(79.8%)	207(79.3%)	
Gender	Male	49(67.1%)	134(71.3%)	183(70.1%)	0.511
	Female	24(32.9%)	54(28.7%)	78(29.9%)	
Diabetes Mellitus (DM)	Yes	13(17.8%)	39(20.7%)	52(19.9%)	0.594
	No	60(82.2%)	149(79.3%)	209(80.1%)	
Dyslipidemia	Yes	13(17.8%)	41(21.8%)	54(20.7%)	0.474
	No	60(82.2%)	147(78.2%)	207(79.3%)	
Hypertension	Yes	27(37.0%)	61(32.4%)	88(33.7%)	0.486
	No	46(63.0%)	127(67.9%)	173(66.3%)	
Coronary Artery Involved	RCA	56(76.7%)	153(81.4%)	70(26.8%)	0.396
	LCx	17(23.3%)	35(18.6%)	52(19.9%)	
Troponins	Normal	3(4.1%)	12(6.4%)	15(5.7%)	0.479
	Raised	70(95.9%)	176(93.6%)	246(94.3%)	
LV Dysfunction	Yes	16(21.9%)	54(28.7%)	70(26.8%)	0.265
	No	57(78.1%)	134(71.3%)	191(73.2%)	

hypertension in 88 (33.7%). Frequency of right ventricular (RV) infarction after PPCI in patients with acute inferior MI was $n=73$ (28%), as shown in table-I. Age more than 50 years, male gender, on-diabetic and non-hypertensive patients with no lipid disorders, RCA (Right Coronary Artery) involvement, raised cardiac bio markers and absence of LV (Left Ventricle) dysfunction were

associated with the presence of RV infarction but none of this association was statistically significant (p -value <0.05) as shown in table-III. Out of total study population, 8 (3.1%) patients suffered non-fatal MI, 10 (3.8%) had stroke and 20 (7.7%) died (table-II). Age more than 50 years, male gender, on-diabetic non-hypertensive patients with no lipid disorders, RCA (Right Coronary Artery) involvement, raised cardiac bio markers and absence of LV (Left Ventricle) dysfunction were associated with associated with MACE (Major Adverse Cardiovascular Events) including non-fatal MI, stroke and death as shown in table-IV. This association in non-diabetic group was statistically significant (p -value 0.049).

DISCUSSION

Acute myocardial infarction is defined as a clinical event caused by myocardial ischemia in which there is evidence of myocardial injury or

necrosis¹¹. The World Health Organization estimated in 2004, that 12.2% of worldwide deaths were from ischemic heart disease; with it being the leading cause of death in high- or middle-income countries and second only to lower respiratory infections in lower-income countries. Worldwide, more than 3 million people have STEMIs and 4 million have NSTEMIs a year¹². In

Pakistan the prevalence of acute coronary syndrome is increasing rapidly due to increasing prevalence of risk factors of atherosclerosis, which is the major cause of acute coronary syndrome¹⁰. In Pakistan coronary artery disease causes more than 100,000 deaths (12% of total deaths) annually^{13,14}. The most common symptom is chest pain or discomfort that may travel into the

least one value above the 99th percentile of the upper reference limit, together with evidence of myocardial ischemia. In our study, Mean age (years) in the study was 58.0 ± 12.59. Similarly, in a study conducted by Khan *et al*¹⁰ mean age in years was 56.3 ± 13.1¹⁰. In our study, there were 183 (70.1) male and 78 (29.9) female patients. Likewise, in a study conducted by Sawar *et al*

Table-IV: Clinical Characteristics And Their Association With In-Hospital Mortality.

Clinical Characteristics		In-Hospital Outcome			p-value
		Non-fatal MI	Stroke	Death	
Age Group	<50	1 (12.5%)	3 (30.0%)	5 (25.0%)	0.773
	>50	7 (87.5%)	7 (70.0%)	15 (75.0%)	
Gender	Male	5 (62.5%)	5 (50.0%)	13 (65.0%)	0.443
	Female	3 (37.5%)	5 (50.0%)	7 (35.0%)	
Diabetes Mellitus (DM)	Yes	3 (37.5%)	5 (50.0%)	3 (15.0%)	0.049
	No	5 (62.5%)	5 (50.0%)	17 (85.0%)	
Dyslipidemia	Yes	2 (25.0%)	3 (30.0%)	4 (20.0%)	0.883
	No	6 (75.0%)	7 (70.0%)	16 (80.0%)	
Hypertension	Yes	4 (50.0%)	5 (50.0%)	6 (30.0%)	0.502
	No	4 (50.0%)	5 (50.0%)	14 (70.0%)	
Coronary Artery Involved	RCA	6 (75.0%)	10 (100.0%)	16 (80.0%)	0.442
	LCx	2 (25.0%)	-	4 (20.0%)	
Troponins	Normal	1 (12.5%)	2 (10.0%)	-	0.571
	Raised	7 (87.5%)	18 (90%)	10 (100.0%)	
LV Dysfunction	Yes	1 (12.5%)	4 (40.0%)	4 (20.0%)	0.527
	No	7 (87.5%)	6 (60.0%)	16 (80.0%)	

shoulder, arm, back, neck or jaw. Often it is in the center or left side of the chest and lasts for more than a few minutes^{15,16}. The discomfort may occasionally feel like heartburn. Other symptoms may include shortness of breath, nausea, feeling faint, a cold sweat or feeling tired. About 30% of people have atypical symptoms, with women more likely than men to present atypically. Among those over 75 years old, about 5% have had an MI with little or no history of symptoms^{17,18}. Non-modifiable risk factors for atherosclerosis include increasing age, male, family history of premature CHD, premature menopause and modifiable risk factors for atherosclerosis include smoking, diabetes mellitus (and impaired glucose tolerance), metabolic syndrome, hypertension, hyperlipidemia, obesity and physical inactivity. The new criteria for diagnosing myocardial infarction are detection of rise and/or fall of cardiac biomarkers (preferably troponin) with at

frequency and percentage of male and female patients were 36 (60) and 34 (57) respectively. A study conducted in 2016, observed that the frequency and percentage of diabetes and hypertension among patients were found to be 22 (37) and 28 (47) respectively. Likewise, in our study, there were 52 (19.9) patients of diabetes presented in the study and hypertension in 88 (33.7) patients. In our study, frequency of right ventricular (RV) infarction after PPCI in patients with acute inferior MI was assessed, which was 28.0%. Consequently, in a study conducted by Sawar *et al* anticipated incidence of RV infarction was 21.6% with inferior MI using criteria of ≥1 mm ST segment elevation in V4R. A study by Goldstein *et al* has predicted in-hospital mortality of 14% in patients presenting with RV infarct⁹. Similarly in our study, out of 261 cases, there were 7.7% cases of mortality documented.

CONCLUSION

The study concluded that there is substantial in-hospital mortality due to Major Adverse Cardiac Events (MACE) in patients presenting with acute inferior MI complicated with RV infarction.

CONFLICT OF INTEREST

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

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