

COMPARISON OF IN-HOSPITAL OUTCOME OF ACUTE INFERIOR MYOCARDIAL INFARCTION COMPLICATED BY RIGHT VENTRICULAR INFARCTION WITH ISOLATED ACUTE INFERIOR MYOCARDIAL INFARCTION

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Contribution

All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: To compare the in-hospital outcomes of acute inferior myocardial infarction complicated by right ventricular myocardial infarction (RVMI) with isolated acute inferior myocardial infarction (IWMI).

Methodology: This observational comparative study was carried out at Department of Cardiology, Lady Reading Hospital, Peshawar from May to October 2009. Patients were divided into two groups. Group A included patients with acute IWMI complicated by acute RVMI while Group B were patients with isolated acute IWMI. Both groups were monitored for in hospital complications during hospital stay.

Results: A total 337 patients were enrolled in the study in which group A had 99(29) and group had 238(71). Both groups were similar for baseline characteristics. Mean age in group A was 58.90 ± 10.6 years and 58.74 ± 9.0 in group B; $P=0.94$. Male patients were 73(74) and 182(77) in group A and B respectively. In-hospital morbidity was present in 77 % patients in group A and 25 % in group B ($P<0.0005$). Complications between group A and group B were; Left ventricular Failure 16% vs 11% ($P<0.19$), Cardiogenic shock 26% vs 6% ($P<0.0005$), atrioventricular block 25% vs 12% ($P<0.003$) respectively. Similarly, Recurrent myocardial infarction was 7% vs 3% ($P<0.1$) and Ventricular septal rupture 3 % vs 1 % ($P<0.26$) in group A and B respectively. Mortality in Group A patients was 22 % vs. 7% in group B ($p<.0.0005$).

Conclusion: Patients with acute inferior myocardial infarction complicated by RVMI had significantly higher in-hospital complications as compared to patients with isolated acute inferior myocardial infarctions.

Key Words: Acute inferior myocardial infarction, Right ventricular myocardial infarction, In hospital complications.

INTRODUCTION

Globally atherosclerosis of the coronary and peripheral vasculature is the leading cause of death.¹ In the year 2000, about ten million people had an Acute Myocardial Infarction.² Each year, nearly one million individuals in the United State suffer an acute myocardial infarction (AMI) of which 20% to 25% experience sudden cardiac death.³ Cardiovascular diseases have emerged as major health burden in developing countries.⁴ South Asia have a high burden of coronary artery disease and is the leading cause of death in the Indo-Pakistan subcontinent.^{5,6}

Pakistani population is a part of an ethnic group which suffers from the highest prevalence rates of coronary artery disease compared to the rest of the world. CAD present at a younger age in this country and it has a more aggressive course and higher mortality.⁷ In Pakistan mortality from coronary artery disease (CAD) is estimated to be 410/10,000.⁸

Although the death rate from acute myocardial infarction has declined by over 30% in recent decades,⁹ it still has high mortality with approximately one third of patients dies before arriving at hospital or in the first few days.¹ Acute inferior myocardial infarction is a type of myocardial infarction which has better short and long term prognosis with mortality of about 8%.^{10,11} However, when inferior myocardial infarction is associated with acute RVMI, mortality rises to 28%. In hospital mortality is even higher in elderly patients with RVMI and reaches up to 50%.¹¹

Acute RVMI complicates 20-50% of acute inferior myocardial infarction as reported by different studies.^{12,13} In a local study RVMI was found in 27% of patients with acute inferior myocardial infarction.¹⁴ Gumina et al¹⁵ showed an increased rate of cardiac arrest (17.9%vs.7.3%), hemodynamic compromise (14.7%vs.7%) ventricular arrhythmias (13.7%vs.7.5%) and mechanical complications (3.9%vs.0.84%) when inferior myocardial infarction was complicated by RVMI. The major cause of death in patients with acute right ventricle infarction is cardiogenic shock.¹⁰ Thus right ventricular infarction complicating inferior myocardial infarction has worse prognosis and high in-hospital morbidity and mortality and it is also an independent predictor of major complications and mortality.^{1,16}

Diagnosing RVMI in patients with acute IWMI is very important because its management is somewhat different from other types of myocardial infarction. Patients with RVMI are usually hypotensive and require intravenous fluids in addition to standard management of establishing reperfusion. Treatment with nitrates and morphine is usually avoided as this may cause complications such as hypotension.¹⁷ This study compares the in-hospital morbidity and mortality of acute RVMI with isolated IWMI in local setup. It will sensitize physician to look for possible

complications of acute RVMI well on time. It will help reducing morbidity and mortality associated with this treatable condition.

METHODOLOGY

This prospective comparative study was conducted at Cardiology Department, Postgraduate Medical Institute, Lady Reading Hospital, Peshawar from 1st May to 31st October 2009. Sample size was 337 calculated on Casagrande, Pike and Smith sample size calculator based on Gumina et al¹⁵ results of cardiac arrest 17.9% in patients with inferior myocardial infarction with RV infarction and 7.3% in patients with isolated inferior myocardial infarction, keeping a 5% margin of error and power of statistics at 80%. Group A patients were 99 and included patients with acute inferior myocardial infarction complicated by right ventricular myocardial infarction while Group B patients were 238 and included patients with isolated acute inferior myocardial infarction. Both groups were observed for in-hospital outcomes during admission.

Patients of all age groups and both genders were enrolled using non probability purposive sampling technique. Informed consent was taken from all the patients. Patients with acute inferior myocardial infarction who also had ST segment elevation of more than 1 mm in any lead of V₃, V₄, V₅ or V₆ on right sided precordial chest leads and / or evidence of right ventricle akinesia/ hypokinesia/dilatation or new tricuspid regurgitation on echocardiography were considered to have had an acute RVMI. Patients with associated anterior or lateral myocardial infarction, Left or Right bundle branch block and Recurrent Myocardial Infarction on presentation were excluded because these associated conditions mask the diagnose of RVMI. Patients with valvular heart disease and cardiomyopathy were also excluded from the study as these conditions independently affect the morbidity and mortality in acute myocardial infarction patients.

In-hospital outcome was defined as the presence of any one or more of the following complications during hospital stay: Cardiogenic shock, Acute left ventricular failure. Supraventricular arrhythmias (supraventricular tachycardia, atrial fibrillation), ventricular arrhythmias (ventricular tachycardia, ventricular fibrillation), atrio ventricular blocks (first degree, second degree, third degree), mechanical complications (ventricular septal rupture, tricuspid regurgitation, papillary muscle rupture), recurrent myocardial infarction, more than four days of hospital stay or death of a patient before discharge.

Patients used to be examined daily until discharge to detect development of any new complications. Vital parameters were recorded to detect cardiogenic shock and acute left ventricular failure.

Rhythm was monitored with cardiac monitors (Nihon Koden) for 24 hours and ECG recorded daily to detect arrhythmias.

Echocardiography was obtained for the diagnosis as well as detection of complications such as acquired ventricular septal rupture, tricuspid regurgitation, and papillary muscle rupture.

Cardiac enzymes (CKMB or Troponin I) were measured whenever required for diagnosis. Cardiac enzyme (CK-MB) was measured in patients having new chest pain or new ST segment elevation in any two contiguous leads to detect recurrent myocardial infarction.

Data was entered and analyzed using statistical package for social sciences (SPSS) version 16. Mean±standard deviation were calculated for continuous variables like age of the patient. Frequencies and percentages were calculated for qualitative variables such as gender, Diabetes, hypertension, in-hospital complications, mortality and duration of hospital stay.

RESULTS

A total of 337 patients were included in the study in which group A (IMI plus RVMI) had 99 patients while group B (isolated IMI) had 235 patients. Both groups were similar regarding baseline characteristics (Table 1). Majority of the patients were male in both groups (Male to female ratio 3: 1).

Male patients were 73 (74%) Vs 182 (77%), $P=0.4$ in group A and B respectively while female patients were 26 (26%) Vs 53 (23%), $P=0.4$ respectively. The age of patients ranged from 32 to 83 years, mean age for group A was 58.9 ± 10.6 years and for group B 58.74 ± 9.0 . Majority of patients (84%) were in the age range of 40-70 years, 10% patients were in the age group above 70 years and 6% patients were in age group below 40 years. Thrombolytics were given in 75% patients in both groups.

In-hospital complications were significantly higher in group A as compared to group B (77% vs 25% ($P<0.0005$)). Cardiogenic shock was 26% in acute IMI with associated RV MI group while it was 6% in isolated IMI ($P<0.0005$). Similarly left ventricular failure was more common in group A as compared to group B, however this difference was not statistically significant (16%Vs 11%, $P=0.19$). We observed statistically significant differences in the frequency of atrioventricular blocks between Group A 25% vs 12 % group B ($P<0.003$). Similarly, recurrent myocardial infarction occurred in 7% vs 3% ($P<0.1$) patients in group A vs group B respectively (Table 2). Among rhythm problems, the most common abnormality were ventricular arrhythmias (ventricular tachycardia and ventricular fibrillation) which achieved statistical significance 13% vs 5.9 % ($p<0.005$). Supraventricular arrhythmias were more common in group A however the difference between the two groups was not statistically significant. 7% Vs. 4% , $P<0.2$).

Table 1: Baseline Characteristics of Patients

Variables	Group A, n=99(%)	Group B, n=238(%)	p-Value
Gender			
Male	73(74)	182(77)	0.4
Female	26(26)	56(23.5%)	0.4
Age Ranges (In years)			
Below 40 years	6(6)	18(8)	0.6
40-70 years	86 (87)	197(83)	0.35
Above70 years	7 (7)	23(10)	0.46
Mean age (years)±SD	58.90 ± 10.6	58.74±9.0	0.94
Risk factors			
Diabetes	22 (22)	57(24)	0.7
Hypertension	49 (49)	93(39)	0.08
High cholesterol	4 (4)	14(6)	0.5
Positive family history of CAD	33 (33)	70(29)	0.5
Smoking	20 (20)	63(26)	0.2
Obesity	19 (19)	53(22)	0.5
Previous history of angina	7 (7)	20(9)	0.7
Thrombolysis	75(75)	178(75)	0.9

Table 2: Comparison of In-Hospital Complications between Group A & B

In Hospital Complication	Group A n=99 (%)	Group B n=238 (%)	p -Value
In-hospital morbidity	77(77)	60(25)	0.0005
Left ventricular failure (LVF)	16(16)	26(11)	0.19
Cardiogenic shock	26(26)	13(6)	0.0005
Reinfarction	7(7)	8(3)	0.1
Atrioventricular blocks	25(25)	29(12)	0.003
Ventricular arrhythmias	13(13)	14(5.9)	0.005
Supraventricular tachycardia	7(7)	9(4)	0.2
Mechanical complications	03(3)	3(1)	0.02
More than 4 days hospital stay	64(65)	52 (22)	0.0005
Death	21(21)	17(7)	0.0005

Mechanical complications including ventricular septal rupture, free wall rupture and tricuspid regurgitation were three times more common in RVMI as compared to isolated IWMI patients 3% vs 1% ($P=0.02$). Hospital stay for IMI with existing RVMI patients was longer as compared to those with isolated IMI. Hospital stay for more than 4 days was needed in 65% of patients in IMI with coexisting RVMI as compared to 22% of patients with isolated IMI. In-hospital mortality in Patients with IMI with coexisting RVMI was higher as compared to isolated IMI patients (21% vs. 7%, $P<0.0005$). In hospital complications between two groups are summarized in Table 2.

DISCUSSION

Coronary artery disease (CAD) has the highest rate of prevalence in South Asian population including Pakistan^{18,19}. Complications during acute phase of myocardial infarction are responsible for the high mortality associated with acute myocardial infarction. Recognition of complications and managing promptly is the key to reduce this high mortality.²⁰

Patients with inferior MI who have right ventricular involvement have increased in-hospital morbidity and mortality as shown by various studies.^{1,14} A study conducted in National Institute of Cardiovascular Diseases Karachi¹ reported that IMI with RVMI had higher in hospital morbidity and mortality as compared to IMI alone. Iqbal MA et al¹⁴ observed 27% frequency of RVMI in acute IMI. This high frequency signifies the importance of acute RVMI. How adversely does RVMI affect the outcome in these patients was not studied locally.

Mehta SR et al.,²¹ reported high frequency of heart failure (11.7%), cardiogenic shock (6.9%) atrial fibrillation (12.5%), ventricular fibrillation (8.4%) and ventricular tachycardia

(6.8%) in patients with IMI with RVMI. Gumina et al¹⁵ showed an increased rate of cardiac arrest (17.9%vs.7.3%), hemodynamic compromise (14.7vs.7%) ventricular arrhythmias (13.7%vs.7.5%) and mechanical complications of (3.9 % vs. 0.84%) when inferior myocardial infarction was complicated by right ventricular myocardial infarction.

Our results are comparable to those of international results. In our study in-hospital morbidity is three times more frequent in patients with IMI with RVMI as compare to isolated inferior myocardial infarction. This high frequency of complications is because we included less serious causes of morbidity such as supraventricular t tachycardia, atrial fibrillation, first degree and second degree heart block.

Incidence of cardiogenic shock complicating acute myocardial infarction varies and risk increases in cases of older age, female sex.²² It is known as the leading cause of mortality in patients with acute myocardial infarction.²³ It complicates RVMI in 6-14.7%.²⁴ Khan S et al¹ reported cardiogenic shock with the frequency of (14.7%), We observed similar findings with cardiogenic shock the most frequent complication and the leading cause of death. Similarly left ventricular failure was found in 16% of our RVMI patients.

In our study 1st degree, second degree and third degree were studied commonly as atrioventricular blocks. Frequency of atrioventricular blocks was more than double in patients with associated RVMI. Both transient and permanent heart blocks were included. Previous studies reported prevalence of complete heart block only and reported 5-12% frequency.

Recurrent myocardial infarction is a significant complication and a major cause of morbidity and mortality. Its frequency was more than two folds as compared to isolated IMI in our

patients. Our definition for recurrent myocardial infarction was a second increase in the value of CK-MB just above normal after first myocardial infarction. This could be the possible reason for registering high percentage of recurrent myocardial infarction in our patients.

Supraventricular and ventricular arrhythmias were significantly more common in RVMI than isolated IMI. Similarly mechanical complications which include tricuspid regurgitation and ventricular septal rupture were observed with a frequency of 3% vs. 1%. Overall 77% patients with RV infarction developed some form of complication.

Length of hospital stay, mean bed occupancy and utilization of precious hospital resources. More than 65% patients who had IMI+RVMI had hospital stay of more than 4 days as opposed to 22% with isolated IMI. This reflects higher rate of in-hospital complications in patients with combined IMI and RVMI as compared to IMI alone.

According to Chokalingam A et al.¹³ in-hospital mortality was 16% in patients with IMI with RVMI as compared to 3.5% for isolated IMI. Our results are consistent with this study. In-hospital mortality in our study was four times higher in IMI with RVMI as compared to isolated inferior myocardial infarction (21% vs 7%, $p=0.005$).

CONCLUSION

Patients with inferior with existing right ventricular myocardial infarction have significantly higher in-hospital morbidity and mortality as compared to patients with isolated inferior wall myocardial infarction.

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