

## Comparison of In-Hospital Complications among Patients with Right Ventricular Infarction

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### Abstract

**Background:** Patients with right ventricular infarction is a critical condition and may cause adverse cardiac events. **Objective:** The purpose of the present study was to compare the in-hospital complications among patients with right ventricular infarction based on TIMI risk score. **Methodology:** This prospective observational study was conducted in the Department of Cardiology, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh from May 2007 to April 2008 for a period of one year. All the patients who were admitted into the coronary care unit of NICVD with acute inferior myocardial infarction with or without anterior myocardial infarction were selected as study population. Inclusion Criteria were patients admitted in CCU (NICVD) with acute inferior myocardial infarction with right ventricular infarction. Patients were categorized into two groups according to the extent of TIMI risk score. Patients with low TIMI risk score (0 to 3) were included in Group I and patients with high TIMI risk-score (4 to 14) were include in group II. Patients were followed up in their hospital stay to see the incidence of major cardiac events. **Results:** A total number of 60 patients with right ventricular infarction of which 30 consecutive patients with low TIMI risk score (0 to 3) were in Group I and 30 consecutive patients with high TIMI risk score (4 to 14) were in Group II. In-hospital mortality was 18.3% in the study populations and it was significantly higher in group II (33.3%) than group (3.3%). The next most common complication is cardiogenic shock followed by complete heart block, Cardiac arrest, VT and 2nd degree heart block. **Conclusion:** In conclusion the in-hospital mortality in the study populations is significantly higher in group II than group I [*Journal of National Institute of Neurosciences Bangladesh, July 2022;8(2):143-146*]

**Keywords:** right ventricular infarction; TIMI; risk score; Complications

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### Introduction

Right ventricular infarction occurs in 30% to 50% of patients with AMI inferior<sup>1</sup>. Right coronary artery (RCA) is almost the culprit vessel but it may also occur with an occlusion of the left artery in patients who: have

left-dominant coronary circulation<sup>2</sup>. In a study, the incidence of RVI was 30.0% cases<sup>3</sup>. Patients with RVI had significantly higher incidence of hypotension (60%), arrhythmias (45%), conduction disturbances (30%) and death (3%) than patients without RVI<sup>4</sup>.

The pathophysiology of right ventricular infarction may explain these findings<sup>5</sup>. In left ventricular infarction, low blood pressure is associated with impairment of left ventricular function, whereas in right ventricular ischaemia or infarction, acute right ventricular distension within the restraining pericardium may flatten the interventricular septum towards the left ventricle during diastole, restricting left ventricular diastolic filling and increasing the left ventricular end-diastolic pressure<sup>6</sup>. Thus right ventricular infarction may compromise cardiac output, culminating in cardiogenic shock. The higher incidence of advanced heart block may be explained by the fact that the right ventricle and atrioventricular node share a common origin of blood supply<sup>7</sup>.

The reason for the increased incidence of ventricular arrhythmia is unclear. Sympathetic activation secondary to the low-output state is pro-arrhythmogenic, and infarction of the right ventricle may itself be more arrhythmogenic than infarction that is confined to the left ventricle<sup>8</sup>. The diagnosis of RVI can be made from the physical examination, echocardiography, myocardial contrast echocardiography, radionuclide ventriculography, technetium pyrophosphate myocardial scanning, tissue Doppler imaging (TDI) and hemodynamic measurements<sup>9</sup>.

However, right precordial electrocardiography is the most readily available, simplest, and most objective of these techniques as compared with the other diagnostic procedures<sup>10</sup>. The presence of acute ST-segment elevation, Q waves, or both in the right precordial leads (V<sub>1</sub> to V<sub>4</sub>R) predicted RVI with a sensitivity of 76 to 92 percent, a specificity of 50 to 81 percent, and a diagnostic accuracy of 78 to 87 percent<sup>11-12</sup>. The presence of ST-segment elevation in lead V<sub>4</sub>R is highly predictive of RVI like sensitivity 88 percent, specificity 78 percent and diagnostic accuracy 83 percent<sup>12</sup>. The purpose of the present study was to compare the in-hospital complications among patients with right ventricular infarction based on TIMI risk score.

### Methodology

This prospective observational study was conducted in the Department of Cardiology, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh from May 2007 to April 2008 for a period of one year. All the patients who were admitted into coronary care unit of NICVD with acute inferior myocardial infarction with or without anterior myocardial infarction were selected as study population. A total number of 60 patients with right ventricular infarction of which 30

consecutive patients with low TIMI risk score (0 to 3) were in Group I and 30 consecutive patients with high TIMI risk score (4 to 14) were in Group II. The study protocol was approved by the Institutional Review Board. Informed consent was obtained from each patient. Inclusion Criteria were patients admitted in CCU (NICVD) with acute inferior myocardial infarction with right ventricular infarction. Exclusion Criteria were patients with associated congenital anomalies, cardiomyopathy, known valvular heart disease, associated severe co-morbidity like malignancy, patients who were not thrombolysed. Initial evaluation of the patients were performed by history, clinical examination and ECG was performed and recorded in patient's data collection form. Demographic Profiles like age, Sex, BMI, Height, Weight were recorded. Risk factors of Ischaemic Heart Disease like Diabetes Mellitus, Hypertension, Smoking, Dyslipidemia and Family History were noted. Clinical profiles were Pulse, Blood pressure, Auscultation of Lung bases were recorded. Baseline laboratory investigations like random blood sugar, blood urea, serum creatinine, lipid profile, serum electrolyte, CK-MB, 12 lead ECG, echocardiography were done for each patient. Criteria for diagnosis of RVI was the presence of a clinical suspicion of RVI and any of the following which was present within 24 h of presentation with ST elevation > 1 mm in V<sub>3</sub>R or V<sub>4</sub>R on right-sided precordial chest leads and evidence of right ventricular infarction or dilatation with hypokinesis on echocardiography. TIMI risk scoring was done. Patients were categorized into two groups according to the extent of TIMI risk score. Thirty consecutive patients with low TIMI risk score (0-3) were included in Group- I and Thirty consecutive patients with high TIMI risk score (4-14) were include in group- II. group- 1 = TIMI risk score 0-3; Group- II = TIMI risk score 4-14. Patients were followed up in their hospital stay to see the incidence of major cardiac events.

**Statistical Analysis:** All data was analyzed by using computer based SPSS (statistical programme for social science) programme. Continuous data was expressed as median or mean  $\pm$  SD. Dichotomous data was expressed as percentage. Comparison between groups was done by unpaired t-test to continuous variable. Categorical data was analyzed by chi-square (X<sup>2</sup>) test. P value < 0.05 was considered as significant.

### Results

A total of sixty patients with right ventricular infarction, who were admitted to Coronary Care Unit of NICVD

within 12 hours of onset of chest pain, were evaluated. Patients were divided into two groups according to the TIMI risk scoring like group I included patients with low TIMI risk score (0-3) and group II included patients with high TIMI risk score (4-14). Table 1 showed that the mean age of the study patients was 58.3 ±10.4 years with mean age of group I patients 53.1±9.6 years and group II patients 63.5±11.2 years. 35.0 % of the patients were in the age group of 65-74 years Only 8.3 % patients were > 75 years of age. Analysis revealed statistically significant mean age difference between the two groups of patients (p <0.05).

Table 1: Distribution of patients by age (n=60)

Age Group	Group I	Group II	Total	P value
35 to 44 Years	4(13.4%)	2(6.6%)	6(10.0%)	
45 to 54 Years	10(33.4%)	4(13.3%)	14(23.3%)	
55 to 64 Years	9(29.9%)	5(16.7%)	14(23.3%)	
65 to 74 Years	7(23.3%)	14(46.7%)	21(35.0%)	
≥75 Years	0(0.0%)	5(16.5%)	5(8.3%)	
Mean ± SD	53.1±9.6	63.5±11.2	58.3±10.4	0.001*
Range (Min, max)	(35-68)	(38-85)	(35-85)	

Group I= Score (0-3); Group II= Score (4-14);\* = significant at the level of p value <0.01; p value reached from unpaired t test

Table 2 showed the distribution of the patients by in-hospital complication. In-hospital mortality was 18.3% in the study populations and it was significantly higher in group II (33.3%) than group I (3.3%). The next most common complication is cardiogenic shock followed by complete heart block, Cardiac arrest, VT and 2<sup>nd</sup> degree heart block.

Table 2: Distribution of patients by in-hospital complication (n=60)

Complication	Group I	Group II	Total	P value
Death	1(3.3%)	10(33.3%)	11(18.3%)	0.002*
Cardiogenic shock	1(3.3%)	8(26.6%)	9(15.0%)	0.011*
Complete heart block	0(0.0%)	4(13.3%)	4(6.6%)	0.038*
2 <sup>nd</sup> degree heart block	0(0.0%)	1(3.3%)	1(1.6%)	0.313
Cardiac arrest	0(0.0%)	4(13.3%)	4(6.6%)	0.038*
VT	0(0.0%)	2(6.6%)	2(3.3%)	0.150

Group I= Score (0-3); Group II= Score (4-14);\* = significant at the level of p value <0.01; p value reached from Chi-square test

**Discussion**

The clinical triad of hypotension, clear lung fields, and elevated jugular venous pressure in a patient with an inferior infarction is virtually pathognomonic for RVI<sup>11</sup>. Other physical findings may include Kussmaul's sign, right ventricular gallops, tricuspid regurgitation, and

atrioventricular dissociation<sup>13</sup>.

Shock though uncommon, is the most serious complication of this<sup>9</sup>. Patients with RVI have higher incidence of atrioventricular block in as many as 48 percent<sup>7</sup>, supraventricular tachycardia including atrial fibrillation in up to one third of patients<sup>14</sup> and ventricular arrhythmias<sup>11</sup>. Other complications of right ventricular infarction include ventricular septal rupture, right ventricular thrombus formation and subsequent pulmonary embolism and a high incidence of pericarditis.

When AMI inferior is complicated by RVI, the in-hospital mortality may be as high as 31 percent, as compared with 6 percent for patients with inferior myocardial infarction and no RVI<sup>14</sup>. RVI in elderly patients with AMI inferior have a substantially increased risk of death during hospitalization<sup>15</sup>.

Concomitant posterior wall infarction may attenuate ST-segment elevation in lead V4R in proximal RCA occlusion. In such case, incidence of RVI may be underestimated on the basis of ST-segment elevation in lead VVR. The use of ST-segment elevation in lead V4R for the diagnosis of RVI is known to lose specificity in the presence of any heart disease that may induce anterior oriented ST vector & ST-segment elevation in lead V1, such as pericardial disease, acute pulmonary embolism, left anterior fascicular block, and AMI anterior present in 10 percent of patients with RVI<sup>16</sup>. The diagnostic accuracy of right precordial ST-segment elevation is considered to be greatest during the first 10 hours after an AMI, which underscores the need for an electrocardiographic assessment as soon as possible after admission to the hospital<sup>16</sup>.

The presence of RVI is associated with increased mortality and morbidity. Prompt recognition of RV involvement is important to allow early interventions such as thrombolytic therapy or angioplasty. Early aggressive reperfusion therapy in these patients, can significantly reduce the risk of major complications and in-hospital death<sup>11,15</sup>. Attempts at reperfusion may be especially worthwhile in elderly patients.

**Conclusion**

In conclusion in-hospital mortality in the study populations is significantly higher in group II than group I. The most common complication is cardiogenic shock followed by complete heart block, cardiac arrest, VT and 2<sup>nd</sup> degree heart block. Further large scale study should be carried out.

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