# Early Risk Assessment In Right Ventricular Infarction By TIMI Risk Score

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***Key words:***
*Right ventricular infarction, TIMI risk scoring, ECG.*

**Abstract:**

***Background:*** *Inferior myocardial infarction complicated by right ventricular infarction is associated with a greater risk of in-hospital mortality and cardiovascular related complications. Early risk stratification of patients with right ventricular infarction is crucial for appropriate management and reduction of adverse cardiac events. The development of TIMI risk score has provided a useful tool to quickly and easily stratify patients with right ventricular infarction. We conducted this study to evaluate the prognostic value of TIMI Risk Score analysis in patients with right ventricular infarction.*

***Methods:*** *This observational study was conducted in the department of Cardiology in NICVD, Dhaka, from July 2006 to June 2008. Considering inclusion and exclusion criteria, a total of 60 patients with right ventricular infarction were evaluated. All the patients were evaluated clinically and ECG was done after admission. Patients were categorized into two groups by TIMI risk scoring. Patients with low TIMI risk score(0-3) were in Group-I and patients with high TIMI risk score(4-14) were in Group-II.*

***Results:*** *The study revealed no statistically significant difference among the patients of two groups ($p>0.05$) in relation to sex, weight, risk factors and presenting complaints. Analysis revealed statistically significant difference among the patients of two groups ($p<0.05$) in relation to age, duration of chest pain, clinical parameters, Killip class of heart failure and LVEF. Regarding in-hospital outcome, 51.7% patients developed complications during the study period and all the complications were more in group II patients with high TIMI risk score(4-14). Death (18.3%) was the most common complication followed by cardiogenic shock (15.0%), complete heart block(6.6%),cardiac arrest(6.6%),VT(3.3%)and 2nd degree heart block(1.6%).*

***Conclusion:*** *This study indicates that on admission - TIMI risk score analysis can identify patients with right ventricular infarction at higher risk for in-hospital mortality and morbidity .*

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## Introduction:

Cardiovascular Diseases (CVD) are the leading cause of death worldwide. Coronary Heart Disease (CHD) is the most common CVD and the major cause of death in middle aged and older people.[1]Acute myocardial infarction (AMI) is a major component of acute coronary syndrome and is usually due to anterior and or inferior wall involvement.

Inferior wall AMI accounts for 40-50% of all AMI.[2] The incidence of right ventricular infarction (RVI) in acute Inferior MI setting is about 30%.[3] The right coronary artery is almost always the culprit vessel with occlusion proximal to right ventricular branch.

Right ventricular involvement should always be considered and should always be specifically sought out in inferior MI with clinical evidence of low output because the therapeutic approaches are quite different in presence of right ventricular involvement from those for predominantly left ventricular failure.

Inferior wall MI is usually regarded as having better prognosis in both the short and long term than the anterior wall MI ,because the amount of myocardium supplied by the right coronary artery or left circumflex artery is much less than the left anterior descending artery. When there is right ventricular involvement, in-hospital complication is increased and it has prognostic implication.[4] The

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mortality of patient with only inferior wall MI is 5-6%, which increases to 25-30% along with the involvement of right ventricle.

Inferior myocardial infarction complicated by right ventricular infarction is associated with a greater risk of in-hospital mortality and cardiovascular related complications including ventricular arrhythmia, electromechanical dissociation, cardiac arrest, heart failure, cardiogenic shock, and mechanical complications.[5] Immediate risk stratification of patients with myocardial infarction, at the time of initial presentation is important for their optimal emergency treatment .[6]

The development of TIMI risk score has provided a useful tool to quickly and easily stratify patients with right ventricular infarction. TIMI risk score is a simple bed side scoring system that has broad applicability and easy to calculate at bed side on admission. Early risk stratification of patients with right ventricular infarction is crucial for appropriate management and reduction of adverse cardiac events.

**Materials and Methods:**

This observational study was conducted in the department of Cardiology in NICVD from July, 2006 to June, 2008. Informed written consent was taken from each patient or near relatives. 60 patients with right ventricular infarction with or without anterior MI were included in the study. Patients with associated congenital anomalies, cardiomyopathy, known valvular heart disease, associated severe co- morbidity and patients who are not thrombolysed were excluded.

Initial evaluation of the patients by history, clinical examination and ECG was performed and recorded in patient's data collection form. Demographic Profile: 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: Pulse, Blood pressure, Auscultation of Lung bases etc. were recorded. Baseline laboratory investigations: Random blood sugar, blood urea, serum creatinine, lipid profile, serum electrolyte, CK-MB, 12 lead ECG and echocardiography were done for each patient.

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 included in group- II.

Patients were followed up in their hospital stay to see the incidence of major cardiac events like Death, tachyarrhythmia, A-V conduction disorder, cardiac arrest, congestive heart failure, cardiogenic shock, cardiac tamponade and acute ventricular septal rupture.

Thrombolysis in Myocardial Infarction (TIMI) risk score[5]

| | |
|---|---|
| History | |
| Age > 75 years | 3 |
| Age 65-74 years | 2 |
| History of diabetes mellitus or hypertension or angina | 1 |
| Examination | |
| Systolic blood pressure <100 | 3 |
| Heart rate >100 | 2 |
| Killip class II–IV | 2 |
| Weight <67 kg | 1 |
| Presentation | |
| Anterior ST elevation or left bundle branch block | 1 |
| Time to therapy >4 h | 1 |
| Total possible score | 14 |

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 ± SD. Dichotomous data was expressed as percentage.Comparison between groups was done by unpaired t-test to continuous variable. Categorial data was analyzed by chi-square($X^2$) test. p-value $< 0.05$ was considered as significant.

**Results:**

A total of sixty patients with right ventricular infarction,who 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: group I included patients with low TIMI risk score (0- 3) and group II included patients with high TIMI risk score (4-14).

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 (Table I) . 85% patients of the study population were male and 15% patients were female. Male and female ratio was 5.6:1.

Considering the risk factors, smoking (71.6%) was most prevalent in all groups and highest in group II (76.7%) followed by hypertension (50 %), family history of CAD (26.6%), diabetes mellitus (21.6%) and dyslipidemia (18.3%) respectively.

All the patients in the study group were presented within 12 hours of chest pain. Shortness of breath was significantly more in group II (37.9%) followed by vomiting (33.3%), sweating (20.0%) and syncope(10.0%). No statistically significant difference was found in relation to age, sex, risk factors and the presenting complains between the two groups of patients ($p>0.05$).

Most of the patients (31.6%) attended the hospitals within 7-9 hours of complaints followed by 25.0 % within 4-6 hours and 23.3 % within 10-12 hours. There was statistically significant difference in the duration of chest pain between the two groups of patients ($p<0.05$).

In haemodynamic evaluation, Pulse and BP varied markedly between the two groups. Maximum pulse rate was in group I (71.2±12.9 beats/min), systolic BP was more in group I patients (110.3±16.1mmHg) and diastolic BP was more in group I patients (68.2±17.9mmHg). There was statistically significant difference in clinical parameters among the study populations of the two groups ($p<0·05$) (Table II).

In group I no patients suffered from Killip class II/ III/IV . In group II 46.6 % patients suffered from Killip class II/III/IV. There was statistically significant difference in killip class of heart failure among the patients of two groups ($p<0·05$) (Table III).

Ejection fraction was 49.9±6.5 % in group I followed by 44.0±8.1% in group II patients. Statistically significant difference in ejection fraction was found between the two groups ($p<0·05$).

Mean duration of hospital stay was more in group II patients 8.6±4.0 days. Statistically significant difference in hospital stay was revealed between the two groups of patients ($p<0·05$).

48.3 % patients were uneventful in the study period but 51.7 % patients had complications. All the complications were more in group II patients.2% patients in group I and 96.7% patients in group II developed complications. Analysis revealed statistically significant difference in relation to in-hospital outcome between the two groups of patients ($p>0.05$) (Table IV).

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 was cardiogenic shock followed by complete heart block, Cardiac arrest, VT and 2nd degree heart block. Analysis revealed statistically significant difference in relation to death, cardiogenic shock, complete heart block and cardiac arrest between the two groups of patients ($p>0.05$) (Table V).

**Table-I**

*Distribution of patients by age (N=60)*

| Age in years | Group I(n=30) | | Group II(n=30) | | Total (N=60) | | p value |
|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | |
| 35-44 | 4 | 13.4 | 2 | 6.6 | 6 | 10.0 | |
| 45-54 | 10 | 33.4 | 4 | 13.3 | 14 | 23.3 | |
| 55-64 | 9 | 29.9 | 5 | 16.7 | 14 | 23.3 | |
| 65-74 | 7 | 23.3 | 14 | 46.7 | 21 | 35.0 | |
| e" 75 | 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-II**

*Distribution of patients by clinical parameters (N=60).*

| Parameters | Group I (n=30) Mean± SD | Group II (n=30) Mean± SD | p value |
|---|---|---|---|
| Pulse (beats /min) | 71.2±12.9 | 59.4±23.5 | 0.019* |
| Range (Min, max) | (40-98) | (10-110) | |
| Systolic B.P (mmHg) | 110.3±16.1 | 79.3±14.1 | 0.001 ** |
| Range (Min, max) | (90-170) | (50-110) | |
| Diastolic B.P (mmHg) | 68.2±17.9 | 55.3±12.5 | 0.002 * |
| Range (Min, max) | (10-90) | (30-80) | |

Group I = Score 0-3 ,Group II = Score 4-14 ,
** = significant at the level of p value <0.01
*= significant at the level of p value <0.05 ,
p value reached from unpaired t test

**Table-III**

*Distribution of patients by killip class of heart failure (N=60)*

| Killip class of heart failure | Group I (n=30) | | Group II (n=30) | | Total (N=60) | | p value |
|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | |
| II-IV | 0 | 0.0 | 14 | 46.6 | 14 | 23.3 | 0.001** |

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

**Table-IV**

*Distribution of patients by in-hospital outcome (N=60)*

| In-hospital outcome | GroupI (n=30) | | Group II (n=30) | | Total (N=60) | | p value |
|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | |
| Uneventful | 28 | 93.3 | 1 | 3.3 | 29 | 48.3 | 0.001** |
| Complication | 2 | 6.7 | 29 | 96.7 | 31 | 51.7 | |

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

**Table-V**

*Distribution of patients by in-hospital complication (N=60)*

| Complication | Group I (n=30) | | Group II (n=30) | | Total (N=60) | | p value |
|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | |
| 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 * |
| 2nd degree heart block | 0 | 0.0 | 1 | 3.3 | 1 | 1.6 | 0.313 NS |
| 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 NS |

Group I = Score 0-3, Group II = Score 4-14, VT – Ventricular tachycardia,
NS= Not significant , ** = significant at the level of p value <0.01,
*= significant at the level of p value <0.05 , p value reached from chi square test

**Discussion:**

The TIMI Risk Score is a useful tool to quickly and easily stratify patients with acute coronary syndrome. TIMI Risk Score is a simple bed side scoring system that helps to predict outcome in patients with acute coronary syndrome. Inferior myocardial infarction complicated by right ventricular infarction is associated with a greater risk of in-hospital mortality and cardiovascular related complications.

Considering inclusion and exclusion criteria, a total of 60 patients with right ventricular infarction were evaluated. By applying TIMI Risk Scoring on admission, patients were categorized into two groups. Patients were divided into two groups according to the TIMI risk scoring: group I included patients with low TIMI risk score (0- 3) and group II included patients with high TIMI risk score ( 4-14).

Among the study patients, 51 were male (85%) and 9 were female (15%) with male and female ratio 5·6:1. The result was consistent with the result of Hossain M[7] and Rahman et al[8] where the percentage of male patients were 92, and 72·5 respectively.

Mean age of the study population was 58.3 ±10.4 years. Hossain M[7]showed mean age of the study patients, 53.29±11.55, years. These finding of the previous study support the result of the present study. In this study, mean age was 53.1±9.6 and 63.5±11.2 years in two groups of patients respectively.

Maximum numbers (35%) of patients were in 65-74 years group. Alam[9]showed maximum numbers (32.1%) of patients in the age range 55-64 years and Malik et al[10] showed maximum numbers (27%) of patients in 51-60 years of age group. However, there was statistically significant difference in age distribution of the two groups of patients (p<0·05).

In the present study, smoking (71.6%) was the most common risk factor in all patients, followed by hypertension (50%), family history of CAD (26.6%), diabetes mellitus (21.6%) and dyslipidemia(18.3%). Khan[11]found similar results in his study e.g. smoking 77.6%, hypertension 48.1%, diabetes mellitus 23%, family history of family of CAD 20% and dyslipidemia 9%. Alam[9] showed family history of CAD 31.7% and dyslipidemia 14.2% in his study. There was no statistically significant difference in risk factors distribution in the two groups of patients (p>0·05).

All the patients of the study groups were admitted within 12 hours of chest pain. Shortness of breath (SOB) was the next common complaints and 33.3% patients presented with S0B, followed by vomiting 28.3%, sweating18.3% and syncope 5·5% .All the complaints were statistically non significant among the two groups (p>0·05). The results were consistent with that of Alam.[9]

On average patients attended the hospital within 6.9±2.9 hours after onset of chest pain. Recently Khan[11] found similar type of presentation in his study. Only 16.7% of the patients attended the hospital within 4 hours of onset of chest pain. Patients of group I attended the hospital within 6.0±3.1hours after onset of chest pain and patients of group II attended the hospital within 7.8±2.7 hours after onset of chest pain. There was statistically significant difference in duration of chest pain of the two groups of patients (p<0·05).

Regarding haemodynamic status- Pulse, Systolic BP and Diastolic BP varied markedly between the two groups. Recently Alam[9] found similar results in their study. Analysis revealed statistically significant difference between the two groups (p <0·05). 46.6% patients of group II presented with Killip class II/III/IV of heart failure, but no patients in group I presented with Killip class II-IV. Analysis revealed statistically significant difference between the two groups (p <0·05).

All the patients were evaluated echocardiographically to see the left ventricular ejection fraction (LVEF). Mean LVEF was 46.9%±7.3.Mean LVEF was 49.9%±6.5 in group I and 44.0%±8.1 in group II. Gumina et al[5] found Mean LVEF was 50.2%±13.1 in their study. LVEF varied significantly between the two groups of patients (p<0·05).

Regarding in-hospital outcome, 51.7% patients developed complications during the study period and all the complications were more in group II patients. 6.7% patients in group I and 96.7% patients in group II developed complications like death, cardiogenic shock, complete heart block, cardiac arrest, arrhythmia, and 2nd degree heart block.

Cardiogenic shock was 15.0% in this study. Gumina et al[5] and Kukla et al found 14.7% and 14% cardiogenic shock respectively in their study. Complete heart block was 6.6% in this study. Alam[9] found 17% complete heart block in his study. Cardiac arrest was 6.6% in this study. Gumina et al[5] found 17.7% cardiac arrest in their study. VT was 6.6% in this study.

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%). Gumina et al[5] found 21.6% in-hospital death in their study. In this study, the in-hospital mortality and morbidity were significantly higher in high TIMI risk group patients than low TIMI risk group patients.

Conclusion:

This study indicates that on admission, it is possible to predict in-hospital outcome in patients with right ventricular infarction. TIMI risk score analysis can identify RVI patients at higher risk for in-hospital mortality and morbidity. Early risk stratification of patients with right ventricular infarction is crucial for appropriate management and reduction of adverse cardiac events. In developing country like Bangladesh, medical facilities are very limited and various investigation procedures are not widely available, very often costly and time consuming. In this situation TIMI risk score is likely to be clinically useful to predict the prognosis and to give the effective management.

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