International Journal Dental and Medical Sciences Research
Volume 6, Issue 4, July-Aug 2024 pp 496-502 www.ijdmsrjournal.com ISSN: 2582-6018

Association of QRS Score with Coronary Angiographic Severity in Acute ST Elevation Myocardial Infarction

Rajib Das[1*], Kaushik Majumdar[2], Md. Shahabuddin[3], Farzana Tazin[4], Mohammad Azizur Rahman[5], Suborna Dey[6], Md. Mahbub Alam[7], Md. Shuaib Ahmed[8], S. M. Habibullah Selim[9], Md. Mukhlasur Rahman[10]

[1]*Senior Consultant (Cardiology), Clinical and Intervention Cardiologist, National Heart Foundation Hospital, Sylhet, Bangladesh*
[2]*Senior Consultant (Cardiology), Clinical and Interventional Cardiologist National Heart Foundation Hospital Sylhet, Bangladesh*
[3]*Ex- Professor and Departmental Head (Cardiology), MAG Osmani Medical College, Sylhet & Vice Principal and Departmental Head (Cardiology), Parkview Medical College, Sylhet, Bangladesh*
[4]*Senior Consultant (Cardiology), Clinical and Intervention Cardiologist, National Heart Foundation Hospital, Sylhet, Bangladesh*
[5]*Assistant Professor, Department of Cardiology, Sylhet MAG Osmani Medical College, Sylhet, Bangladesh*
[6]*Assistant Professor, Department of Microbiology, Sylhet Women's Medical College (SWMC), Sylhet, Bangladesh*
[7]*Assistant Professor (Cardiology), Sylhet MAG Osmani Medical College, Sylhet, Bangladesh*
[8]*Assistant Professor (Cardiology), Sylhet MAG Osmani Medical College, Sylhet, Bangladesh*
[9]*Associate Professor (Cardiology), Sylhet MAG Osmani Medical College, Sylhet, Bangladesh*
[10] *Professor and Head, Department of Cardiology, SMAGOMC, Sylhet, Bangladesh*
Corresponding Author: *Rajib Das, Senior Consultant (Cardiology), Clinical and Intervention Cardiologist, National Heart Foundation Hospital, Sylhet, Bangladesh*

Submitted: 20-08-2024 Accepted: 30-08-2024

ABSTRACT
Background: A 12-lead electrocardiogram (ECG) has remained the standard for determining the presence and location of myocardial infarction. The Selvester QRS scoring system is used to measure infarct size before current use of thrombolytic therapy. The relationship between QRS score and left ventricular ejection fraction has also been described. Several studies showed the associations of QRS score with coronary angiographic severity in acute ST Elevation Myocardial Infarction. **General objectives:** To find out the association of QRS score with angiographic severity in acute ST Elevation Myocardial Infarction. **Methodology:** This cross-sectional study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet, during the period from January 2014 to December 2015. A total of fifty patients with ST Elevation Myocardial Infarction based on predefined enrolment criteria were included. QRS score was calculated for all patients at the time admission from admission ECG. Coronary angiography was performed using standard techniques. Severity of CAD was determined by vessels score and Friesinger score. **Results:** The mean age of the patients was 49.14 (SD 11.50) years. Majority of the patients were male 44 (88%) with a ratio of male to female was 7.33:1. Among the cardiovascular risk factors, QRS score showed significant difference (p=0.028) between smoker and non-smoker group but in other risk factors group there was no significant difference. A significant positive correlation was found between QRS score and Vessel score (r=0.972, p<0.001) and also between QRS score and Friesinger score (r=0.989, p<0.001. Thus the angiogrhaphic severity was significantly dependent on QRS score. **Conclusion:** It is concluded that high admission QRS score is associated with more severe coronary artery involvement in patients with acute ST elevation MI.

Keywords: QRS Score, Coronary Angiographic, Acute ST Elevation Myocardial Infarction.

I. INTRODUCTION

Coronary heart disease (CHD) is a major cause of death and is a global health problem reaching epidemic in both developed as well as in developing countries [1]. It has emerged as a major health burden in developing countries and is a subject of great concern for its significant contribution to mortality. The acute coronary syndrome is a major cause of cardiovascular morbidity and mortality for which timely diagnosis and appropriate therapy is of paramount importance to improve clinical outcome [2].The

International Journal Dental and Medical Sciences Research
Volume 6, Issue 4, July-Aug 2024 pp 496-502 www.ijdmsrjournal.com ISSN: 2582-6018

incidence of Ischemic heart disease (IHD) is on increase in developing countries, including Bangladesh. In 1975, the incidence of IHD in Bangladesh was reported to be 3.3 per thousand, and that in 1985 was 14 per thousand [3]. Safiuddin, Rahman, Ali, Malif, Rahman, Zaman, et al.,[4] observed that unheralded myocardial infarction was common (32%) among younger age group that was comparable with a previous retrospective study of premature coronary artery disease conducted by [5]. Additionally this simplified scoring system has been found to be clinically valuable in estimating left ventricular function after acute MI Depace, Iskandrian and Hakki, et al [6]. Patients with higher QRS score at hospital discharge were associated with more frequent multivessel coronary artery disease as well as associated with male gender, large higher heart rate, worse killip class, noninferior infarct location, less ST segment resolution after reperfusion, greater ST segment deviation and longer times to reperfusion. Therefore this non invasive and inexpensive technique may prove to be a useful means of recognizing high risk patients after acute MI and evaluating a novel therapy to limit infarct size [7]. Edvaedes, Jolanta, Navickas, et al. [8] reported that in patients of acute myocardial infarction high QRS score was associated with multivessel coronary artery disease. They also found that QRS score was higher among patients with left main coronary artery involvement, proximal left anterior descending coronary artery occlusion, and increased vessel score and less TIMI flow grade assessed by angiography. No study was done in this hospital to assess coronary artery severity in relation with QRS scoring system in patient with acute STEMI. This association is important as patient with high QRS score could be recognized as high risk patient, help to predict the extent of ST segment resolution, indicative of epicardial and microvascular reperfusion, coronary angiographic severity and able to put forward the acuteness of AMI, which in turn helps the decision on the therapy to be used and to establish prognosis. Therefore, it was worthwhile to do this type of study in the context of our country with limited resource where a practical non-invasive marker of reperfusion is required to identify those patients who might benefit from rescue strategies.

II. METHODOLOGY

Study Design: This was a cross sectional study.

Study Period: The study was conducted during the period from 1st January 2014 to 31st December 2015.

Place of Study: This study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet, Bangladesh.

Target Population: All the patients admitted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet with the diagnosis of acute ST Elevation Myocardial Infarction.

Study Population: All the patients admitted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet with the diagnosis of acute ST Elevation Myocardial Infarction and were undergone coronary angiography during index hospital admission, fulfilling the inclusion and exclusion criteria were the study population.

Inclusion Criteria

- Patients with first episode of acute ST elevation myocardial infarction (STEMI)
- Patients who received streptokinase therapy

Exclusion Criteria

- Old myocardial infarction
- Previous PTCA or CABG cases
- Left anterior hemiblock
- Bundle branch block
- Intraventricular conduction defect
- Paced rhythm
- Serious comorbid conditions like cerebrovascular disease or renal impairment (serum creatinine ≥2.0 mg/dl)
- Congenital and valvular heart disease
- Cardiomyopathy
- Patients who refused to be included in the study

Sample size: The calculated sample size was 50 patients with acute ST elevation myocardial infarction fulfilling the inclusion and exclusion criteria.

Procedure of Data Collection: Consecutive patients admitted in cardiology department of Sylhet MAG Osmani Medical College Hospital, Sylhet fulfilling the inclusion and exclusion criteria were considered for study. Informed written consent was taken from all patients or from legal guardian before enrollment. Initial evaluation of the patients by history and clinical examination were performed and recorded in patients' data collection sheet. Demographic profile, pulse, blood pressure, BMI and cardiovascular risk factors were recorded. Acute STEMI was diagnosed by "Third Universal Definition of Myocardial Infarction". QRS score was calculated for all patients with STEMI at the time of admission from admission ECG. All patients received standard medical therapy for

International Journal Dental and Medical Sciences Research
Volume 6, Issue 4, July-Aug 2024 pp 496-502 www.ijdmsrjournal.com ISSN: 2582-6018

STEMI. Baseline laboratory investigations such as Blood Sugar, Serum Creatinine, Lipid profile, Serum Electrolytes and Troponin-I were measured. Coronary angiogram was done during index hospital admission. Angiographic severity of coronary artery disease was assessed by vessel score (Annex-II) and Friesinger score (Annex-III). Interpretations of coronary angiogram were reviewed by at least two cardiologists. Relevant data were recorded in data collection sheet designed for the study.

Statistical Analysis: Data were processed and analyzed both by manually and with the help of SPSS (Statistical Package for Social Sciences) Version 21.0. Quantitative data were expressed as mean and standard deviation; and comparison was done by "Z" test. Qualitative data were presented as frequency and percentage. Pearson correlation was done to find out correlation. A probability value (p) of less than 0.05 was considered statistical significant, p value of <0.01 was considered highly significant and p value of >0.05 was considered not significant.

III. RESULTS

Table 1. Age and sex distribution of Patients (n=50)

Age	**Frequency**
Up to 30 years	4
31-40 years	11
41-50 years	12
51-60 years	17
61-70 years	6
Mean (SD)	49.14 (SD 11.50)
Sex	
Male	44
Female	6

Fifty patients with acute ST elevation myocardial infarction were studied. The age of the patients ranged from 27 to 70 years with the mean age of 49.14 (SD 11.50) years. Distribution of the patients by age was shown in Table-1. There were 17 (34%) patients in the age group of 51-60 years, 12 (24%) patients in the age group of 41-50 years, 11 (22%) patients in the age group of 31-40 years, 6 (12%) patients in the age group of 61-70 years and 4 (8%) patients in the age group of up to 30 years. There were 44 (88.0%) male and 6 (12.0%) female with a ratio of male to female was 7.33:1.

Table 2. Frequency distribution of hypertension, diabetes mellitus, smoking status and dyslipidaemia (n=50)

Smoking Status	Frequency
Non-smoker	17
Smoker	33
Total	50
Diabetes mellitus	
No	31
Yes	19
Total	50
Hypertension	
No	24
Yes	26
Total	50
Dyslipidaemia	
No	40
Yes	10
Total	50
Family History of CAD	
No	43

International Journal Dental and Medical Sciences Research
Volume 6, Issue 4, July-Aug 2024 pp 496-502 www.ijdmsrjournal.com ISSN: 2582-6018

Yes	7
Total	50

Showed 33(66%) patients were smoker and 17 (34%) were non-smoker. Showed 19 (38%) patients were diabetic and 31 (62%) patients were non-diabetic among the study population. Table-2 showed that 26 (52%) patients were hypertensive and 24 (48%) patients were normotensive among the study population. 10 (20%) patients had dyslipidaemia and 40 (80%) patients did not have dyslipidaemia. Table showed that 7 (14%) patients had family history of CAD and 43 (86%) patients did not have family history of CAD.

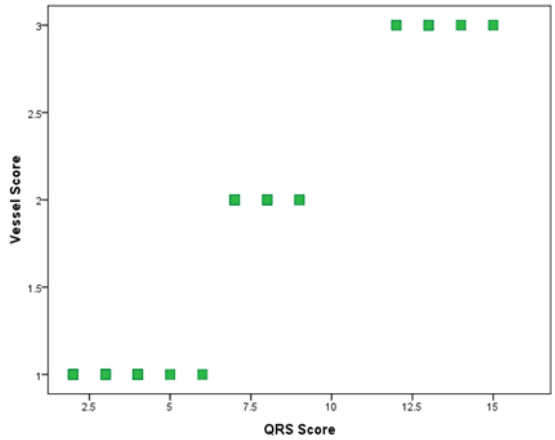
Table 3. Relationship of Smoking, Diabetes Mellitus, Hypertension, Dyslipidemia and Family History of CAD Status with QRS Score.

Variables	Status		p-value
	Non-smoker (n=17)	Smoker (n=33)	
Smoking Status			
QRS Score	5.24 (SD 3.34)	7.73 (SD 3.85)	p<0.05, Z=-2.262
Diabetes Mellitus	No (n=31)	Yes (n=19)	
QRS Score	6.42 (SD 4.02)	7.63 (SD 3.50)	p>0.05, Z=-1.085
Hypertension	No (n=24)	Yes (n=26)	
QRS Score	6.79 (SD 3.63)	6.96 (SD 4.09)	p>0.05, Z=-0.155
Dyslipidemia	No (n=40)	Yes (n=10)	
QRS Score	6.63 (SD 3.69)	7.90 (SD 4.46)	p>0.05, Z=-0.937
Family History of CAD	No (n=43)	Yes (n=7)	
QRS Score	6.81 (SD 3.61)	7.29 (SD 5.38)	p>0.05, Z=-0.298

Table-3 showed there was significant difference in QRS score between Smoker and Non-smoker group of patients (Z=-2.262; p<0.05). Table 2 showed that there was no significant difference in QRS score between two groups of patients who had DM and who didn't have DM (Z=-1.085; p>0.05). Table 2 showed that there was no significant difference in QRS score between two groups of patients who had hypertension and who didn't have hypertension (Z=-0.155; p>0.05). Table 2 showed that there was no significant difference in QRS score between two groups of patients who had dyslipidaemia and who didn't have (Z=-0.937; p>0.05). Table-3 showed that there was no significant difference in QRS score between two groups of patients who had Family History of CAD and who didn't have Family History of CAD (Z=-0.298; p>0.05).

Figure-I showed that QRS score and vessel score exhibited a significantly positive correlation (Pearson correlation coefficient, r=0.972, p<0.001) indicating QRS score and Vessel score tend to increase and decrease in the same direction.

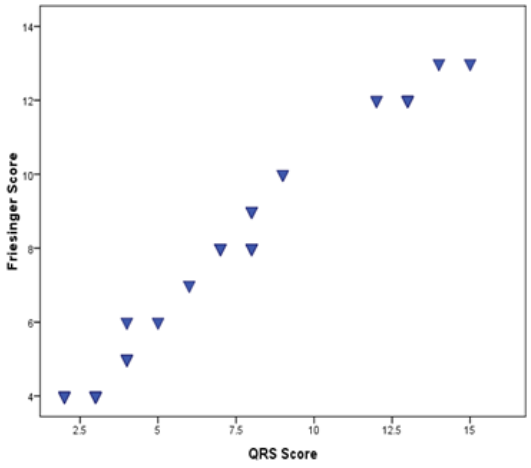
International Journal Dental and Medical Sciences Research
Volume 6, Issue 4, July-Aug 2024 pp 496-502 www.ijdmsrjournal.com ISSN: 2582-6018



r=0.972

Figure I. Correlation between QRS Score and Vessel Score (n=50)

Figure-II showed that QRS score and Friesinger score exhibited a significantly positive correlation (Pearson correlation coefficient, r=0.989, p<0.001) indicating QRS score and Friesinger score tend to increase and decrease in the same direction.



r=0.989

Figure II. Correlation between QRS score and Friesinger score (n=50)

IV. DISCUSSION

This was a cross-sectional study conducted in the department of cardiology, M.A.G Osmani Medical College Hospital, Sylhet during the period of January 2014 to December 2015. The main objective of the study was to find out the association of admission QRS score with coronary angiographic severity in patients with acute ST-segment elevation myocardial infarction after getting streptokinase therapy during index hospital admission.In pre-fibrinolytic era QRS scoring system was used to estimate myocardial infarct size and it was found that it had a good correlation with anatomic infarct size, left ventricular ejection fraction and biochemical measurement of infarct size. In the reperfusion era QRS score had been shown to correlate well with infarct size by ceMRI in acute ST segment elevation myocardial infarction. The usefulness of QRS score had been studied to assess not only the infarct size but also prognosis after acute myocardial infarction such as 30–day or 90-day clinical outcome including death, congestive cardiac failure and cardiogenic shock [9]. The Selvester QRS score is a weighted and quantitative index of myocardial damage. It includes not only the number of Q wave but also Q and R wave width and amplitude. This study was intended to find whether admission QRS score could assess coronary angiographic severity in STEMI receiving streptokinase therapy. A total of 50 patients with diagnosis of acute ST elevation myocardial infarction who were admitted in the

coronary care unit of Sylhet MAG Osmani Medical College Hospital, Sylhet, were selected for the study after considering inclusion and exclusion criteria. All the patients got streptokinase and had ECG before streptokinase and 90 minutes after the initiation of streptokinase therapy. QRS score was calculated from admission ECG. Coronary angiograms for above mentioned patients were done during index hospital admission. The age of the patients ranged from 27 to 70 years with the mean age of 49.14 (SD 11.50) years. Study done by Salam et al [10], found mean age of 54 years which was comparable with the present study. Uyarel et al [11] found mean age of 56.6 years and Armstrong et al [12] found mean age 60 years in their series. The higher age range in some studies might be due to increased life expectancy, geographical location and racial influences. This study also showed that there were 17 (34%) patients in the age group of 51-60 years, 12 (24%) patients in the age group of 41-50 years, 11 (22%) patients in the age group of 31-40 years, 6 (12%) patients in the age group of 61-70 years and 4 (8%) patients in the age group of up to 30 years. This result was almost similar to the study of Rashid, Islam and Islam et al [13] that 34% patients in the age group of 50 to 59 years, 22% patients in the age group of 40 to 49 years, 19.5% patients in the age group of 60 to 69 years, 15.5% patients in the age group of under 40 years and 9% patients in the group of above 70 years. In this study it was observed that there were 88.0% male and 12.0% female with a ratio of male to female was 7.33:1. Study done by Salam et al [10] also found 88.3% male and 11.7% female. Male has greater risk of MI than female. This might be due to natural sex hormone balance of the reproductive period of those. The risk of cardiovascular disease (i.e. MI) is greater in man than in woman [13]. Among the current study population 66% patients were smokers. There was significant difference in QRS score between Smoker and Non-smoker group of patients ($p<0.05$). A significant association between smoking status and QRS score was observed as previously reported in several studies [10, 11]. Regarding other risk factors in this current study it was observed that diabetes mellitus (38%), hypertension (52%), dyslipidemia (20%) and family history of CAD (14%) were present in the study population in various percentages and there was no significant difference in QRS score among these cardiovascular risk factors ($p>0.05$). Kosuge et al [14] showed that the prevalence of hypertension was 51.9%, type 2- diabetes mellitus was 28%, and dyslipidemia was 36% which was almost comparable with the current study. Coronary angiogram was performed in all study population during index hospital admission. The findings were analyzed as a number of vessel involvement, i.e. vessel score and also by Friesinger coronary angiographic severity index. To study the association between QRS score with angiographic severity we measured the correlation between QRS score and Vessel score, again the correlation between QRS score and Friesinger score. The correlation between QRS score and Vessel score ($r=0.972$) indicated a significantly positive correlation between those scores, i.e. they tend to increase or decrease together. Similarly, the correlation between QRS score and Friesinger score ($r=0.989$) indicated a significantly positive correlation between them, i.e. they tend to increase or decrease together. This result was similar to the study of Kabir et al [15] that there was strong positive correlation of QRS score with vessel score and Friesinger score. Thus the angiographic severity was significantly dependent on QRS score.

Study limitations

Although the result of this study supports the hypothesis, there are some facts to be considered which might affect the result:

1. It was a single centre study and the number of study population was limited.
2. QRS score was obtained in a blinded manual conventional manner rather than high resolution screen of a digital ECG system.
3. Adequate follow up could not be done to reveal whether QRS score could predict the occurrence of major adverse cardiac events in short and long term.

V. CONCLUSION

From the present study we may conclude that higher admission QRS score was associated with more severe coronary artery disease assessed by vessel score and Friesinger score.

Recommendation:

1. Higher admission score of QRS in acute ST elevation myocardial infarction may be considered as a simple diagnostic tool for assessing angiographic severity of coronary artery disease.
2. However, multicentric trial is needed to assess the reliability and validity of QRS score in acute ST elevation myocardial infarction to predict severity of coronary artery disease.

REFERENCES

[1]. Chaturvedi, V., and Bhargava, B., 2007, ‘Health care delivery for coronary heart

disease in India where are we headed?', Am Heart Hospital Journal, vol-5, pp.32-37.

[2]. Terkelsen, CJ., Lassen, JF., Norgaard, BL., Gerdes, JC., Jensen, T. Gotzsche, LB., 2005, 'Mortality rates in patients with ST elevation versus non ST elevation acute myocardial infarction: observation from unselected cohort', Eur Heart J, vol.26, pp.18-26.

[3]. Akanda, MAK., Rahman, S., Choudhury, AHK., Zaman, S., Ali, MA., Sadequzzaman, M., et al., 1996, 'Arteriographic pattern in coronary heart disease in Bangladesh documented by selective coronary angiogram', Bangladesh Heart Journal, vol.11, no.2, pp.55-59

[4]. Safiuddin, M., Rahman, S., Ali, MA., Malif, F., Rahman, S., Zaman, MA., 1999, "First acute myocardial infarction and chronic stable angina pectoris. A clinical comparative study." Chest and Heart J, vol. 23, no. 2, pp.63-67.

[5]. Amanullah, M., Thapa, LB., Farooque, GM., Hasanat, A., Mohibullah, AKM. and Malik, A., 1984, 'A profile of 51 cases of acute myocardial infarction amongst young Bangladeshi. In proceeding Bangladesh Japan joint conference on cardiovascular disease, Dhaka', JICA, pp.118-121.

[6]. Depace, NL., Iskandrian, AS. and Hakki, AH., 1982, 'Use of QRS scoring and thalium 201 scintigraphy to assess left ventricular function after MI' , Am J Cardiol , vol 50 , pp.1262-1264.

[7]. Tjandrawidjaja, MC., Fu, Y., Westerhout, CM., Wagner, GS., Wagner, GS., Granger, CB., et al., on behalf of APEX-AMI investigator 2010, 'Usefulness of QRS score as a strong prognostic marker in patients discharged after undergoing PPCI for ST- Segment elevation myocardial infarction', Am J Cardiol, vol. 106, pp.630-634.

[8]. Edvaedes, VK., Jolanta, L., Navickas, R. and Ragaisyte, N., 2011 'Post reperfusion left ventricular recovery in patients with ST elevation myocardial infarction, feature related to the immediate and delayed PCI,' Seminar in cardiovascular medicine, vol.17 no. 7, pp.1-9.

[9]. Zaman, M.M., Ahmed, J., Choudhury, S.R., Numan, S.M., Parvin, K., Islam, M.S., 2007. Prevalence of ischemic heart disease in a rural population of Bangladesh. Indian Heart J, 59(3), pp. 239-41.

[10]. Salam, ZA., Wafa, S., Kamel, S. and Nammas W., 2010, 'The modified Selvester QRS score: Can we predict successful ST segment resolution in patients with myocardial infarction receiving fibrinolytic therapy?' Cardiology J, vol. 17, pp.1-7.

[11]. Uyarel, H., Nese, C., Ertan, O., Hulya, K., Zeynep T., Ozgur, A., et al., 2006, 'Level of Selvester QRS score is predictor of ST segment resolution and 30 day outcome in patients with acute myocardial infarction undergoing primary PCI', Am Heart J, vol.151, pp.1239.e 1-1239.e7.

[12]. Armstrong, PW., Fu, Y., Westerhout, CM., Hudson MP., Mahaffey KW., White, HD., et al., 2009, 'Baseline Q wave surpasses time from symptom onset as a prognostic marker in ST segment elevation myocardial infarction patients treated with primary percutaneous coronary intervention', J Am Coll Cardiol, vol. 53, pp.1503-1509.

[13]. Rashid, A., Islam, M.M. and Islam, M.R., 2005. Selected Risk Factors for Myocardial Infarction among the Patients Admitted in Rajshahi Medical College Hospital. TAJ, Vol. 18, pp.37-42

[14]. Kosuge, M., Toshiaki, E., Kiyoshi, H., Satoshi, M., Mitsuaki, E., Noriaki, I., et al., 2011, 'High QRS score on admission strongly predicts impaired myocardial reperfusion in patients with a first anterior acute myocardial infarction', Circulation J, vol. 25, no. 75(3), pp.626-632.

[15]. Kabir, M. S., 2012, Value of QRS score to assess ST segment resolution and coronary angiographic severity in patient with acute ST elevation myocardial infarction receiving fibrinolytic therapy. University of Dhaka.