Pattern of Cardiac Arrhythmia in Patients with Acute Coronary Syndrome

[*]Hossain MI,[1] Monjur-E-Elahi M,[2] Mukta SI,[3] Karim MR,[4] Hoque MA,[5] Ekram S[6]

Acute coronary syndrome is a growing health hazard in the world. Cardiac arrhythmia usually manifest during or following acute coronary syndrome is an important complication and risk factor for fatal outcome. Early identification and management of arrhythmia has both short term and long term prognostic significance. The study was undertaken to know the pattern of early cardiac arrhythmia in patients with acute coronary syndrome. Further, attempt has been made to know the prevalence and to compare the frequency of arrhythmia among STEMI, NSTEMI, and unstable angina. This is a hospital based descriptive study done in the department of Cardiology, Rajshahi Medical College Hospital, Rajshahi from January, 2012 - June, 2012. During this period 50 patients with Acute Coronary Syndrome admitted to the Department of Cardiology who fulfill the inclusion and exclusion criteria were studied. Acute coronary syndrome was diagnosed on the basis of clinical presentation, ECG changes and evidence of cardiac enzyme elevation. After admission to CCU every patient was observed under continuous cardiac monitoring to see and record any arrhythmia within 24 hours of onset of symptoms. This study showed a significant male predominance of ACS with mean age being 54.5 ± 4.5 years. Significant proportion of patients 25(50%) developed different types of arrhythmia in 1st 24 hours of onset of symptoms. The frequency of arrhythmia was higher in STEMI patients (93.75%) and most of them occurred in anterior wall infarction (46.66%). Most frequent arrhythmia among the ACS patients in first twenty-four hours was PVC (44%). However, AIVR (16%), AF (16%), 1^0 AVB (16%), and VT (12%). VF was observed less frequently (4%).

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Key words: Coronary heart disease, Acute coronary syndrome, Acute myocardial infarction, Unstable angina, Arrhythmia.

Introduction

Coronary heart disease (CHD) is a worldwide health epidemic, In the united states, for example it is estimated that 13.7 million individuals who already have had a myocardial infarction.[1] Worldwide 30% of all death can be attributed to cardiovascular disease, of which more than half are caused by coronary heart disease and the forecast for the future estimate a growing number as a consequence of lifestyle changes in developing countries.[2] Coronary heart disease can be classified as acute coronary syndrome (ACS), sudden cardiac death (SCD) and chronic coronary heart disease. Acute coronary syndrome is a unifying term representing a common end result, acute myocardial ischemia and is associated with an increased risk of myonecrosis and cardiac death. The full spectrum of ACS comprises of an ST elevation myocardial infarction (STEMI), non ST elevation myocardial infarction (NSTEMI), and unstable angina. This will likely become a major public health and clinical problem in South Asia (India, Pakistan, Nepal, Bangladesh).[3]

1. *[*]Dr. Md. Iqbal Hossain, Lecturer, Department of Pharmacology, Rajshahi Medical College. iqbal39th@gmail.com*
2. *Dr. Md. Monjur-E-Elahi, Jr. Consultant, Medicine, M Abdur Rahim Medical College Hospital, Dinajpur.*
3. *Dr. Sarwarul Islam Mukta, Asstt. Professor, Dept. of Medicine, M Abdur Rahim Medical College, Dinajpur.*
4. *Dr. Md. Rejaul Karim, Lecturer, Department of Biochemistry, Rajshahi Medical College.*
5. *Dr. Md. Azizul Hoque, Former Associate Professor of Medicine, Rajshahi Medical College.*
6. *Dr. Saifuddin Ekram, Former Professor & Head, Department of Medicine, Rajshahi Medical College.*

[*]*For correspondence*

The prognosis of patient who has survived an acute coronary syndrome is related to the extent of residual myocardial ischemia, the degree of myocardial damage and the presence of ventricular arrhythmia. ACS can cause mechanical problems, as well as electrical complications (SCD, arrhythmias). Serious cardiac arrhythmic complications i.e. cardiac arrest, ventricular tachycardia, ventricular fibrilation, atrioventricular block are associated with a higher in hospital mortality.[4-7]

Early death is usually due to an arrhythmia is independent of the extent of MI. However late outcome are determined by the extent of myocardial damage and unfavorable features include poor left ventricular function, AV block and persistent ventricular arrhythmia. In general bradyarrhythmia and conduction dysturbances are associated with inferoposterior infarction are related to enhanced vagal activity and imply a somewhat more benign outcome than those involved in anterior infarction. The occurrence of CHD in a patient with inferior infarction confers a 1.5-4 fold increase in risk of in hospital mortality.[8,9] CHB in the presence of anterior infarction usually indicates an extensive area of myocardial necrosis and carries a poor prognosis. The mortality rate for inferior myocardial infarction patients who develop complete heart block is approximately 15% unless there is coexisting right ventricular infarction, in which case the mortality rate is doubled.[10] The occurrence of any new bundle branch block with acute MI also identifies extensive infarction and associated with higher in hospital and long term mortality. Early presence of atrial fibrillation signifies atrial ischemia. Later it represents atrial stretching caused by increased filling pressure also associated with adverse prognosis. Atrial fibrillation in the setting of acute MI especially if it occurs after admission is associated with higher mortality and incidence of stroke.[11, 12]

Sustained ventricular arrhythmia, ventricular tachycardia (VT) and/or ventricular fibrillation (VF) occurs in up to 20% of patient with ACS. In hospitalized patient with STEMI, the most common sustained ventricular arrhythmia is primary ventricular fibrillation, which occurs in 3-5% of patient within the first few hours following onset of MI. Early (< 48 hours) post infarction primary VF is associated with increased in hospital mortality, but those who survive to hospital discharge have a similar outcome to patients without primary VF. Late VF (> 48 hours) though less common is associated with increased short and long term mortality.[5,13]

Independent predictors of in hospital VF included prior HTN, COPD, MI, and ST segment changes at presentation. Except for HTN, these variables also independently predicted in hospital VT. The incidence of VT is higher in the younger age group while AV block and arrhythmic death are higher in older aged patients. Congestive heart failure within first 48 hours, current use of tobacco and cardiac troponin elevation are associated with significantly higher arrhythmic complications during hospitalization.[14]

An ECG change (especially ST segment) at presentation is an important predictor of ventricular arrhythmia. Patient admitted to CCU with possible ACS and a non ischemic ECG have a very low rate of serious ventricular arrhythmia.[15]

Methods

This is a hospital based observational descriptive study done in the department of Cardiology, Rajshahi Medical College Hospital, Rajshahi from January 2012-June 2012. Consecutive 50 patients having acute coronary syndrome who fulfilled the inclusion (patients with acute coronary syndrome, onset of clinical symptoms within 24 hours, any age and sex were included) and exclusion criteria(onset of clinical symptoms more than 24 hours, patient with previous history of structural heart disease, patient with COPD, electrolytes imbalance were excluded) was enrolled in this study through purposive sampling method.

Data was collected from patients with acute coronary syndrome as determined by clinical features, ECG evidence and biochemical report. After admission to CCU every patient was under continuous cardiac monitoring to see and record any arrhythmia within 24 hours of onset of symptoms. Then the tracing were evaluated and cross checked by a cardiologist. Detailed history and thorough clinical examination was performed in a prefixed questionnaire after taking informed consent of the patients. Then some necessary investigations were done to rule out the risk factors that may be associated with ACS and arrhythmia.

Results

This study was intended to know the pattern of early cardiac arrhythmia in patients with acute coronary syndrome. This study showed a significant male predominance and maximum number of patients were 50-59 years of age. Smoking and hypertension were identified as major risk factors. Chest pain (92%), sweating (76%) & breathlessness (70%) were the main presenting symptoms of ACS. Among the ACS patients 25(50%) developed different types of arrhythmia. Most frequent arrhythmia among the ACS patients in first twenty four hours was PVC (44%). The frequency of arrhythmia was higher in STEMI patients (93.75%) and most of them occurred in anterior wall infarction (46.66%).

Table I: Distribution of patients with arrhythmia in different ACS

Types of ACS	Number(n=50)	Patient with arrhythmia (n=25)	(%)
STEMI	16	15	93.75
NSTEMI	14	6	42.85
UA	20	4	20.00

In this study arrhythmia occurred more in STEMI 16(93.75%) than in NSTEMI or UA.

Table II: Distribution of risk factors associated with arrhythmia

Risk factors	Patient with arrhythmia (n=25)	%
Hypertension	15	60
Diabetes mellitus	6	24
Smoking	20	80
Hyperlipidaemia	8	32
Family history	4	16
Prior infarction	6	24
Troponin elevation	21	84
Heart failure	21	84

NB: Multiple risk factors present in a single patient

Arrhythmia occurred most frequently in ACS patient with heart failure 21(84%), troponin elevation 21(84%), & smoking 20(80%). Hypertension 15(60%), hyperlipidaemia 8(32%), diabetes mellitus 6(24%) contributed relatively less risk to develop arrhythmia.

Table III: Distribution of patients with arrhythmia in ACS (STEMI) according to regional wall infarction

STEMI	Number of patients with arrhythmia (n=15)	%
Anterior wall	7	46.66
Inferior wall	6	40.00
Lateral wall	1	6.67
Combined (anterior & inferior) wall	1	6.67

In case of STEMI, arrhythmia found most frequently in anterior wall 7(46.66%) & inferior wall 6(40%) infarction.

Table IV: Distribution of different arrhythmia in ACS patients

Arrhythmia	No (n=25)	Percentage (%)
PVC	11	44
AIVR	4	16
AF	4	16
VT	3	12
VF	1	04
1^0 AVB	4	16
CHB	2	08

NB: Multiple arrhythmia present in a single patient.

Study showed PVC 11(44%) was the most common arrhythmia in ACS patients.

Table V: Distribution of different arrhythmia in different ACS patients

Arrhythmia	STEMI (n=15)		NSTEMI (n=06)		UA (n=04)	
	No	%	No	%	No	%
PVC	7	46.66	2	33.33	2	50
AIVR	3	20.00	1	16.66	0	00
AF	2	13.33	1	16.66	1	25
VT	3	20.00	0	00	0	00
VF	1	6.66	0	00	0	00
1^0 AVB	2	13.33	1	16.66	1	25
CHB	2	13.33	0	00	0	00

Regarding distribution of different arrhythmia in STEMI (n=15) patients, study showed PVC 7(46.66%), AIVR 3(20%) and VT 3(20%) were common. In case of NSTEMI (n=06) PVC 2(33.33%), AF 1(16.66%) & 1^0 AVB 1(16.66%) were the commonest arrhythmia. PVC 2(50%), AF 1(25%) & 1^0 AV block 1(25%) found in UA (n=04).

Discussion

Heart disease is the lethal cause of death and is more common in adult male. In the present study maximum number of cases of ACS was in the age group 50 to 59 (42%) and the cases were predominately male (64%) suggesting that it is predominately a disease of men. Yadav P et al[16] showed that ACS is more common in 51-60 (32%) age group & in male (32%) which is similar to this study. Pain is the cardinal symptom of an acute coronary syndrome but breathlessness, sweating, vomiting, and collapse are also common features. The present study showed that among the ACS patients the commonest symptoms were chest pain (92%), sweating (76%), breathlessness (70%), and palpitation (56%). Yadav P et al[16] showed the commonest symptoms were chest pain (94%), sweating (78%), breathlessness (67%), and

palpitation (58%) which is very similar with the present study.

Acute coronary syndrome encompasses both unstable angina and MI (STEMI and NSTEMI). Unstable angina is characterized by new-onset or rapidly worsening angina (crescendo angina), angina on minimal exertion or angina at rest in the absence of myocardial damage. In contrast, MI occurs when symptoms occur at rest and there is evidence of myocardial necrosis, as demonstrated by an elevation in cardiac troponin or creatine kinase-MB isoenzyme. In GRACE[17] study they found that STEMI (30%), NSTEMI (25%), unstable angina (38%). The current study showed STEMI 16 (32%), NSTEMI 14(28%), and unstable angina 20 (40%) which is closer to GRACE study.

There are many modifiable and non modifiable risk factors of coronary heart disease. The role and relative importance of many risk factors for the development of coronary, peripheral and cerebrovascular disease have been defined in experimental animal studies, epidemiological studies and clinical interventional trials. The effect of risk factors is multiplicative rather than additive. People with a combination of risk factors are at greatest risk and so assessment should take account of all identifiable risk factors. The present study showed that commonest risk factors in STEMI were smoking (62.5%), hypertension (56.25%), DM (18.75%), Prior infarction (18.75%), hyperlipidemia (31.25%). In NSTEMI commonest risk factors were hypertension (57.14%), smoking (57.14%) and DM (28.57%) Prior infarction (35.71%), hyperlipidemia (42.85%). In GRACE[17] study they found that commonest risk factors in STEMI were smoking (62%), hypertension (50%), DM (21%), Prior infarction (19%), hyperlipidemia (35%) and in NSTEMI commonest risk factors were hypertension (59%) , smoking (57%), DM (27%) , Prior infarction(33%), hyperlipidemia (42%) which is very close to the current study. Kelly A.M.et al[18] showed that family history contributes 25% risk of ACS. Whereas present study showed 24% reflecting the similar risk.

Complications are commonly seen in all forms of acute coronary syndrome, although the frequency and extent vary with the severity of ischemia and infarction. Major mechanical, structural and electrical complications are seen with transmural infarction. Perron AD et al[19] found that arrhythmia complicating ACS was higher in STEMI. Present study also showed higher frequency of arrhythmia complicating ACS in STEMI 15 out of 16 (93.75%). Misiriya R.K.J et al[20] found that among the patients with STEMI, 50% had inferior wall, 43.97% had anterior wall infarctions, 6.03% had lateral wall and isolated posterior wall infarctions. The present study showed 37.5 % had inferior wall, 50% had anterior wall infarctions, and 6.25% had lateral wall infarction.

Ngarmukos T et al[21] al in their study found that heart failure, troponin elevation and smoking were associated with serious cardiac arrhythmia. The current study also showed that heart failure (84%), troponin elevation (84%) and smoking (80%) were more associated with cardiac arrhythmia. Perron AD et al[19] found that serious arrhythmia complicating ACS like VF, type II 2^0 AV block, CHB were common in anterior MI. This study showed higher incidence of arrhythmia (46.66%) in anterior wall infarction. Misiriya R.K.J et al[20] found that in STEMI commonest arrhythmia encountered was premature ventricular complex (PVC) 40.04%. Other arrhythmias observed were accelerated idioventricular rhythm (AIVR) 18%, ventricular tachycardia (VT)13.98%, atrial fibrillation (AF) 8.05% and ventricular

fibrillation (VF) 5.36% patients. In NSTEMI they found that commonest arrhythmia was premature ventricular complex (PVC) that occurred in 38.5% patients. Other arrhythmias observed were accelerated idioventricular rhythm (AIVR) 2.1%, ventricular tachycardia (VT) 3.3% , atrial fibrillation (AF) 3.5% and ventricular fibrillation (VF) 1.2% patients. The present study showed commonest arrhythmia in STEMI patients were PVC 46.66%, VT 20% and AIVR 20%, AF and CHB 13.33%. In case of NSTEMI PVC 33.33%, AF 16.66% & 1^0 AVB 16.66% were the commonest arrhythmia.

Conclusion

Significant proportion of patients with ACS developed arrhythmia in 1^{st} 24 hours of onset of symptoms. Smoking & hypertension were identified as major risk factors. Among the ACS patients 25(50%) developed different types of arrhythmia. Most frequent arrhythmia among the ACS patients in first twenty four hours was PVC. STEMI particularly anterior wall infarction, heart failure, smoking and troponin elevation were associated with greater risk of development of arrhythmia.

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