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Research Article

A Clinical Study of Post Infarction Cardiac Arrhythmias in First One Week: A Study from Rural Hospital

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Abstract: Acute myocardial infarction continues to be a major public health problem in the competitive stressful world. About 50 percent of the deaths associated with acute myocardial infarction occur within one hour of the event and are attributable to arrhythmias, most often ventricular fibrillation. 100 cases of acute myocardial infarction admitted to intensive coronary care unit were selected for this study. Patients were studied with special reference to arrhythmias occurring during first week of acute myocardial infarction. Study protocol included detailed clinical history, clinical examination and investigations. 89% of patients had one or the other risk factors for ischemic heart disease. The most common risk factor was smoking (50%), followed by hypertension (49%) and hyperlipedemia (48%). Arrhythmias were more common in anterior wall myocardial infarction. Sinus tachycardia, ventricular premature beats, ventricular tachycardia and ventricular fibrillation were common in anterior wall myocardial infarction. Most of arrhythmias (82.6%) appeared within 48 hours after acute myocardial infarction. Incidence of arrhythmias was higher in those with multiple risk factors. Arrhythmias contributed for 33.3% of total mortality. Among arrhythmias highest mortality rate was seen with ventricular fibrillation (100%). As arrhythmias, particularly ventricular arrhythmias, in anterior wall myocardial infarction, associated with multiple risk factors are more common and also mortality rate is high in this group, prophylaxis for ventricular arrhythmias is justifiable for patients of acute myocardial infarction with multiple risk factors.

Keywords: Acute myocardial infarction, Arrhythmias, Hypertension, Smoking, Ventricular fibrillation, Ventricular tachycardia

INTRODUCTION

Acute myocardial infarction (AMI) continues to be a major public health problem in the competitive stressful world, despite impressive strides in diagnosis and management over the past three decades and is becoming an increasingly important problem in developing countries[1]. With a decline in infectious disease - related deaths accompanied by accelerated economic development and life style change promoting atherosclerosis, developing countries are expected to experience a sharp increase in ischemic heart disease and AMI.[2]Although the death rate from AMI has declined by about 30 percent over the past decade, its development is still a fatal event in approximately one third of patients. About 50 percent of the deaths associated with AMI occur within 1 hour of the event and are attributable to arrhythmias, most often ventricular fibrillation[1]. Because AMI may strike an individual during the most productive years, and it can have profoundly deleterious psychosocial and economic ramifications. The introduction of intensive coronary care units primarily meant for reducing the mortality in early stages of AMI by early detection and timely intervention of arrhythmias with the help of continuous monitoring and institution of proper treatment will save many precious lives. An attempt has been made in this study to know the incidence, diagnosis and management of various arrhythmias that occur in the first week after AMI.

MATERIALS AND METHODS

Source of data

This descriptive observational study was conducted over a period of 12 months starting from 1st august 2014 to 31st July 2015. A total of 100 cases of acute myocardial infarction admitted to ICCU of Sri Adichunchanagiri Hospital & Research Centre, during this study period were considered for the study with special reference to cardiac arrhythmias occurring during first week of myocardial infarction. Ethics committee approval was taken for the study.

Method of collection of data

The diagnosis of AMI was based on the presence of at least two of the following three criteria's (WHO criteria).

- Clinical history of ischemic type of chest discomfort
- Changes on serially obtained electrocardiographic tracings
- A rise and fall in serum cardiac markers.

A detailed case history was taken in all patients and a meticulous examination was done as per proforma. A twelve lead electrocardiogram (ECG) was recorded immediately after admission and four right precordial leads were recorded when right ventricular infarction was suspected. Patients were connected to bed side cardiac monitor for 48 hours. E.C.G. was repeated subsequently each day and additional E.C.Gs were taken as and when arrhythmias appeared. Routine blood and urine investigations, serum cardiac enzymes, blood urea, serum creatinine, blood sugar, lipid profile, serum electrolytes and chest x ray were done for all patients. 2D-Echocardiography was done on 5th day of admission. Evaluation of hemodynamic status was done daily by monitoring pulse, blood pressure, jugular venous pressure, cyanosis, urinary output and auscultation of cardia and lungs. Average stay of patients in I.C.C.U was 5 days. Their stay in I.C.C.U was extended if any complications developed.

Statistical Analysis:

Independent variables (Risk factors) and main outcome variable (arrhythmias) were treated as categorical variables. These are represented by numbers and percentages.

RESULTS:

Age Incidence

Maximum incidence of AMI occurred in the age group of 51-60 years (36%). Youngest patient was 29 years and the oldest patient was 78 years (Table 1).

Sex distribution:

In our study 87 patients were males and 13 were females. Male to female ratio was 6.7:1. Number of premenopausal women -1. Number of post menopausal women - 12(Table 2).

Risk factors

Smoking, hypertension, hyperlipedemia and diabetes mellitus are the most common risk factors in the present study (Table 3).

Clinical presentations

Chest pain (92%) was the most common symptom at the time of presentation fallowed by sweating (49%) (Table 4).

Time interval between onset of symptoms and hospitalization

73% of patients were admitted within 12 hours of onset of symptoms. 92% of patients were admitted within 24 hours of onset of symptoms (Table 5).

Killip's class

Majority of patients (82%) admitted were either in Killip's I / II class(Table 6).

Site of infarction

Anterior wall infarction (56%) was more common than inferior wall myocardial infarction. Right ventricle infarction is commonly associated with inferior wall myocardial infarction (Table 7).

Complications

Arrhythmias (69%) were most common complication following AMI(Table 8).

Type of arrhythmias

Ventricular premature beats (VPBs) (23%) were the commonest arrhythmia, following AMI in the present study. Sinus tachycardia (19%) and sinus bradycardia (11%) were next common arrhythmias (Table 9).

Various Arrhythmias

Ventricular premature beats(VPBs), sinus tachycardia, ventricular tachycardia and ventricular fibrillation were common in anterior myocardial infarction. Sinus bradycardia and AV blocks were common in inferior myocardial infarction (table 10).

Time of appearance of arrhythmias

Out of 69 patients of AMI who developed arrhythmias, 42 patients (60.9%) developed arrhythmias within 24 hours of onset of AMI, while 27 patients (39.1%) developed arrhythmias after 24 hours of onset of AMI (Table 11).

Risk factors and their relation to arrhythmias

Diabetes mellitus and smoking were the commonest risk factors in relation to arrhythmias followed by hyperlipedemia and hypertension (Table 12).

Arrhythmias in various combinations of risk factors

Incidence of arrhythmias was higher in patients with combination of risk factors (Table 13).

Reperfusion Arrhythmias

VPBs and sinus bradycardia were present in four patients (Table 14)

Mortality

Overall mortality in present study was 21% (21 patients). Highest mortality following AMI was seen in cardiogenic shock (Table 15). Among arrhythmias

highest mortality was seen with ventricular fibrillation (Table 16).

Table 1: Showing age distribution

Age interval in years	Total	Percentage
< 30	1	1
31-40	7	7
41-50	24	24
51-60	36	36
61-70	27	27
> 70	5	5
Total	100	

Table 2: Showing sex distribution

Sex	Number of cases	Percentage
Male	87	87
Female	13	13

Table 3: Showing coronary risk factors

Sl. No.	Risk factors	Number of cases	Percentage
1.	Smoking	50	50
2.	Hypertension	49	49
3.	Hyperlipedemia	48	48
4.	Diabetes mellitus	37	37
5.	Obesity	17	17
6.	Family history of ischemic heart disease (IHD)	11	11

Table 4: Showing the symptoms at the time of presentation

Symptoms	No. of patients	Percentage
Chest pain	92	92
Sweating	49	49
Breathlessness	22	22
Palpitations	17	17
Nausea / vomiting	12	12
Giddiness	10	10
Pain abdomen	2	2

Table 5: Showing time interval between onset of symptoms and hospitalization

Duration in hours	Number of patients	Percentage
< 6 hours	32	32
7-12 hours	41	41
13-24 hours	19	19
> 24 hours	8	8

Table 6: Showing the cardiac status according to Killip's class

Sl. No.	Killip's class	Number of patients	Percentage
1	I	69	69
2.	II	13	13
3.	III	6	6
4.	IV	12	12

Table 7: Showing site of infarction

Sl. No.	Site of myocardial infarction	No. of patients	Percentage
1.	Anterior wall	56	56
	a. Antero septal MI	30	
	b. Antero lateral MI	-	
	c. Extensive anterior wall MI	26	
2.	Inferior wall	33	33
	a. Inferior wall MI	22	
	b. Inferior wall MI + right ventricle infarction	8	
	c. Infero lateral MI	3	
3.	Anterior and inferior wall MI	5	5
4.	Subendocardial infarction	2	2
5.	Miscellaneous		4
	New onset Left bundle branch block (LBBB)	3	
	b. Posterior infarction	1	

Table 8: Showing the complications

Complications	No. of patients	Percentage
Arrhythmias	69	69
Left ventricular failure	31	31
Cardiogenic shock	11	11

Table 9: Showing the type of arrhythmias

Type of arrhythmia	No. of patients	Percentage
Sinus tachycardia	19	19
Sinus bradycardia	11	11
Ventricular premature beats	23	23
Atrial premature beats	2	2
Atrial fibrillation	1	1
Junctional rhythm	2	2
Supra ventricular tachycardia	1	1
Ventricular tachycardia	6	6
Ventricular fibrillation	3	3
Ventricular asystole	-	-
First degree A.V. block	4	4
Second degree A.V. block		
Mobitz type I	2	2
Mobitz type II	-	-
Complete heart block	4	4
Right bundle branch block	2	2
Left bundle branch block	-	-

Table 10: Showing the incidence of various arrhythmias in relation to site of infarction

Arrhythmias	Total no. of patients	Anterior wall infarction	Inferior wall infarction	Anterior + Inferior wall infarction	Miscellaneous
Sinus tachycardia	19	15	1	1	2
Sinus bradycardia	11	3	8	-	-
Ventricular premature beats	23	17	6	-	-
Atrial premature beats	2	2	-	-	-
Supra ventricular tachycardia	1	1	-	-	-
Atrial fibrillation	1	1	-	-	-
Junctional rhythm	2	-	2	-	-
Ventricular tachycardia	6	6	-	-	-
Ventricular fibrillation	3	3	-	-	-
Ventricular asystole	-	-	-	-	-
First degree AV block	4	-	4	-	-
Second degree AV block Mobitz type I Mobitz type II	 2 -	 - -	 2 -	 - -	 - -
Complete heart block	4	2	2	-	-
Right bundle branch block	2	2	-	-	-
Left bundle branch block	-	-	-	-	-

Table 11: Time of appearance of arrhythmias

Days	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Arrhythmias	42	15	7	3	2	0	0

Table 12: Incidence of risk factors and their relation to arrhythmias

Risk factors	Number of patients	Incidence of arrhythmias	Percentage
Smoking	50	37	74
Hypertension	49	35	71.4
Hyperlipedemia	48	35	72
Diabetes Mellitus	37	27	74.5

Table 13: Incidence of arrhythmias in various combinations of risk factors

Risk factors	Number of patients	Cases with arrhythmias	Percentage
No risk factor	11	5	45.5
Single risk factor			
Smoking	9	7	77
Hypertension	8	6	75
Hyperlipedemia	7	5	71
Diabetes Mellitus	5	3	60
Two risk factors			
Hypertension + hyperlipedemia	5	3	60
Hyperlipedemia + Diabetes Mellitus	4	3	75
Hypertension + Diabetes mellitus	3	2	66
Hypertension + smoking	8	5	62.5
Hyperlipedemia + Smoking	6	4	66.6
Diabetes mellitus + smoking	4	3	75
Three risk factors			
Hypertension + Hyperlipedemia + Diabetes Mellitus	7	5	71
Hypertension + Hyperlipedemia + Smoking	9	7	77
Hypertension + Diabetes Mellitus + Smoking	4	3	75
Hyperlipedemia + Diabetes Mellitus + Smoking	5	4	80
Multiple risk factors			
Hypertension + Hyperlipedemia + Diabetes Mellitus + Smoking	5	4	80

Table 14: Incidence of reperfusion arrhythmias during thrombolytic therapy

Reperfusion arrhythmias	No. of patients
Ventricular premature beats	4
Accelerated idioventricular rhythm	1
Non sustained ventricular tachycardia	3
Sinus bradycardia	4

Table 15: Mortality in relation to complications

Complication	No. of deaths	Mortality rate
Cardiogenic shock	10	47.6%
Left ventricular failure	4	19%
Ventricular tachycardia and ventricular fibrillation	5	23.8%
Complete heart block	2	9.5%

Table 16: Mortality in relation to various arrhythmias

Arrhythmias	No. of patients developed	Death	Mortality rate
Ventricular tachycardia	6	2	33.3%
Ventricular fibrillation	3	3	100%
Complete heart block	4	2	50%

DISCUSSION

An arrhythmia implies a deviation beyond conventionally defined limits of rate, rhythm of heart or any disturbance in the sequence of cardiac activation. Some abnormality of cardiac rhythm has been noted in 72 to 96% of patients of AMI treated in ICCU. Arrhythmias in patients with AMI require vigorous and prompt treatment as they impair hemodynamics, compromise myocardial viability by augmenting myocardial oxygen requirement.[4,5,6] The incidence of arrhythmias, complicating AMI was studied by several authors. The wide range of variations in the incidence of arrhythmias detection in the study population, during early hours of acute infarction depends upon the severity of infarction, site of infarction, presence of shock or associated cardiac failure, drugs administered and methods employed to pick up arrhythmias.[7,8] In the present study, the maximum incidence of AMI (36%) occurred in the 6^{th} decade. Julian et al and Rajgopalan et al have observed higher incidence of AMI in the same age group (32% and 33.2% respectively. Next common age group was 61-70 years (27% incidence) which is similar to study made by Julian et al (30%).[9,10]The male to female ratio in present study is 6.7:1. The ratio has been found to vary from 3.1:1 (Julian et al) to 10.9:1 (Rajgopalan et al). Out of 13 female patients, 12 were in postmenopausal group and 1 in premenopausal age group. The incidence of AMI in women before the age of 50 years, in the absence of hypertension, diabetes mellitus and hyperlipedemia is much lower than in men of similar age. Protection from IHD in younger women is due to endogenous estrogen. At the age of 60, the level of atherogenic lipids increase and risk of IHD doubles for women. [11, 12].

The most common risk factor in AMI was smoking (50%). This incidence is similar to studies made by Meher et al.; (50%), Kundu et al.; (51.4%) and Sharma SK et al.; (52.69%). [8, 13, 14]Hypertension and hyperlipedemia are next common risk factors (49% and 48% respectively). Incidence of hypertension (49%) is comparatively higher compared to older studies due to present day life style and dietary habits. Incidence of hyperlipedemia (48%) is comparable to study made by Subramanya et al.; (55.5%). [15]Diabetes mellitus was found in 37% of patients which is similar to study made by Meher et al (32.9%). [13]In the present study obesity was present in 17% of patients, similar to study done by Sharma SK et al.; (13.37%).[14] Family history of ischemic heart disease was present in 11% of patients in present study, similar to study done by Passey MN et al.; (13%).[16]Chest pain was the commonest symptom of AMI. In present study 92% presented with chest pain at the time of admission, which is similar to study done by Subramanya et al (94%).[15] Among other symptoms incidence of sweating (49%) is comparable to study of Mehata et al.; (43%).[17] Other symptoms like breathlessness (22%), vomiting (12%), giddiness (10%) and pain abdomen (2%) are comparable to study of Jacob et al.; [18] 32% of patients came to hospital within 6 hours of onset of symptoms in present study. This is less compared to other studies.[8,18] This may be due to lack of awareness of symptoms of AMI and lack of transport facilities, since it is a rural hospital. This period is crucial where we can salvage myocardium by thrombolytic therapy. So continuing medical education of primary care physicians, awareness of symptoms of AMI in public that too in rural population and proper availability of transport

facilities will help in early admission of patients of AMI.

Majority of patients in the present study were in Killip's class I (69%) during the time of admission.13 patients (13%) were admitted in Killip's class II. Totally 82 patients (82%) presented either in Killip's I or II class. This is similar to study of Killip's and Kimbal et al (85%). 6% and 12% of patients presented with Killip's class III and class IV respectively, similar to study of Killip's and Kimbal et al; [19].

Anterior wall myocardial infarction (MI) is more common than inferior wall MI. In present study 56 patients (56%) had anterior wall MI. It is similar to studies done by Sharma SK et al (55.7%), Banerjea et al (56.5%), Kundu et al (52.61%), and Jacob et al (54%). [8, 14, 18, 20]33 patients (33%) in present study had inferior wall infarction, comparable to studies of Banerjea et al (35.8%) and Jacob et al (35%).[18,20]In present study combination of anterior and inferior wall infarction was seen in 5 patients (5%) comparable with study of Banerjea et al (4.6%)[20]. Subendocardial infarction in the present study was 2%,Sharma SK et al reported 6.3% incidence[14]. In present study new onset Left bundle branch block was seen in 3% and posterior wall infarction was seen in 1 patient (1%).Out of 100 acute MI patients, 30 patients (30%) had anterioseptal MI and 26 patients (26%) had extensive anterior wall MI comparable to studies of Banerjea et al[20]. Out of 33 inferior wall MI patients, 8 patients had right ventricle infarction (24.6%) comparable to study of Gupta MC et al (27.5%)[21].

In the present study 69 patients (69%) developed arrhythmias in one or the other form. It is concurrent with the studies made by Rajgopalan et al (67%) ,Sharma SK et al (69%), Jewitt DE et al (73%), and Kundu et al(73.44%)[8,10,14,22]. Sinus tachycardia was common in anterior wall MI (15 out of 19 cases). It was seen in 19 patients (19%) in present study. It is similar to study of Kundu et al (20.3%).Sinus bradycardia was seen in 11 patients (11%). It is comparable to study of Kundu et al (12.6%). It was common in inferior wall MI (8 out of 11 patients). In the present study atrial premature beats was seen in 2 patients (2%). It is concurrent with study of Kundu et al (3.9%)[8]. In the present study atrial fibrillation was seen in 1 patient (1%). This is comparable with study of Rajgopalan et al (1.21%). [10]. Junctional rhythm was seen in 2 patients (2%) in the present study. It is similar to study done by Jacob et al (2.3%)[18]. In present study Paroxysmal supraventricular tachycardia was seen in 1 patient (1%). Julian et al reported 4% in his study[8].

In present study VPBs were seen in 23 patients (23%). It was the commonest arrhythmia in the present study. Its incidence is similar to studies done by Bahl et al (23.7%). It was the commonest arrhythmia in studies done by various authors, Julian et al Kundu et al, Rajgopalan et al and Jacob et al[8,9,10,18,23]. Out of 23 patients, 17 had anterior MI and 6 had inferior MI. In present study 6 patients had ventricular tachycardia (VT)(6%). It is concurrent with studies done by Julian et al; (6%) and Rajgopalan et al (8%)[9,10]. All these patients had anterior MI. The incidence of ventricular fibrillation (VF) was 3% in the present study. It is concurrent with studies of Kundu et al (3.6%) and Jacob et al (4%)[8, 18]. In present study, all 3 patients had anterior MI and VF occurred within 6 hours of onset of symptoms.

Various forms of Atrio ventricular Blocks **(**AV blocks) were observed in 10 patients (10%). Most of them were seen in the inferior wall MI (80%) except 2 cases of complete heart block, developed in anterior wall MI. In present study first degree AV block was seen in 4 patients (4%) comparable with studies of Bahl et al(3.6%) and Rajgopalan et al(6.4%)[10,23]. Second degree Mobitz type 1 block was seen in 2 patients (2%) in the present study comparable with study of Rajgopalan et al (1.2%) [10]. Mobitz type 2 block was not seen any patient in the present study. Complete heart block (CHB) was seen in 4 patients (4%) in the present study, comparable with study of Jacob et al (4%)[18]. Among these 4 patients, 2 had anterior wall MI and developed CHB within 24 hours of onset of infarction. In the present study two patients had right bundle branch block (2%) comparable with study of Bahl et al(2.7%)[23]. Incidence of left bundle branch block in the present study was nil.

In the present study 65% of arrhythmias developed in anterior wall MI and 31.25% of arrhythmias in inferior wall MI and 1.25% in combined anterior and inferior wall MI and 2.5% in miscellaneous group. Rajgopaplan et al noted higher incidence of arrhythmias in anterior wall MI[10]. Sinus tachycardia, ventricular premature beats, ventricular tachycardia, ventricular fibrillation were common in anterior wall MI. Similar observations are encountered in studies of Jewitt DE et al, Rajgopalan et al, and Julian et al[9,10,22]. Sinus bradycardia and AV blocks were common in inferior wall MI similar observations are made in the study of Julian et al[9].

Most of the arrhythmias appeared within 48 hours after AMI. In the present study 42 patients (60.9%) have developed arrhythmias within 24 hours of onset of AMI, 15 patients (21.7%) developed on 2nd day, 7 patients (10.5%) developed on 3rd day and remaining 5 patients (6.9%) developed between 4th and 7th day after AMI. These observations are concurrent to

the study done by Bahl et al (55% of arrhythmias within 24 hours of onset of AMI and 25% of arrhythmias on 2nd day following AMI)[23]. In the present study incidence of arrhythmias in patients with smoking, hypertension, hyperlipedemia and diabetes mellitus were 74%, 71.4%, 72% and 74.5% respectively. In patients with none of the above risk factors incidence of arrhythmias was 45.5%. These results are concurrent with studies of Sharma SK et al. In the present study incidence of arrhythmias was higher in those with combination of risk factors. In patients with hypertension, diabetes mellitus and smoking incidence was 75%. It is comparable to study of Sharma SK et al (83.3%). In patients with hyperlipedemia, hypertension, diabetes mellitus and smoking the incidence was 80%. It is concurrent with study of Sharma SK et al (80%)[14]. In this study Reperfusion arrhythmias developed in 12 patients. Four patients had VPBs; accelerated idioventricular rhythm was seen in 1 patient, non sustained ventricular tachycardia in three patients and sinus bradycardia in four patients. Out of 21 deaths, 10 patients (47.6%) expired due to cardiogenic shock, 4 patients (19%) due to Left ventricular failure(LVF), 5 patients due to either VT or VF (VT-2, VF-3) (23.8%), and 2 patients due to CHB (9.5%). These results are comparable to study by Passey et al.; He reported cardiogenic shock was major cause of death (49%) followed by LVF 21%, VT and VF contributing for 19% and CHB accounting for 9% of deaths[16].

In the present study, mortality rate among patients who developed VT was 33.3%. Behl et al reported 60% and Agarwal BL et al reported 83.3% mortality with VT[23,24]. Due to highly equipped I.C.C.Us and better management, present study has showed decreased mortality rate with ventricular tachycardia compared to other studies. The mortality rate among patients who developed ventricular fibrillation was 100% Behl et al.; and Agarwal BL et al reported similar incidence[23,24]. The mortality rate among patients who developed complete heart block was 50%. This is comparable with study of Agarwal BL et al[24].

CONCLUSION

Arrhythmias in general are more common in first 24 hours of onset of acute myocardial infarction, which is observed in present study also. Ventricular arrhythmias are more common in anterior myocardial infarction occurring within 24 hours of onset of infarction. As arrhythmias, particularly ventricular arrhythmias, in anterior wall myocardial infarction, associated with multiple risk factors are more common and also mortality rate is high in this group, prophylaxis for ventricular arrhythmias is justifiable for patients of acute myocardial infarction with multiple risk factors.

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