DOI: 10.7860/JCDR/2014/6658.3769

Original Article

Internal Medicine Section

A Study of 100 Cases of Arrhythmias in First Week of Acute Myocardial Infarction (AMI) in Gujarat: A High Risk and Previously Undocumented Population

MOHIT J SHAH[1], NIKITA R. BHATT[2], AJAY DABHI[3], P.B. THORAT[4], KETAN CHUDASAMA[5], JIGAR PATEL[6]

ABSTRACT

Aim: To study the incidence of arrhythmias in the first week of Acute Myocardial Infarction (AMI) with respect to type of arrhythmia, age distribution, sex and location of infarctin a patient population from western India and to evaluate its prognostic value and assessment of effect of pharmacotherapy.

Study Design: A prospective clinical study consisting of 100 patients was undertaken to investigate the relationship of arrhythmia with site of AMI, timing, complications and outcome in terms of mortality and morbidity.

Materials and Methods: Hundred consecutive cases of AMI with arrhythmia admitted in ICCU of Sir Sayaji General Hospital, Vadodara were taken in the study.

Results: Among 100 cases, maximum incidence (41%) was found after 6th decade. Incidence of arrhythmias was higher in males (70%) than females (30%). Anterior wall infarcts (69%) were more common than inferior wall (26%). Ventricular Premature Contraction (VPC) (36.23%) was the commonest arrhythmia is anterior wall MI while Complete Heart Block (CHB) (26.92%) was most frequent in inferior wall MI. A large number of arrhythmias were terminated pharmacologically (39%) whereas 13 % of the arrhythmias persisted in spite of treatment.

Conclusion: Hence, in one of the largest study of this kind in a patient population of Western India, we established VPC's as the most common arrhythmia in AMI patients. Older patients (sixth decade) and males are affected more commonly. Ventricular tachycardia is more fatal in acute inferior wall MI. Pharmacotherapy was successful in a large number of cases.

Keywords: Arrhythmia, Acute myocardial infarction, Location of infarct

INTRODUCTION

Acute Coronary Syndrome (ACS) represents a Global epidemic, and is intimidating large as the new epidemic afflicting population worldwide, especially in the sub-continent. According to the National Commission on Macro-economics and Health, there would be around 62 million patients with Coronary Artery Disease (CAD) by 2015 in India, and of these, 23 million would be younger than 40 years of age [1]. CAD affects Indians with greater frequency and at a younger age than in the developed countries, as well as many other developing countries. As a leading cause of morbidity and mortality, ACS are major public health problems [2]. By 2020 it is estimated that ACS will become a major cause of death in all the regions of the world. Many of these deaths are attributed to the development of arrhythmias during periods of myocardial infarction [3].

There is a view that the cascade leading to sudden death from arrhythmias can be predicted by certain interactions among structural and functional abnormalities [4]. The search for new tools for prediction, the refinement of the existing tools, and the initiation of well designed intervention trials are the steps that must be taken towards the more efficient prevention of premature deaths from arrhythmias. There is no documented evidence regarding the profile of such arrhythmias in the present population of Gujarat. Hence the purpose of this study is to evaluate the incidence and profile of cardiac Arrhythmias in AMI in the first week of hospitalization in a population of 100 patients in a tertiary hospital in Vadodara, Gujarat; as most arrhythmias develop in first week of AMI, and especially in the first 24 hours.

Age in Years	Male	Female	Total no. of Cases
30 to 39	2	0	2 (2%)
40 to 49	22	1	23 (23%)
50 to 59	24	10	34 (34%)
More than 60	22	19	41 (41%)

[Table/Fig-1]: Age distribution of 100 cases

MATERIALS AND METHODS

It is a prospective clinical study consisting of 100 consecutive patients admitted in ICCU of SIR SAYAJI GENERAL HOSPITAL with following criteria.

Inclusion criteria

1. Patient in hyper-acute to acute phase of myocardial infarction and developed arrhythmia within first week of AMI were included.

2. The patients should be included from both rural and urban areas and age above 19 years.

Exclusion criteria

The patients were admitted in our hospital not having arrhythmias or arrhythmias after first week of MI were excluded. The patients requiring intervention like angioplasty or pacemaker insertion were also excluded from the study.

All the patients admitted were evaluated by detailed history, clinical examination and the required investigations. The patients were

Myocardial Wall	No. of Cases
Anterior	69 (69%)
Inferior	26 (26%)
Inferior and Posterior	5 (5%)

[Table/Fig-2]: Location of infarct

Location	Mortality	Percentage
Anterior	10	14.45%
Inferior	5	19.2%
Inferior and Posterior	0	0

[Table/Fig-3]: Mortality according to location of infarct

Arrhythmia	No. of Cases	Mortality
APC	4 (4%)	0
Atrial Flutter/Fibrillation	4 (4%)	1 (25%)
Supraventricular Tachycardia	3 (3%)	0
AIVR	2 (2%)	0
VPC	31(31%)	0
Ventricular Tachycardia	12 (12%)	6 (50%)
Ventricular Flutter/ Fiblrilation	2 (2%)	2 (100%)
First Degree AV Block	11 (11%)	1 (9.1%)
Second Degree AV Block	4 (4%)	1 (25%)
Complete Heart Block	6 (6%)	2 (33.33%)
LBBB	10 (10%)	1 (10%)
RBBB	11 (11%)	1 (9.1%)

[Table/Fig-4]: Distribution of arrhythmias in 100 cases

Arrhythmia	No. of Cases	Mortality
APC	2 (2.9%)	0
Atrial Flutter/Fibrillation	4 (5.79%)	1 (25%)
Supraventricular Tachycardia	2(2.9%)	0
AIVR	1 (1.44%)	0
VPC	25(36.23%)	0
Ventricular Tachycardia	11 (15.94%)	5(45.45%)
Ventricular Flutter/ Fiblrilation	2 (2.9%)	2 (100%)
First Degree AV Block	5 (7.24%)	0
Second Degree AV Block	1 (1.44%)	0
Complete Heart Block	1 (1.44%)	0
LBBB	8(11.6%)	1 (12.5%)
RBBB	8 (11.6%)	1 (12.5%)

[Table/Fig-5]: Arrhythmias in anterior wall

observed for arrhythmia for 7 days after the admission. Twelve -lead ECG was taken at admission, at 24 hours, 48 hours and at the time of arrhythmia. Multi parameter monitors were used to monitor the patients for 48 hours and the pattern of arrhythmias, if any, was noted. After 48 hours all the patients were regulary monitored by 12 lead ECG thrice a day uptil discharge from the hospital. Blood sugar level, 2-D echocardiography with Doppler flow study, Lipid profile and electrolytes was done wherever possible, during the first 7 days of hospitalization. The diagnosis of AMI was based on the Third Universal Definition of Myocardial Infarction [5]: is the detection of a rise and/or fall of cardiac biomarker values, with at least one of the values being elevated (i.e.,>99th percentile upper reference limit). The preferred cardiac biomarker of necrosis is the highly sensitive and specific cardiac troponin. In addition, at least one of the five following diagnostic criteria should be met:

(1) Symptoms of ischaemia.

(2) New (or presumably new) significant ST/T wave changes or left bundle-branch block (LBBB).

(3) Development of pathological Q waves on ECG.

(4) Imaging evidence of new loss of viable myocardium or regional wall motion abnormality.

Arrhythmia	No. of Cases	Mortality
APC	2 (7.69%)	0
Atrial Flutter/Fibrillation	0	0
Supraventricular Tachycardia	1 (3.84%)	0
AIVR	1 (3.84%)	0
VPC	6 (23.07%)	0
Ventricular Tachycardia	1 (3.84%)	1 (100%)
Ventricular Flutter/ Fiblrilation	0	0
First Degree AV Block	6 (23.07%)	1 (16.6%)
Second Degree AV Block	6 (23.07%)	2 (33.33%)
Complete Heart Block	7 (26.92%)	1 (14.28%)
LBBB	2 (7.69%)	0
RBBB	3 (11.53%)	0

[Table/Fig-6]: Arrhythmias in inferior wall

	No. of Cases	Percentage
Spontaneous	35	35
Pharmacological	37	37
DC Shock	15	15
Persistent	13	13

[Table/Fig-7]: Mode of termination

(5) Identification of intracoronary thrombus by angiography or autopsy.

The diagnosis of arrhythmia was carried out as per AHA guidelines and treated accordingly.

RESULTS

Among 100 cases, maximum incidence (41%) was found after 6th decade, 34% between 50-60 years [Table/Fig-1]. The youngest patient was 34 years old, while oldest was 90 years.

The cases of arrhythmias with AMI was far more common with males (70% of the cases), and 30% patients being female.

The most common location of infarct was anterior wall (69%), inferior wall (26%), and rest is 5% [Table/Fig-2].

Mortality according to location of infarct, it was higher with inferior wall (19.2%) than anterior wall (14.45%) [Table/Fig-3]. [Table/Fig-4] shows incidence of various arrhythmias in all 100 cases of AMI with arrhythmia showing most common Arrhythmia is VPC (31%) and least common is Ventricular Fibrillation (2%). Most fatal Arrhythmia is Ventricular Fibrillation (100%). Other common Arrhythmias are Ventricular Tachycardia (12%), 1st degree AV Block (11%).

[Table/Fig-5] shows the distribution of various arrhythmias in AMI involving Anterior wall. Most common arrhythmia in Acute Anterior Wall MI is VPC (36.23%). Others are Ventricular Tachycardia (15.94%), LBBB (11.6%), and RBBB (11.6%). Mortality is 100% in Ventricular Fibrillation, 45.45% in Ventricular Tachycardia, 11.6% in LBBB and RBBB.

[Table/Fig-6] shows the distribution of various arrhythmias in AMI involving Inferior wall. Most common arrhythmia in acute Inferior wall MI in this study is CHB (26.92%), and others being various AV blocks, VPCs, RBBB (11.53%), LBBB (7.69%) and others.

[Table/Fig-7] specifies Pharmacological (39%) as most common Mode of Arrhythmia Termination followed by Spontaneous in 34%, by Dc Shock In 14% and remains Persistent in 13% of Patients.

DISCUSSION

Myocardial ischemia is characterized by ionic and biochemical alterations, creating an unstable electrical substrate capable of initiating and sustaining arrhythmias and infarction creates areas of electrical inactivity and blocks conduction, which also promotes

arrhythmogenesis [6].

It has been found that many serious arrhythmias develop before hospitalization, even before the patient is brought to hospital. At least 75% of patients with AMI have arrhythmia in the peri-infarct period, and also that majority of deaths occur secondary to development of arrhythmias [6].

Gujarat has very high prevalence of coronary disease but unfortunately dedicated studies on this patient population are lacking. EMRI (108) services in Gujarat revealed that 56,252 heart disease-related deaths occurred in Gujarat during the July 2009-August 2010 period.The data was collected from central and state agencies for analysis. The data showed that 14% the of total deaths in Gujarat were due to cardiac arrests. Although there have been studies published stated the incidence in various age, sex groups, associated risk factors of Western India; there was no study which exclusively studied cases of myocardial infarction which had concurrent arrhythmia. Our study aims to concentrate only on the patients which have myocardial infarction PLUS arrhythmia and other parameters associated with it. The maximum incidence (41%) of arrhythmias was found in sixth decade. the results of the study were in accordance with those of the American Heart Association, which showed 42% in age group of 60 or more [7]. This is due to high prevalence of DM, dyslipidemia, atherosclerosis in age group of 60 or more. However, in a study it has been found that as compared to non- sudden cardiac death, the risk of sudden cardiac death (which is mostly due to arrhythmias), is relatively highest in the younger age groups, but the absolute risk of sudden cardiac death, is much higher among the upper age groups than the younger [8].

This study showed a male preponderance with approximately 70% patients being male with male: female ratio of 2.3: 1. Similar results were seen in the Framingham Heart study [9].

Women develop coronary disease less often and later as compared to males, due to the relative protection conferred by oestrogen. This however incomplete and wears off with increasing age, especially after menopause making coronary disease the leading cause of death among women [2].

In our study, out of 100 cases of AMI with arrhythmia, 69% of them had anterior wall MI, while 26% had inferior wall MI, whereas 5% had inferior plus posterior wall involvement. Arrhythmias most common observed in anterior wall were VPCs. Patients with inferior wall involvement had AV block as the most common arrhythmia. However, One of the study by H. B. LAL [10] showed anterior wall involvement in 46% and inferior wall in 12.8% and anterior with inferior wall in 35%.

Ventricular Premature Beats

In the present study VPCs were observed in 31% of the patients when they occurred alone. In Anterior wall MI VPCs were observed in 36.23% of the patient while 23.1% of the patients with Inferior wall MI had VPCs. In a study by Campbell RW et al., VPCs of various frequencies were observed in upto 90% of patients with MI [9]. In another study [11], approximately 36% of patients with acute myocardial infarct ion presented with less than one premature ventricular beat per hour in Holter, whereas almost 20% of patients showed frequent (more than 10 premature ventricular beats per hour).

Ventricular Tachycardia

In the present study, VT occurred alone in 12% of the patients.

In a study by Echt DS et al and the CAST investigators, 20% of patients had non-sustained and only 10% had more than one run of VT in 24 hours [12]. A study showed that sustained VT occurring within 48 hours of MI was seen in 2% of patients and is often transient and is not associated with long-term risk of sudden cardiac death [13]. While other study by Wolfe CL et al., [14] showed that polymorphic VT seen in 2% of patients with MI is often rapid, symptomatic and hemodynamically and electrically unstable.

The study by Newby KH et al., [15] showed that sustained VT and VF occur in upto 20% of patients with AMI and have been associated with poor prognosis.

Despite the use of thrombolytic therapy, occurrences of sustained VT were associated with a higher risk of mor-tality; patients with VT had the worst outcomes, with a mortality of 30% in our study.

Ventricular Fibrillation

In our study, ventricular fibrillation occurred only in 2 of the 100 patients, however with 100% mortality.

In previous studies, it has been proven that the incidence of ventricular fibrillation is highest during first 24 to 48 hours, particularly within the first 4 hours after the acute event, and may occur in up to 5% of patients 13. Ventricular fibrillation occurring within 48 hours of myocardial infarction is not predictive of higher mortality during the first year after infarction.

It is an established fact that primary VF, irrespective of timing, is an independent predictor of in hospital mortality. In the study by Behar S et al., [16], the incidence of secondary VF complicating AMI was 2.4%.

Atrial Arryhthmias

In the current study, atrial premature beats occurred in 4% of patients, and 4% had atrial fibrillation/flutter.

In other study by Jewitt DE et al., [17], atrial arrhythmias oc-cured in upto 20% within 24 hours of infarction.

Similarly, the SPRINT Study Group [18], observed that atrial fibrillation is seen in upto 15% of patients with myocardial infarction, most commonly in those who have significant left ventricular dysfunction.

Bundle Branch Blocks

In our study, RBBB was present in 11% of patients, while LBBB was also seen in 10% patients.

Overall incidence in earlier study [19] of intra-ventricular conduction delays, including bundle branch block and fascicular block, is up to 20% of patients.

Archbold RA, et al., [20] observed that LBBB and RBBB occurred in 2.4% and 3.6% of the patients respectively.

Compared with LBBB, RBBB seems to be a stronger in-dependent predictor of in-hospital death. In our study mortality with RBBB was not seen, while mortality with LBBB was 10%.

Atrioventricular Blocks

In this study, first degree heart block was seen in 11%, second degree heart block in 4% of the patients, CHB presenting alone in 6% of all MI the patients. Among this, in Inferior wall MI, this arrhythmias are 30%, 15%, 15% respectively, and in Anterior wall MI, this arrhythmias are 5%, 1.66%, 3.33% respectively. So in our study, Inferior wall MI patients having more incidences of AV conduction defects than anterior wall MI patients.

In study by Simon H et al., [21], first degree AV block in 16%,second degree AV block in 8% and CHB in 9%. In Inferior wall MI, first degree AV block is 36%, second degree AV block is 18% and CHB is 19% and In Anterior wall MI, this arrhythmias are 4%, 2%,3% respectively.

In a study by Nicod P et al., [22], Second degree heart block Mobitz Type I is observed in up to 10% of patients, but it is usually transient resolving within 72 hours post – infarction. Mobitz Type II observed in less than 1%.

A study by Goldberg RJ et al., [23], showed that in hospital mortality is significantly higher with anterior wall infarction with CHB than

with inferior wall myocardial infarction and that CHB is twice as common with inferior or posterior wall infarction as with anterior wall involvement.

CONCLUSION

Hence, we can conclude from the results of this prospective study that maximum arrhythmias in the first week following AMI occur in the patients above 60 years of age and they are more common in males than in females. The most common arrhythmia is VPCs (31%) and least common is ventricular fibrillation (2%). Other common arrhythmias are ventricular tachycardia (12%), bundle branch blocks, and first degree AV blocks. The most common mode of termination is pharmacological.

REFERENCES

[1] Rissam HS, Kishore S, Trehan N. Coronary artery disease inyoungIndians–Themissinglink. *Journal, Indianacademy of clinicalmedicine*. 2001;2(3):128-32.
[2] "The Top 10 Causes of Death." WHO. N.p., 2013. Web. 25 Sept. 2013.
[3] Fabijanic D, Culic V, Bozic I, et al. Gender differences in in-hospital mortality and mechanisms of death after the first acute myocardial infarction. *Ann Saudi Med*. 2006; 6: 455–60.
[4] Armstrong, William F, and Paul L Mchenry. Ambulatory electrocardiographic monitoring: can we predict sudden death? *Journal of the American College of Cardiology.* 5.6 (1985): 13B-6B.
[5] Thygesen K, Alpert JS, Jaffe AS, et al. Third universal definition of myocardial infarction. *European Heart Journal.* 2012.
[6] Ghuran AV and Camm AJ. ischemic heart disease presenting as arrhythmias. *BMB*. 2001; 59: 193-210.
[7] American Heart Association. Heart and stroke facts: 1995. Statistical Supplement. *Dallas, American Heart Association*. 1994.
[8] Abildstrom SZ, Rask-Madsen C, Ottesen MM, Anderson PK, Rosthoy S, Torp-Pedersen C et al. Impact of age and sex on sudden cardiovascular death following myocardial infarct ion. *Heart.* 2002; 88 : 573-78.
[9] Campbell RWF, Murray A, Julian DG. Ventricular arrhythmias in first 12 hours of acute myocardial infarction. Natural history study. *Br Heart J.* 1981; 46: 351-57.
[10] Bahl AL, Lal HB, Dhawad PN. Arrhythmias complicating acute myocardial infarction. *Journal of the Indian Medical Association*. 1969; 53(11):, 534-38.
[11] Volpi A, Cavali A, Santoro L, Negri E. Incidence and prognosis of early primary ventricular fibrillation in acute myocardial infarct ion results of the Gruppoltaliano per lo studio dellaSopravvivenzanell'InfartoMiocardico (GISSI-2) database. *Am J Cardiol.* 1998; 82: 265-71.
[12] Echt DS, Liebson PR, Mitchell LB, Peters RW, Obias-Manno D, Barker AH, et al. Mortality and morbidity in patients receiving encainide, flecainide, or placebo - the cardiac arrhythmia suppression trial. *New England Journal of Medicine*. Mar 1991; 324(12): 781-88.
[13] Geoffrey H Tofler, Peter H Stone, James E Muller, John D Rutherford, Stefan N Willich, Nancy F. Gustafson, et al. and the MILIS study group. Prognosis after cardiac arrest due to ventricular tachycardia or ventricular fibrillation associated with acute myocardial infarction. *Am J Cardiol.* 1987; 60 (10): 755-61.
[14] Wolfe CL, Nibley C, Bhandari A, Chatterjee K, Scheinman M. Polymorphous ventricular tachycardia associated with acute myocardial infarction. *Circulation.* 1991; 84(4): 1543-51.
[15] Newby KH, Thompson T, Stebbins A, Topol EJ, Califf RM, Natale A. Sustained ventricular arrhythmias in patients receiving thrombolytic therapy. Incidence and outcomes. *The GUSTO Investigators. Circulation.* 1998; 98(23):2567-73.
[16] Behar S, Reicher–Reiss H, Shechter M, Rabinowit z B, Kaplinsky E, Abinader E, et al. Frequency and prognostic significance of secondary ventricular fibrillation complicating acute myocardial infarction. SPRINT Study Group. *Am J Cardiol.* 1993; 71(2): 152-56.
[17] Jewitt DE, Balcon R, Raftery EB, and Oram S. Incidence and management of supraventricular arrhythmias after acute myocardial infarction. *Lancet*. 1967; 2(7519), 734-38.
[18] SPRINT Study Group. Long term prognosis of patients with paroxysmal atrial fibrillation complicating acute myocardial infarction. *Eur Heart J.* 1992 ; 13 (1): 45-50.
[19] Hindman MC, Wagner GS, JaRo M, JM Atkins, MM Scheinman, RW DeSanctis, et al. The clinical significance of bundle branch block complicating acute myocardial infarction: 2. Indications for temporary and permanent pacemaker insert ion. *Circulation.* 1978; 58(4): 679-88.
[20] Archbold RA, Sayer JW, Ray S, Wilkinson P, Ranjadayalan K, Timmis AD. Frequency and prognostic implications of conduction defects in acute myocardial infarct ion since the introduction of thrombolytic therapy. *Eur Heart J.* 1998; 19(6): 893-98.
[21] Simon H. Braet, Christoffel de Zwaan, Pedro Brugada, Coenegracht JM, Wellens HJJ. Right ventricular involvement with acute inferior wall myocardial infarction identifies high risk of developing atrioventricular nodal conduction disturbances. *Am Heart J.* 1984 ; 107(6) : 1183 – 87.
[22] Nicod P, Gilpin E, Dittrich H. Factors associated with acute onset of atrioventricular block in acute Q-wave inferior infarction. *J Am Coll Cardiol.* 1988; 12: 589.
[23] Goldberg RJ, Zevallos JC, Yarzebski J, Alport JS, Gori JM, Chen Z, et al. Prognosis of acute myocardial infarction complicated by complete heart block (the Worcester Heart Attack Study). *Am J Cardiol.* 1992; 69(14): 1135-41.

PARTICULARS OF CONTRIBUTORS:

1. Resident, Department of Medicine, Baroda Medical College, Sir Sayaji General Hospital, Vadodara, India.
2. Intern, Department of Medicine, Baroda Medical College, Sir Sayaji General Hospital, Vadodara, India.
3. Associate Professor, Department of Medicine, Baroda Medical College, Sir Sayaji General Hospital, Vadodara, India.
4. Associate Professor, Department of Medicine, Baroda Medical College, Sir Sayaji General Hospital, Vadodara, India.
5. Resident, Department of Medicine, Baroda Medical College, Sir Sayaji General Hospital, Vadodara, India.
6. Resident, Department of Medicine, Baroda Medical College, Sir Sayaji General Hospital, Vadodara, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr Mohit J Shah,
B/14, Ashok Vatika Soc., Behind Bright School lane, VIP Road, Vadodara-18, India.
Phone: +91-9825700991, E-mail: mohitjshah@yahoo.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Jun 08, 2013**
Date of Peer Review: **Sep 18, 2013**
Date of Acceptance: **Oct 19, 2013**
Date of Publishing: **Jan 12, 2014**