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A Study on Arrhythmias within 48 Hours of Acute Myocardial Infarction

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Abstract: ***Background and Objectives: The profile of coronary artery disease is different in India in terms of incidence and risk factors. Indians show higher incidence of hospitalization, morbidity and mortality than other ethnic groups. Also, Gujarat region have higher prevalence. Majority of deaths in acute myocardial infarction are due to arrhythmias. These would suggest that more aggressive identification and modulation of cardiac arrhythmias in acute myocardial infarction is necessary among Asian Indians, particularly Gujarat. This study is undertaken to study the profile of arrhythmias in acute myocardial infarction during the first 48 hours, among survivors of hospitalization in our hospital. Methods: This study was conducted in Sir Takhtasinhji Hospital, Bhavnagar. A total of 100(80 males, 20 females) patients admitted to the intensive coronary care unit (ICCU) with diagnosis of acute myocardial infarction were included in the study. Patients are monitored for 48 hours and the pattern of arrhythmias, among survivors, were noted. Results: 80 males and 20 females were studied. 71% of the patients were thrombolysed. Arrhythmias were seen in 68% of the cases. 73.5% of the arrhythmias occurred during the first hour. 42.7% of the arrhythmias underwent spontaneous resolution. 31% of the patients had sinus bradycardia (alone and along with other arrhythmias). Conclusion: The present study suggests that majority of the cases with acute myocardial infarction had arrhythmias. Sinus bradycardia was the commonest arrhythmia noted, followed by sinus tachycardia and ventricular premature contractions. However, they also occurred along with otherarrhythmias.***

Keywords: Arrhythmia; Myocardial infarction

1. Introduction

Despite considerable progress in management over the recent years, coronary artery disease (CAD) remains the leading cause of death in the industrialized world. Indians also show higher incidence, morbidity and mortality than other ethnic groups. Many of these deaths are attributed to the development of arrhythmias during periods of myocardialinfarction.

A substantial number of patients with acute myocardial infarction have some cardiac rhythm abnormality, and approximately twenty-five percent have cardiac conduction disturbance within 24 hours following infarct onset. Almost any rhythm disturbance can be associated with acute myocardial infarction, including brady- arrhythmias, supraventricular tachyarrhythmias, ventricular arrhythmias, and atrioventricular block. With the advent of thrombolytic therapy, it was found that some rhythm disturbances in patients with acute myocardial infarction may be related to coronary arteryreperfusion[2].
The purpose of this study is to evaluate the incidence and profile of cardiac arrhythmias in acute myocardial infarction in the first 48 hours, among survivors, of hospitalization. Attention is given to the peri infarction period (arbitrarily accepted as within 48 hours of myocardial infarction) as arrhythmias are most likely to be seen around thistime[3].

Aim
The aim of the present study is to study the pattern of arrhythmias during first 48 hours of acute myocardial infarction, among survivors.

2. Materials and Methodology

The study was conducted in GMC and Sir Takhtasinhji Hospital, Bhavnagar through December 2019 to September 2020. A total of 100 cases admitted to the ICCU were studied. This was a descriptive study.

Inclusion Criteria:
1) Patients 18 years of age or above admitted in the ICCU with acute myocardial infarction.
2) Myocardial infarction less than 48 hours old.
3) Above cases surviving for 48 hours post admission.

Study Population:
A total of 100 cases were recruited on admission to the intensive coronary care unit at Sir T. Hospital, Bhavnagar. Cases with confirmed diagnosis of acute myocardial infarction and satisfying the inclusion criteria were studied. The diagnosis of acute myocardial infarction was based on the Revised Definition of Myocardial Infarction.[103] Typical rise and gradual fall (troponin) or morerapidriseandfall(CK-MB)ofbiochemicalmarkersofmyocardialnecrosis with at least one of thefollowing:
a) Ischemicsymptoms.
b) ECG changes indicative of ischemia (ST–segment elevation or depression).

Collaborating Department
Department of Medicine, Government Medical College & Sir Takhtasinhji General Hospital, Bhavnagar.

Clinical Data
A detailed case history with special reference to the cardiovascular system was taken. A thorough physical examination was done with emphasis on the cardiovascular system.

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Investigations

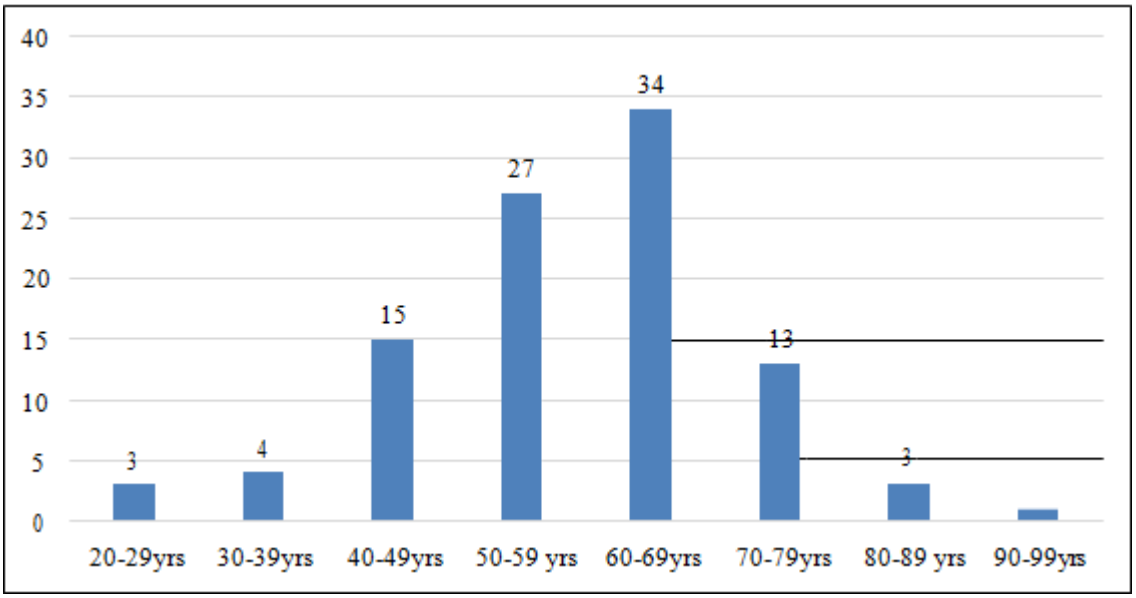
12-lead ECG was taken at admission, at 24 hours, 48 hours and at the time of arrhythmia. Multi parameter monitors were used to monitor the cases for 48 hours and the pattern of arrhythmias, if any, was noted. All the cases are subjected to blood CK- MB estimations and blood sugar evaluation. 2-D echocardiography was done wherever possible, during the first 48 hours of hospitalization. Statistical analysis was done.

3. Observations and Results

A total of 100 cases studied.

Age distribution of the cases:

Age group	Number of cases
18-29 years	03
30-39 years	04
40-49 years	15
50-59 years	27
60-69 years	34
70-79 years	13
80-89 years	03
90-99 years	01
Total	100

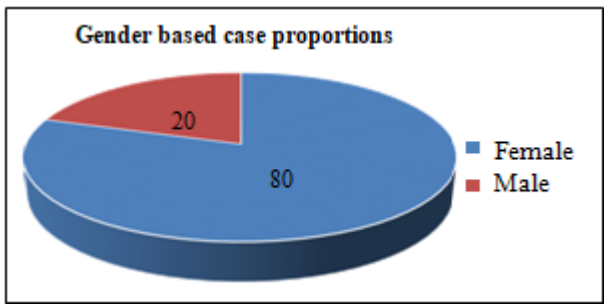


The study group with 100 cases had ages ranging from 25 to 95 years.

Majority were above the age of 50 years.

Gender distribution of cases:

Gender	Number of Cases	Percentage
Males	80	80
Females	20	20
Total	100	100



80% of the cases were constituted by males and 20% by females

Age Vs Gender

Age group	Gender		Total %
	Male %	Female %	
20- 29	3.75	0.0	3
30- 39	5.0	0.0	4
40- 49	17.5	5.0	15
50- 59	26.25	30.0	27
60- 69	30.0	50.0	34
70- 79	13.75	10.0	13
80- 89	3.75	0.0	3
90- 99	0.0	5.0	1
Total	100	100	10 0

Arrhythmia occurrence:

Arrhythmia status	Percentage
Arrhythmias	68
No Arrhythmias	32
Total	100

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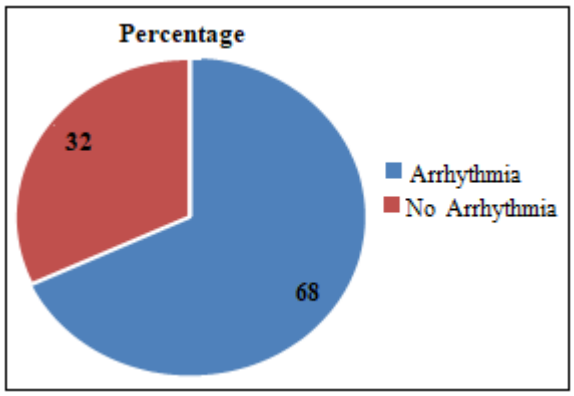
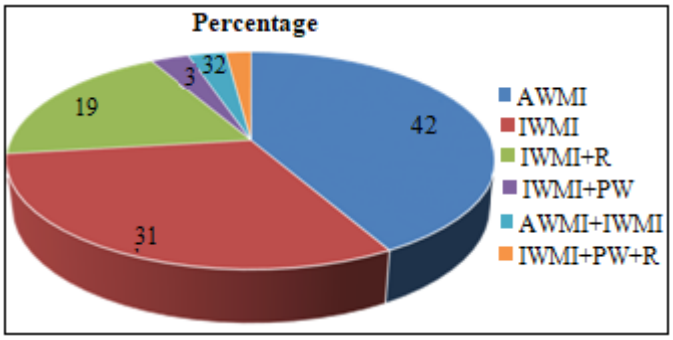


68% of the cases were detected to have arrhythmia.

Site of Infarction:

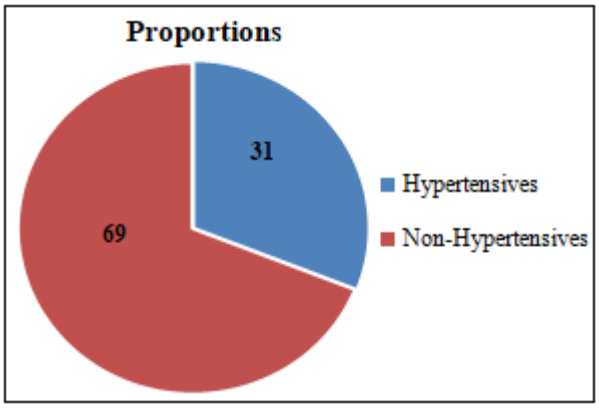
Site of infarction	percentage
AWMI	42
IWMI	31
IWMI+RV	19
IWMI+PW	03
AWMI+IWMI	03
IWMI+PW+RV	02
TOTAL	100



Majority of cases had anterior wall myocardial infarction, followed by isolated inferior wall myocardial infarction.

Hypertensives and non-Hypertensives:

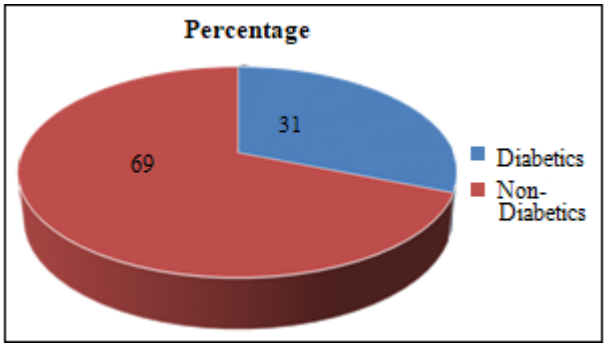
Hypertension status	Percentage
Hypertensives	31
Non-Hypertensives	69
Total	100



Majority of the cases were non-hypertensives.

Diabetics and Non-Diabetics

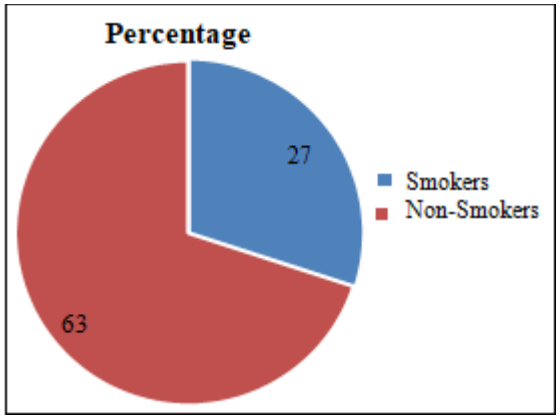
Diabetic	Frequency	Percentage
No	69	69
Yes	31	31
Total	100	100



31.0% of the cases were diabetics.

Tobacco Smoking and AMI:

Smokers	Number of cases
Yes	27
No	63
Total	100



Majority of the cases in this study were found to be non-tobacco smokers.

AMI and Thrombolysis:

Thrombolysis Status	Percentage
Trombolysed	71
Non thrombolysed	29
total	100

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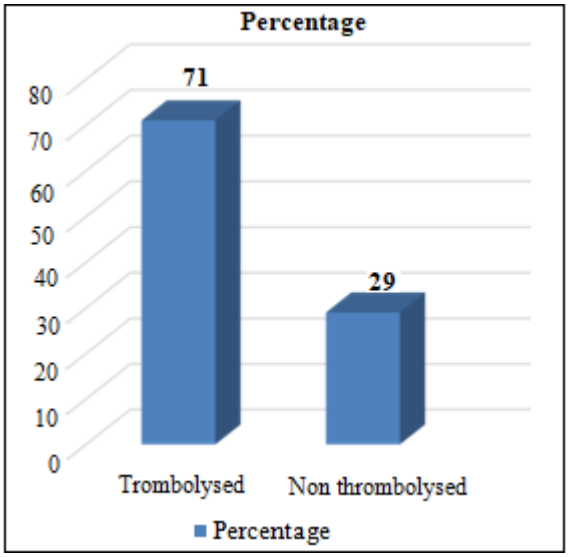
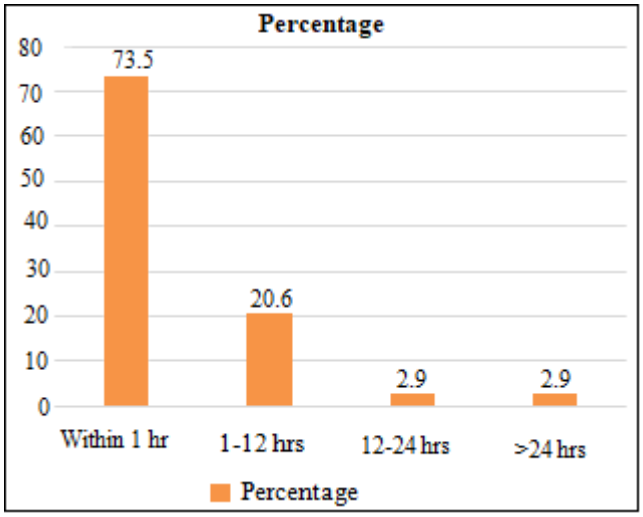


Majority of the cases were thrombolysed.

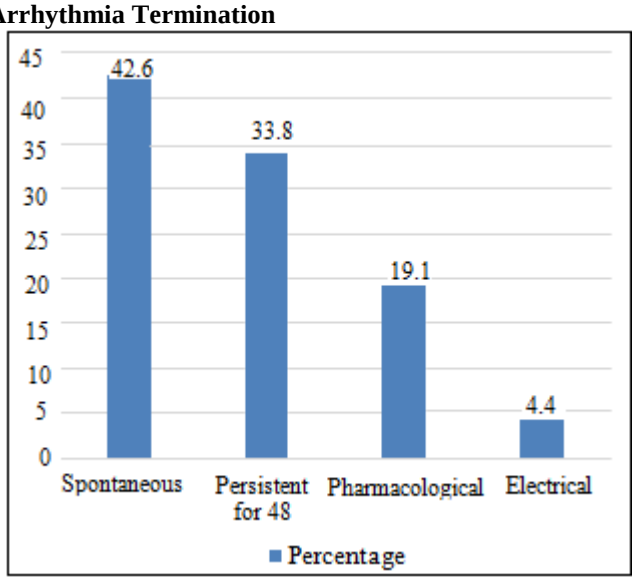
Time of arrhythmia detection:

Timing of Arrhythmia	Frequency	Percentage
Within 1 hour	50	73.5
1-12 hours	14	20.6
12-24 hours	02	2.9
>24 hours	02	2.9
Total	68	100



Majority of arrhythmias occurred during the first hour of hospitalization.

Arrhythmia Termination



Majority of arrhythmias underwent spontaneous resolution. It persisted in 33.8% of cases with arrhythmias for 48 hours, 19.1% required pharmacological intervention, 4.4% required electrical intervention.

Specific Arrhythmias

Type of arrhythmia	Frequency	Percent
VPC	3	4.4
VT	2	2.9
VF	1	1.5
Sinus bradycardia	12	17.6
Sinus tachycardia	11	16.2
SVT	1	1.5
LAFB	1	1.5
CHB	10	14.7
VPC + RBBB	3	4.4
VPC + Sinus bradycardia	3	4.4
VPC+ Sinus tachycardia	4	5.9
LBBB	4	5.9
RBBB	4	5.9
VPC+ Sinus tachycardia +first degree heart block	1	1.5
LBBB+VPCs	1	1.5
Sinus bradycardia+ first degree heart block+ VPCs	1	1.5
Sinus tachycardia+ RBBB	1	1.5
Sinus bradycardia+ first degree heart block	1	1.5
Sinus bradycardia +CHB +Sinus tachycardia	1	1.5
RBBB+ Sinus bradycardia	1	1.5
VT+ Sinus bradycardia	1	1.5
Sinus bradycardia+ Sinus tachycardia	1	1.5
Total		100

VPCs occurred in isolation in 4.4% of cases with arrhythmias but it also occurred along with other arrhythmias. Sinus bradycardia was the most common arrhythmia.

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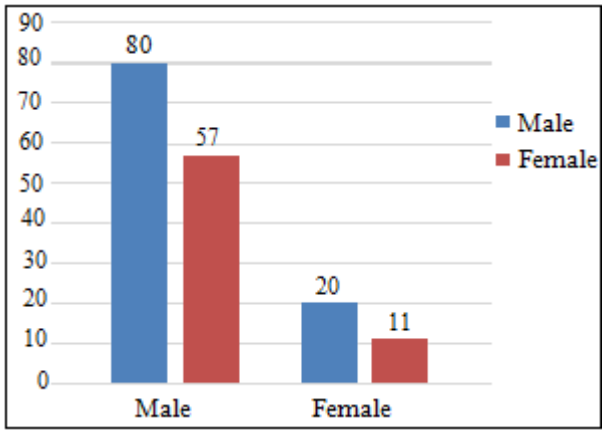
Arrhythmia Vs Gender



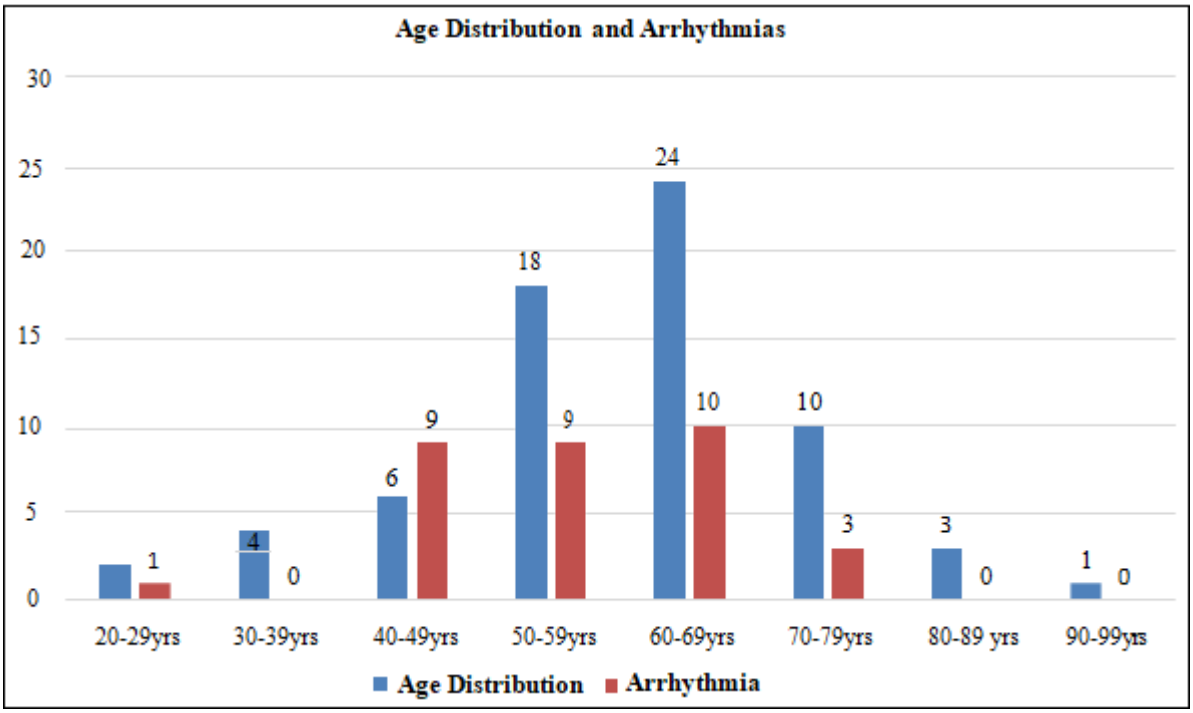
Arrhythmias occurred in 55.0% females and in 71.25% of males.

Time of Arrhythmia Vs Gender

Time of arrhythmia	Gender		Total
	Male	Female	
No	23	09	32
Within 1st hour	41	09	50
1-12hrs	12	02	14
12-24 hrs	02	00	02
>24hrs	02	00	02
Total	80	20	100.0

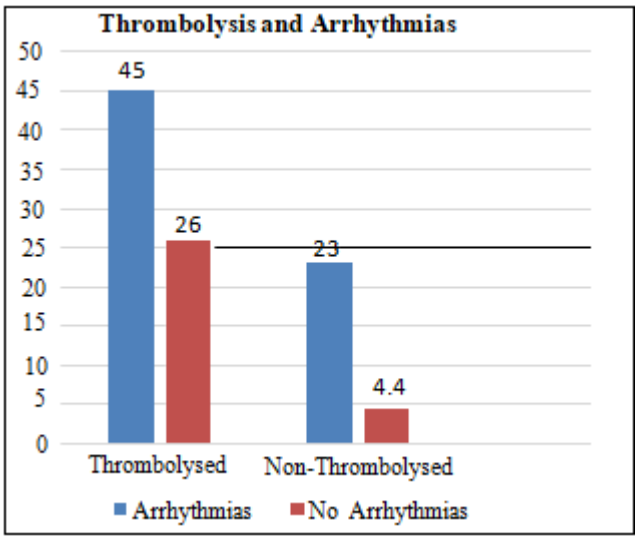
Majority of arrhythmias in both males and females occurred during the first hour of hospitalization and was statistically significant.
P=<0.001

Age Distribution Vs Arrhythmia



Arrhythmia Vs Thrombolysis

	AMI cases	Arrhythmias
Thrombolysed	71	45
Non-Thrombolysed	29	23
Total	100	68



Chi-square test value=2.4012 and p =>0.05

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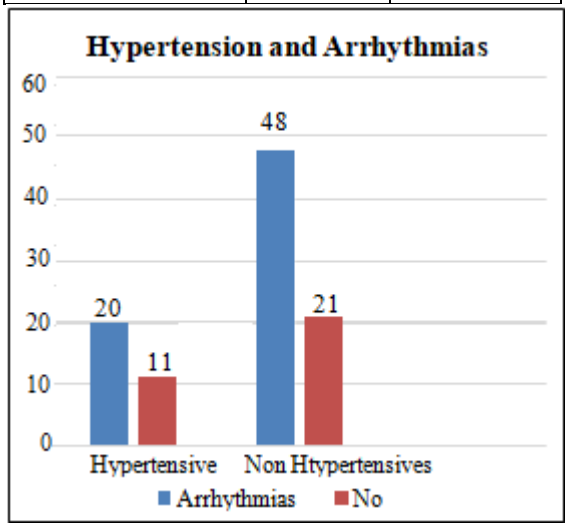
Arrhythmias occurred frequently in those who were non-thrombolysed, than in those who were thrombolysed but was not statistically significant.

Hypertension Vs Arrhythmias

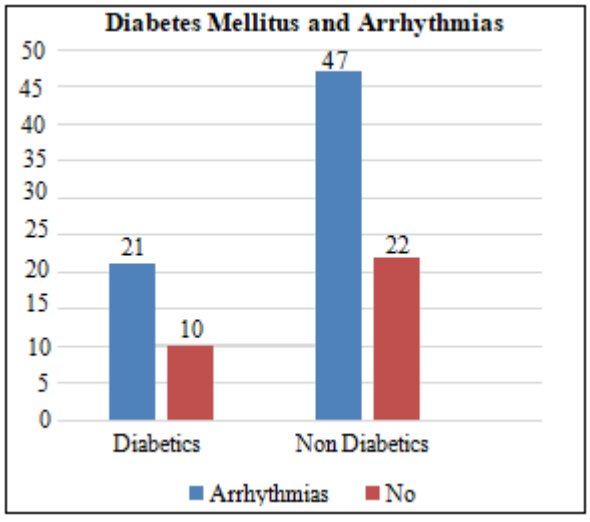
Comorbidity	AMI cases	Arrhythmias
Hypertensives	31	20
Non-Hypertensives	69	48
Total	100	68



Chi -square test value=0.250 and p=>0.05
64.5% of hypertensives were detected to have arrhythmia. It was not statistically significant.

Diabetes Mellitus Vs Arrhythmia

Comorbidity	No. of AMI Cases	Arrhythmias
Diabetics	31	21
Non-Diabetics	69	47
Total	100	68



Chi-square test value=0.0013 and p=>0.05
67.74% of those with diabetes mellitus had arrhythmia but was not found to have any statistical significance.

4. Discussion

The current study is a descriptive study and included 100 cases. Cases were evaluated with special reference to the pattern of cardiac arrhythmias in acute myocardial infarct ion during the first 48 hours of hospitalization. Studying arrhythmias in hospitalized cases of acute myocardial infarction is an indirect estimate of mortality and assumes significance because true mortality due to acute myocardial infarction is difficult to ascertain in the community due to inadequate reporting and low autopsy rates. Indian show higher incidence of mortality than other ethnicgroups.[1]

The conventional risk factors namely age, sex, hypertension, diabetes mellitus, and smoking were also evaluated in these cases. This study showed myocardial infarction was more common among elderly, in accordance to the American Heart Association observation. In the study by SZ Abildstrom et al as compared to non- sudden cardiac death, the risk of sudden cardiac death, 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.

This study showed a male preponderance as was observed in the Framingham Heart study. In a prospective community based study by Shmuel Gottlieb et al of consecutive AMI cases hospitalised in CCUs in the mid 1990s indicate that women fare significantly worse than do men at 30 days. In a study by Yee Guan Yap et al in high – risk post – MI cases with LVEF<40% or frequent VPCs, the risk of arrhythmia deaths was higher than that of non-arrhythmia deaths for up to two years although in female cases, they became increasingly more likely to die from non-arrhythmic deaths after 6 months. The risk of sudden cardiac death, following myocardial infarction was slightly lower in women.

In the present study, 74.07% smokers had arrhythmias. The Framingham study demonstrated that smokers have a 2-3 fold increase in sudden cardiac death in each decade of life at entry between 30 and 50 years and that this is one of the few risk factors in which the proportion of CAD deaths that are sudden increases in association with the risk factors.

In a study by Hallstrong AP et al, out of 310 survivors of out of the hospital cardiac arrest, there current cardiac arrest rate was 27% at 3 year follow- up among those continued to smoke after the index event compared with 19% in those who stopped smoking.

In the present study, arrhythmias were detected in 68% of the cases. In a study by Aufderheide, T.P., 90% of cases with acute myocardial infarction have some cardiac rhythm abnormality during the first 24 hours following infarct onset.

The present study majority of arrhythmias occurred during the first hour of hospitalization. In the study by Aufderheide, T.P. , approximately 25% have cardiac conduction disturbance within 24 hours following infarct onset.

In the present study VPCs were observed in 4.4% of the cases with arrhythmias when they occurred alone. However, they also occurred in the same case along with other arrhythmias like heart blocks and tachyarrhythmias. In a study by Campbell RW et al and Bigger JT et al , VPCs of various

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frequencieswereobservedinupto90%ofcaseswithMI.Inastudy byVolpi A. et al, approximately 36% of cases with acute myocardial infarction presented with less than one premature ventricular beat per hour in Holter, whereas almost 20% of cases showed frequent (more than 10 premature ventricular beats per hour). In the present study, sinus tachycardia alone occurred in 16.17% of the cases with arrhythmias, however it was also associated with other arrhythmias like VPC, and RBBB. In a study by Irwin JM, sinus tachycardia was observed in up to 30% of the cases. In the present study, VT occurred alone in 2.94 % of the patients. In a study by Echt DS et al and the CAST investigators, 20% of cases had non-sustained VT and only 10% had more than one run of VT in 24 hours. In a study by Tofler GH et al , sustained VT occurring within 48 hours of MI seen in 2% of cases is often transient and is not associated with long – term risk of sudden cardiac death. In a study by Wolfe CL et al, polymorphic VT seen in 2% of cases with MI is often rapid, symptomatic and hemodynamically and electrically unstable. In a study by Bigger JT et al, non-sustained VT is linked to an increased risk of sudden death during the first 6 to 12 months after MI especially when associated with reduced LVEF (<40%). In a study by Newby KH et al, sustained VT and VF occur in up to 20% of cases with AMI and have been associated with poor prognosis.

Despite the use of thrombolytic therapy, both early (< 2 days) and late (>2 days) occurrences of sustained VT and VF were associated with a higher risk of later mortality; cases with both VT and VF had the worst outcomes. Eldar M et al concluded that cases with primary sustained ventricular tachycardia identified as sustained tachycardia of ventricular origin occurring within 48 hours of acute MI in cases without hemodynamic compromise (Killip Class I) carries worse in-hospital prognosis than non-sustained tachycardia. In the present study 4.4% of the cases with arrhythmias had VT. In a study by ClemmensenP et al , cases with complete AV block had more episodes of ventricular fibrillation or tachycardia (14%), sustained In the present study, ventricular fibrillation occurred in 1.5% of the cases with arrhythmias. In a study by Tofler GH et al, 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 u to 5% of cases. Ventricular fibrillation occurring within 48 hours of myocardial infarction is not predictive of higher mortality during the first year after infarction.

Volpi A et al concluded that primary VF, irrespective of timing, was an independent predictor of in-hospital mortality. In a study by Behar S et al the incidence of secondary VF complicating AMI was 2.4%.

In the present study, sinus bradycardia was observed in 31%of the cases with arrhythmias. In a study by Pantridge J.F et al , sinus bradycardia was observed in 25 to 40 percent of the cases with arrhythmias. In the present study, LAFB was seen in 1.5% of the cases with arrhythmias, first degree heart block in 4.4%, second degree heart block was not seen, complete heart block presenting alone in 16.17% of the cases with arrhythmias.

RBBB was present along with VPC in 3.0 % of the cases with arrhythmias.

In a study by Hindman MC et al, intraventricular conduction delays, including bundle branch block and fascicular block, occur in up to 20% of cases. Archbold RA, et al observed that LBBB and RBBB occurred in 2.4% and 3.6% of the cases respectively and bi-fascicular block occurred in 2.9%. Alan S. Go et al, concluded that prevalence of RBBB and LBBB are similar. Patients with bundle branch block have more comorbid conditions, are less likely to receive thrombolytic therapy and have an increased risk for in-hospital death compared with patients with no bundle branch block. Compared with LBBB, RBBB seems to be a stronger independent predictor of in- hospital death.

In a study by Nicod P et al, 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%.

In the present study, Complete heart block is seen in 17.6% of cases with arrhythmias(out of which 92% occurred in inferior/posterior wall AMI)and generally occurs early in the course of infarction.111AstudybyGoldbergRJet al , showed that in hospital mortality is significantly higher with anterior wall infarction with complete heart block than with inferior wall myocardial infarction and that complete heart block is twice as common with inferior or posterior wall infarction as with anterior wall involvement. Archbold RA et al observed complete heart block in 5.3% and complete heart block involving both bundle branches in 1.6%, bi-fascicular block in 2.9%. More advanced degree of block in cases with diabetes, AWMI, LVF, previous infarction, Q wave infarction.

Alan S Go et al, noted conduction defects in16%of cases and concluded that a small decline in rate of severe conduction defects compared with previous studies, possibly reflecting the beneficial effects of thrombolytic therapy on infant size. In the present study, 12% of cases had IWMI + RV. Simon H. Braet et al1 1 2 concluded that the incidence of high degree AV nodal block in patients with RV involvement was 48% compared to only 13% in patients with IWMI without RV involvement. Results from TIMI II , showed that heart -block occurred in 12%, 63% had on presentation, 5.7% in 24 hours after treatment with rt –PA and patients with heart block at entry were old and had greater proportion of cardiogenic shock. Heart -block is common among patients with inferior infarction given thrombolytic therapy and is associated with increased mortality. In a study by Harpaz D et al , the incidence of complete heart block complicating AMI is lower in the thrombolytic era than in the pre-thrombolyticera. The AMI patients who develop complete heart block in the thrombolytic era have significantly worse prognosis than do patients without complete heart block.

In the present study 75% of arrhythmias occurred during the first hour of hospitalization. In the study by Aufderheide, T.P.2, 90% of cases with acute myocardial infarction have some cardiac rhythm abnormality within 24 hours following infarct onset. In a study by Alejandro Macchia et al, compared to patients with EF >50%, systolic dysfunction patients had higher mortality and sudden death rates. In a study by Yee Guan Yap et al, in high risk post MI patients with LVEF < 40% or frequent VPCs, the risk of arrhythmic

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deaths was higher than that of non-arrhythmic deaths for up to 2 years. In a study by Scott D Solomon et al, the risk of sudden death is highest in first 30 days after myocardial infarction among patients with left ventricular dysfunction, heart failure or both.

The commonest arrhythmia during thrombolysis was Sinus bradycardia, followed by VPCs. In a study by Maria Cecilia Solimene et al, reperfusion arrhythmias were observed in 75% patients and consisted of ventricular arrhythmias and / or sinus bradycardia. This study group was compared to another group with AMI treated conventionally and there was no difference between both groups in regard to the incidence and type of ventricular arrhythmia.

In the present study, 31% of cases were diabetics and 67.7% of those with diabetes had arrhythmia. In the study by Rana JS et al, patients with diabetes are less likely to develop ventricular arrhythmia than cases without diabetes.

5. Conclusion

In this study 68% of the cases had arrhythmia. Sinus bradycardia was the commonest arrhythmia Sinus tachycardia and Ventricular premature contractions were the next most common arrhythmias. However ventricular premature contractions also occurred along with other arrhythmias like first degree heart block, sinus bradycardia, sinus tachycardia, right and left bundle branch blocks and ventricular tachycardia.

Prompt diagnosis and immediate specific treatment of underlying arrhythmia gives good clinical recovery.

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