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# A Study on the Incidence and Natural History of Various Types of Arrhythmias in Acute Myocardial Infarction

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### ABSTRACT

**Objective:** To study the incidence and natural history of various types of arrhythmias in acute myocardial infarction (ACS).

**Methods:** This was a cross-sectional study. A total of 75 patients diagnosed cases of ACS patients were included in the study. The detailed history was taken for present illness with emphasis on pain in chest, breathlessness, sweating palpitation, fainting attacks and unconsciousness etc.

**Results:** More than one third of patients were between 50-59 years of age (49.3%). Majority of patients were males (68%). The incidence of arrhythmia was 81.3%. About one third of Arrhythmia occurred between 1-12 hours (31.1%). The most common arrhythmia termination was spontaneous resolution (49.2%). VPC was the most common type of arrhythmia (42.6%) and SB was the second most common type of arrhythmia (39.3%). The incidence of arrhythmia was highest in the age between 60-69 years (88.9%) and lowest in  $\geq$ 70 years (60%). The incidence of arrhythmia was higher among females (91.7%) compared to males (76.5%). There was no significant (p>0.05) association of incidence of arrhythmia with age and gender.

**Conclusion:** A high incidence of arrhythmias in the first week following AMI was found. Spontaneous resolution was the most common Arrhythmia termination. VPC was the most common arrhythmia type (42.6%) and SB was the second most common type of arrhythmia (39.3%).

Keywords: Acute myocardial infarction, Arrhythmia, Incidence

## 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 (Rissam et al, 2001). 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. 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 (Fabijanic et al, 2006). It is known that ischemia and infarction leads to metabolic and electrophysiological changes that may cause silent and symptomatic life-threatening arrhythmia. At least 75% of patients with acute myocardial infarction (AMI) have an arrhythmia during the peri-infarct period (Lloyd-Jones et al, 2000).

Different types of arrhythmia (both brady and tachy) can occur. A higher incidence of bradyarrhythmia is associated with inferior and posterior AMI, compared to anterior and lateral AMI. According to one study, around 3.7% of patients with inferior or posterior AMI developed complete heart block, only 1% of those with anterior or lateral AMI developed complete heart block (Hreybeand Saba, 2009).

The diagnosis of first-degree atrioventricular (AV) block (1.1% vs 0.6%), second- degree AV block types I (1.1% vs 0.4%) and II (0.2% vs 0.0%) were more common in the context of inferior or posterior compared to anterior or lateral AMI. There was no difference in the incidence of VT by AMI location (7.3% in inferior or posterior AMI versus 7.9% in anterior or lateral AMI, HR = 0.89, p = 0.064) while VF was marginally more frequent among patients with an anterior or a lateral AMI (9.0% vs 8.1%, HR = 0.65, p = 0.023) (Das, 2016).

The present study was designed to study the incidence and natural history of various types of arrhythmias in acute myocardial infarction. (Did we include unstable angina in ACS? If not we need to mention specifically that U/S cases were excluded , although these too could cause serious arrhythmias)

## MATERIAL AND METHODS

This was a cross-sectional study conducted in a tertiary care hospital. The study was approved by the Ethical committee of the Institute and consent was taken from participants before including in the study. A total of 75 patients were included in the study.Diagnosed cases of ACS patients on emergency treatment irrespective of other coexisting disease, age >20 years, both male & female patients, recent ACS causing recurrent chest pain with OR without cardiac failure features and both tachyarrhythmia &bradyarrhythmia incidence in ACS patients were included in the study. Old referred cases of ACS, stable angina patients, pregnant women, HIV,

Hepatitis B, Hepatitis C positive patients were excluded from the study.

#### Methods

The detailed history was taken for present illness with emphasis on pain in chest, breathlessness, sweating palpitation, fainting attacks and unconsciousness etc. They were asked for such type of attacks in the past and also history suggestive of hypertension, diabetes etc. in themselves or in any family member. Twelve leads electrocardiograms were recorded 12 hour lies for first 48-72 hours from the onset of first symptom then once a day for one week and then at weekly interval as possible till the stay of patient in hospital.

Electrocardiographic findings were carefully analyzed and diagnosis of acute myocardial infarction was made by the presence of at least two of the following criteria:

- I. History of typical chest pain lasting for more than 30 minutes, not relieved by rest or nitroglycerine, associated with or without perspiration, breathlessness or sense of impending death.
- II. Raised levels of serum transaminase (S.G.O.T.) and other serum enzymes.

(The enzymes are Trop T or I / CK MB)

III. Electrocardiographic manifestations of acute myocardial infarction were determined as described by Schamroth (1990)

### RESULTS

More than one third of patients were between 50-59 years of age (49.3%). Majority of patients were males (68%) (Table-1).

The incidence of arrhythmia was 81.3% (Table-2).

About one third of Arrhythmia occurred between 1-12 hours (31.1%) followed by  $1^{st}$  hour (29.5%), >24 hours (24.6%) and 12-24 hours (14.8%) (Table-3).

The most common arrhythmia termination was Spontaneous resolution (49.2%) and Pharmacological intervention was the second most common arrhythmia termination (31.1%). Electrical intervention was the least common arrhythmia termination (8.2%) (Table-4). VPC was the most common type of arrhythmia (42.6%) and SB was the second most common type of arrhythmia (39.3%). AF was found to be third most common type of arrhythmia (24.6%). VF was found to be least common type of arrhythmia (11.5%) (Table-5).

(What is the mortality ? did all patients with serious arrhythmias like VF and VT survive? Whether they needed any intervention other than pharmacological intervention?)

The incidence of arrhythmia was highest in the age between 60-69 years (88.9%) and lowest in  $\geq$ 70 years (60%). The incidence of arrhythmia was higher among females (91.7%) compared to males (76.5%). There was no significant (p>0.05) association of incidence of arrhythmia with age and gender (Table-6).

# 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. 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 (Ghuran and Camm, 2001).

In this study, more than one third of patients were between 50-59 years of age (49.3%). Majority of patients were males (68%). In a study (Tofighiyan et al, 2013), among 132 patients with myocardial infarction, 25% were female and 75% were male. Most patients (31.8%) were 61 to 70 years, and two patients were under 30 years.

The incidence of arrhythmia was 81.3% in the present study. In a study by Aufderheide(1998), 90% of patients with acute myocardial infarction have some cardiac rhythm abnormality during the first 24 hours following infarct onset. Tofighiyan et al (2013) found that less than half of the patients had normal sinus rhythm and the remaining had arrhythmia.

In this study, about one third of Arrhythmia occurred between 1-12 hours (31.1%) followed by  $1^{st}$  hour

(29.5%), >24 hours (24.6%) and 12-24 hours (14.8%). Marangmei et al (2014) showed that seventy-six percent of the patients with AMI had arrhythmia within 48 hours of hospitalization, 22% at the time of hospitalization, and 27% patients within 1st hour of hospitalization. Progressively arrhythmia occurrence decreased with time. Only 2% patients had new arrhythmia after 24 hours of hospitalization.

This showed that the most common arrhythmia termination was Spontaneous resolution (49.2%) and Pharmacological intervention was the second most common arrhythmia termination (31.1%). Electrical intervention was the least common arrhythmia termination (8.2%). Shah et al (2014) reported that pharmacological (39%) was the most common mode of arrhythmia termination followed by spontaneous in 34%, Dc Shock in 14% and remains persistent in 13% of Patients.

In this study, the incidence of arrhythmia was highest in the age between 60-69 years (88.9%) and lowest in  $\geq$ 70 years (60%). The incidence of arrhythmia was insignificantly (p>0.05) higher among females (91.7%) compared to males (76.5%). Shah et al (2014) found that the maximum incidence (41%) of arrhythmias was found in sixth decade. American Heart Association (1994) study showed 42% in age group of 60 or more. Shah et al (2014) showed a male preponderance with approximately 70% patients being male with male: female ratio of 2.3: 1. Marangmei et al (2014) found that out of included 100 arrhythmias patients, age group 40-50 years were 36%, 50-60 years and 60-70 years were 24% each and those more than 70 years were only 14%. Gender-wise 31% were females, while 69% were males.

In the present study, VPC was the most common type of arrhythmia (42.6%) and SB was the second most common type of arrhythmia (39.3%). AF was found to be third most common type of arrhythmia (24.6%). VF was found to be least common type of arrhythmia (11.5%). Shah et al (2014) reported that VPCs were observed in 31% of the patients when they occurred alone.

In this study, VT and VF occurred in 18% and 11.5% patients respectively. Shah et al (2014) found that VT occurred alone in 12% of the patients. In a study by Echt et al (1991) and the CAST investigators, 20% of patients had non-sustained and

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only 10% had more than one run of VT in 24 hours. 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 (Geoffrey et al, 1987). While other study by Wolfe et al (1991) showed that polymorphic VT seen in 2% of patients with MI was often rapid, symptomatic and hemodynamically and electrically unstable. The study by Newby et al (1998) showed that sustained VT and VF occur in upto 20% of patients with AMI and have been associated with poor prognosis.

It is an established fact that primary VF, irrespective of timing, is an independent predictor of in hospital mortality. In the study by Behar et al (1993), the incidence of secondary VF complicating AMI was 2.4%.

In the present study, first degree heart block, 2<sup>nd</sup> degree heart block and CHB occurred in 19.7%, 23% and 13.1% patients respectively. In study by Simon et al (1984), first degree AV block was in 16%,second degree AV block was in 8% and CHB was in 9%. Shah et al (2014) reported that 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 patients.

## CONCLUSION

A high incidence of arrhythmias in the first week following AMI was found. Spontaneous resolution was the most common Arrhythmia termination. VPCwas the most common arrhythmia type (42.6%) and SB was the second most common type of arrhythmia (39.3%).

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Age in	Ma	ıle	Fema	ale	Total		
years	No.	%	No.	%	No.	%	
<50	14	93.3	1	6.7	15	20.0	
50-59	22	59.5	15	40.5	37	49.3	
60-69	14	77.8	4	22.2	18	24.0	
≥70	1	20.0	4	80.0	5	6.7	
Total	51	68.0	24	32.0	75	100.0	

 Table-1: Age and sex distribution of patients

Table-2: Distribution of patients according to incidence of Arrhythmia

Incidence of Arrhythmia	No.	%		
	( <b>n</b> =75)			
Arrhythmia	61	81.3		
No-Arrhythmia	14	18.7		

Time of incidence of	No.	%		
Arrhythmia	( <b>n=61</b> )			
1 <sup>st</sup> hour	18	29.5		
1-12 hours	19	31.1		
12-24 hours	9	14.8		
>24 hours	15	24.6		

### Table-3: Distribution of patients according to time of incidence of Arrhythmia

### Table-4: Distribution of patients according to Arrhythmia termination

Arrhythmia	No.	%		
termination	( <b>n=61</b> )			
Spontaneous resolution	30	49.2		
Persisted for 48 hours	7	11.5		
Pharmacological intervention	19	31.1		
Electrical intervention	5	8.2		

### Table-5: Distribution of patients according to types of Arrhythmia

Arrhythmia termination#	No.	%		
	( <b>n=61</b> )			
Sinus bradycardia (SB)	24	39.3		
Sinus tachycardia (ST)	9	14.8		
Atrial tachycardia (AT)	8	13.1		
First degree heart block	12	19.7		
2 <sup>nd</sup> degree heart block	14	23.0		
Ventricular fibrillation (VF)	7	11.5		
Atrial fibrillation (AF)	15	24.6		
Ventriculartachycardia (VT)	11	18.0		
Left AnteriorHemiblock (LAH)	10	16.4		
Ventricular Premature Contraction (VPC)	26	42.6		
Complete heartblock (CHB)	8	13.1		

#Multiple response

Age and	No. of	Arrhythi	nia	No-Arrh	р- <sub>1</sub>	
gender	patients	No.	%	No.	%	value
Age in years						
<50	15	11	73.3	4	26.7	0.39
50-59	37	31	83.8	6	16.2	
60-69	18	16	88.9	2	11.1	
≥70	5	3	60.0	2	40.0	
Gender						
Male	51	39	76.5	12	23.5	0.11
Female	24	22	91.7	2	8.3	

Тε	ıbl	e-6:	Assoc	iation	of in	cidence	e of A	rrhytł	ımia	with a	ige and	gender	r
								•/			0	0	

<sup>1</sup>Chi-square test