Original Research

To Study Development of Arrhythmia in Patient' s Suffering from Acute Myocardial Infarction and their Outcome

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Abstract:
Introduction: Ischemia and infarction lead 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.
Aim: The aim of the present study is to study the development of arrhythmia in patient's suffering from acute myocardial infarction and their outcome.
Material and methods: The present prospective analysis which includes patients suffering from acute myocardial infarction admitted in MICU. The data was collected by a preformed structured interviewer-administered questionnaire in which demographic, socioeconomic status, medical history and previous history of taking any medications and supplements. ECG was studied on admission and subsequent serial ECG's was analyzed till the patient was discharged or the patient died. The diagnosis and classification of arrhythmia was on the basis of the ECG diagnosis.
Results: A total of 120 subjects were recruited during the study period, out of which 84 (70%) were males and 36 (30%) were females. ST elevation MI was the most common presentation Anterior wall MI was the commonest, followed by inferior wall MI, and the least was combination of inferior and posterior wall MI. VPC (29.17%) was clearly the most common arrhythmia observed, followed by AIVR-13.33%, I degree AVB-11.67% and II degree AVB-9.17%.
Conclusion: In the practice of cardiovascular critical care, we often meet a variety of arrhythmias with a variety of clinical backgrounds. However, conversely, those therapies sometimes bring harmful results. Therefore, we should judge the necessity of the suppressive treatment of arrhythmias and select the most appropriate modality of treatment on a case-by-case basis.
Keywords: Acute myocardial infarction, Acute coronary syndrome, Cardiac arrhythmias, Electrocardiogram

Introduction:

Ischemia and infarction lead 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[1]. Sudden cardiac death (SCD) is most often attributed to this pathophysiology and around one-half of death occurs before the patient reaches hospital. Cause of death in AMI before hospitalization is most often ventricular tachycardia/ventricular fibrillation (VT/VF). Both atrial and ventricular arrhythmia may occur in the setting of acute coronary syndrome (ACS) including ventricular tachyarrhythmia which may cause circulatory collapse and hence need immediate treatment[2]. Incidence of coronary artery disease varies from 20-30% of cardiac cases admitted in any general hospital[1].Cardiac arrhythmias are frequent and serious complications of acute myocardial infarction and along with 7-17% increase in mortality. Despite several breakthroughs in treatment modalities that have emerged, arrhythmia is a major cause of mortality and morbidity in patients of MI[2]. Nearly all patients of acute myocardial infarction have some form of arrhythmias, some are mild without hemodynamic changes, but many of them are life threatening Supraventricular tachycardia (SVT), Ventricular fibrillation (VF) and all are associated with severe hemodynamic changes, hence they have to be recognized and treated urgently to avoid mortality[3-5].The management of arrhythmia is based largely on symptoms. Prophylactic antiarrhythmic management strategies have largely been discouraged. Improvement in medical care, early relief of ischemia, use of beta-blocker, angiotensin-converting enzyme inhibitor (ACE-1) have declined incidence of arrhythmia, still it remains major

cause of mortality in these patients. Use of implantable cardioverter-defibrillator (ICD) has promising effect in primary and secondary prevention of ventricular arrhythmia (VA) in ACS patients[2].   About 50% of deaths of acute myocardial infarction occur within 1hr of onset and are attributable to arrhythmias. Therefore, an attempt has been made to find out the frequency and type of arrhythmias in 1st 48 hrs. of acute myocardial infarction. Thus, this study can be much of practical importance. Since understanding accuracy, identification and prompt management of arrhythmia is important to decrease mortality.Hence, the aim of the present study is to development of Arrhythmia in Patient's Suffering from Acute Myocardial Infarction and their Outcome.

Material and Methods

The present prospective analysis which includes patients suffering from acute myocardial infarction admitted in MICU at Muzaffarnagar Medical college & Hospital, Muzaffarnagar(U.P.) from 1st August 2023 to 31st December 2023. The ethical approval was taken from Institutional Review Board for Ethical Clearance of Muzaffarnagar Medical college & Hospital, after that data collecting was done from admission books and case papers of patients admitted in MICU at Muzaffarnagar Medical college & Hospital. Inclusion criterion include the patient of both sex male and female who fulfill diagnostic criteria for acute myocardial infarction clinically and ECG wise and who present with arrhythmia were included and patient with cardiac disease like Valvular Heart Disease, Congenital Heart Disease, Cardiomyopathies, Pericardial Diseases, Post CABG, Old myocardial infarction & Thyroid dysfunction excluded from study.

Case selection:

The data was collected by a preformed structured interviewer-administered questionnaire that was pretested with modifications made prior to its use in the study. The patients were interviewed with requests for the demographic, socioeconomic status, medical history and previous history of taking any medications and supplements.

Methodology

All the patients of acute myocardial infarction (NSTEMI and STEMI) with arrhythmia admitted in MICU at Muzaffarnagar Medical college & Hospital from 1st August 2023-31th December 2023 was included in this study. The indoor papers were retrieved from the MRO department of Muzaffarnagar Medical college & Hospital.

ECG was studied on admission and subsequent serial ECG's was analyzed till the patient was discharged or the patient died. The diagnosis and classification of arrhythmia was on the basis of the ECG diagnosis. The data collected was analyzed as per the plan mentioned in statistical analysis.

Statistical Analysis:

After collection of data, the data was analyzed in the following way-

(1)   Gender classification into males and females and its percentage.

(2)   Age distribution of patients having arrhythmia after myocardial infarction and its percentage.

(3)   Incidence of various arrhythmias in relation to the site of myocardial infarction was tabulated and its percentage was calculated.

(4)   Incidence of arrhythmias in relation to the time

1. Within 48hrs.
2. At the time of discharge it was calculated.

(5)   Relationship between individual risk factors and patients of AMI and cardiac arrhythmias was tabulated and percentage was calculated.

(6) Outcome as regards death/discharge was calculated as per percentage.

Results:

This prospective study was conducted in MICU at Muzaffarnagar Medical college & Hospital among patients suffering from acute myocardial infarction admitted in MICU at Muzaffarnagar Medical college & Hospital during 1st August 2023 to 31th December 2023. A total of 120 subjects were recruited during the study period, out of which 84 (70%) were males and 36 (30%) were females. Hence there was male dominancy in our study. The age distribution among the study subjects 5%, 17.5%, 35%, 30% and 12.5% of the subjects were having age of 19-30, 31-39, 40-49, 50-59 and >60 years respectively. Hence the maximum subjects were from the age group of 40-49 years followed by 50-59 years while the least subjects were in the age group of 19-30 years showed in table 1Graph 1 showed Out of the 120 cases of acute MI studied, 65.83% had Anterior wall MI, 27.5 % had inferior wall MI, 6.67 % had combined involvement of both inferior and posterior wall. Hence anterior wall MI was the commonest, followed by inferior wall MI, and the least was combination of inferior and posterior wall MI .

Graph 2 showed 12 different types of arrhythmias were observed in the study population. Each occurred at a different frequency. VPC (29.17%) was clearly the most common arrhythmia observed, followed by AIVR-13.33%, I degree AVB-11.67%, II degree AVB-9.17%,VT – 8.33%, LBBB- 6.67%, CHB, APC each 5%, AF – 4.17%, RBBB, VF each 3.33%, SVT- 0.83% respectively . Table 2 showed Chi – square test was used to compare overall outcome in different sex groups. It was found that sex had no significant effect on mortality in this study. It showed significant relationship between the age group and the outcome. Death was highest in 50-59 years age group, and least in below 30 years age group. Using chi-square test overall outcome was compared with the wall involved in MI. It was found that the wall involved affect the prognosis significantly. Maximum death was observed in AWMI, followed by IWMI and the last was Combined Inferior-posterior wall MI (table 3) Using chi-square test overall outcome was compared with various types of arrhythmias observed in this study as shown in table 4. It was found that the type of arrhythmia significantly affects the mortality. Maximum death was observed with ventricular tachycardia (35.29%). Mortality percentages associated with various arrhythmias are CHB - 23.53%, ventricular fibrillation – 17.65%, II-degree AVB – 17.65%, LBBB – 5.88%.

Table 1: Distribution of study subjects according to gender and age

Factor	N	%
Gender		
Male	84	70
Female	36	30
Total	120	100
Age Group (in years)		
19-30	6	5
31-39	21	17.5
40-49	42	35
50-59	36	30
>60	15	12.5
Total	120	100
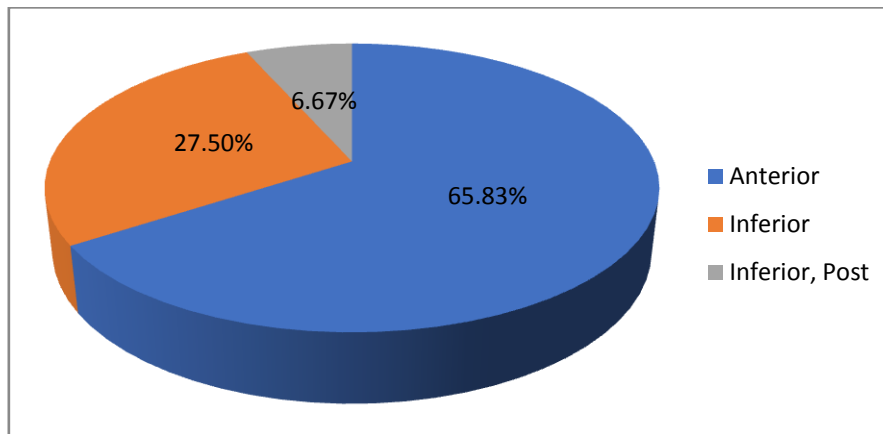
Graph1: Distribution of wall of the heart involved in acute MI among the study subjects
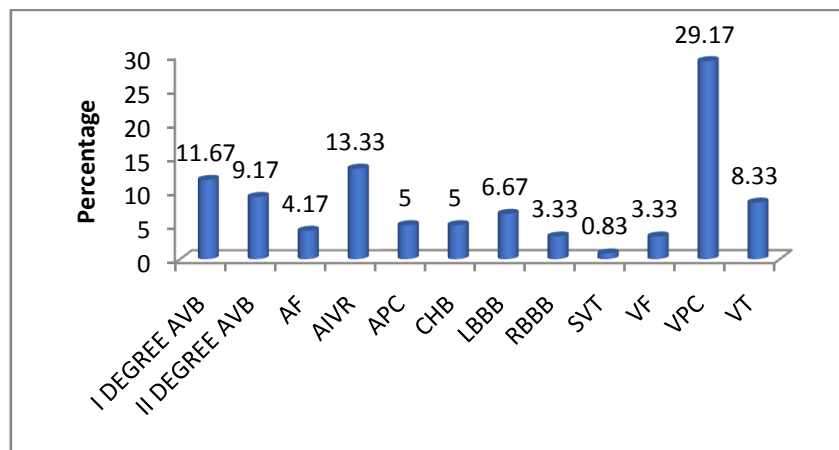
Graph2: Distribution of the type of arrhythmias among the study subjects

Table 2: Outcome among the study subjects w.r.t. gender& age

Variables	Dead		Alive		Chi Square	p value
	N	%	N	%		
Gender						
\Male	11	64.71	73	70.87	2.89	0.47
Female	6	35.29	30	29.13		
Total	17	100	103	100		
Age Distribution						
19-30	0	0.00	6	5.83	12.17	0.009*
31-39	1	5.88	20	19.42		
40-49	3	17.65	39	37.86		
50-59	8	47.06	28	27.18		
>60	5	29.41	10	9.71		
Total	17	100	103	100		

*: statistically significant

Table 3: Outcome among the study subjects w.r.t. wall involved in MI

Particulars	Dead		Alive		Chi Square	p value
	N	%	N	%		
Anterior	10	58.82	69	66.99	10.82	0.02*
Inferior	4	23.53	29	28.16		
Inferior, Post	3	17.65	5	4.85		
Total	17	100	103	100		

*: statistically significant

Table 4: Outcome among the study subjects w.r.t. type of arrhythmias

Particulars	Dead		Alive		Chi Square	p value
	N	%	N	%		
I DEGREE AVB	0	0.00	14	13.59	21.79	0.001*
II DEGREE AVB	3	17.65	8	7.77		
AF	0	0.00	5	4.85		
AIVR	0	0.00	16	15.53		
APC	0	0.00	6	5.83		
CHB	4	23.53	2	1.94		
LBBB	1	5.88	7	6.80		
RBBB	0	0.00	4	3.88		
SVT	0	0.00	1	0.97		
VF	3	17.65	1	0.97		
VPC	0	0.00	35	33.98		
VT	6	35.29	4	3.88		
Total	17	100	103	100		

*: statistically significant

Discussion:

Cardiovascular diseases (CVDs) are the leading causes of death globally. Despite decreasing mortality trends of coronary artery disease (CAD) in many developed countries, an increasing number is noticed in developing countries[6]. Acute myocardial infarction (AMI) is myocardial necrosis in a clinical setting consistent with acute myocardial ischemia and detection of elevated values of cardiac biomarkers (troponin-I/ CK-MB) above the 99th centile of the upper reference limit[7] A substantial number of patients with acute myocardial infarction have some cardiac rhythm abnormality and most cases cardiac conduction disturbance develops within 48 hours following infarct onset. Deaths most commonly occur within the first few hours of acute myocardial infarctions. Early deaths are not related to the severity of infarct but observations from monitoring units suggest that the mechanism in most of the cases is arrhythmias and cardiac asystole.

The present study was conducted to evaluate the development of arrhythmia in patient's suffering from acute myocardial infarction and their outcome.

During the study period, 120 subjects were recruited, out of which 84 (70%) were males and 36 (30%) were females. Hence there was male dominancy in our study. Similar male preponderance was found in almost all studies on arrhythmia in AMI. Patil at el60, observed 77.50% male compared to 22.50% female & Rajhans et al[6], observed 70% male compared to 30% female. In a study by Alam MK et al[7], it was reported that most of the patients were male 42(84%) which is similar to the present study. As females are given less attention and access to health care facilities is limited particularly in low socioeconomic populations like our country may contribute to this male predominance. 5%, 17.5%, 35%, 30% and 12.5% of the subjects were aged 19-30, 31-39, 40-49, 50-59 and >60 years respectively. Hence the maximum subjects were from the age group of 40-49 years followed by 50-59 years while the least subjects were in the age group of 19-30 years in this study. This is comparable with findings of Patil at el[10], who found the maximum number of patients in this similar age group. Similarly, Alam MK et al[9] found that maximum number of patients were from age group 41 to 60 years.

In the present study, out of the 120 cases of acute MI studied, 65.83% had Anterior wall MI, 27.5 % had inferior wall MI. 6.67 % had combined involvement of both inferior and posterior wall. Hence anterior wall MI was the commonest, followed by inferior wall MI, and the least was combination of inferior and posterior wall MI.

This is comparable with the study of Rajhans et al[8], where overall incidence of anterior wall was higher (56%) than inferior wall which was 44%55.Similarly according to Mhatre et al62, incidence of anterior wall myocardial infarction (58%)55.Alam MK et al[9] too in their study found that 46% of the patients had inferior MI followed by anterior MI (36%), antero-septal MI (16%) and extensive anterior MI (2%). In our study, 12 different types of arrhythmias were observed in the study population. Each occurred at a different frequency. VPC (29.17%) was clearly the most common arrhythmia observed, followed by AIVR-13.33%, I degree AVB-11.67%, II-degree AVB-9.17%, VT – 8.33%, LBBB- 6.67%, CHB, APC each 5%, AF – 4.17%, RBBB, VF each 3.33%, SVT- 0.83% respectively. Alam MK et al[9] in their study reported that overall tachyarrhythmias (sinus & ventricular tachycardia) occurred in 56.1% patients and bradyarrhythmia's (sinus bradycardia & complete heart block) in 24.5%. Sinus tachycardia in isolation was the most common arrhythmia observed in 36.8% of patients followed by sinus bradycardia 22.8%, ventricular tachycardia 19.3%, ventricular ectopic 12.3%, first degree AV block 5.3%, complete heart block and atrial ectopic 1.7% each. Overall incidence of ventricular arrhythmias (ventricular tachycardia & ventricular ectopic) was 31.6% & AV blocks (first degree & complete heart block) was 7%. According to the study by Patil BM[10], commonest arrhythmia was sinus tachycardia (40%), which is comparable with the current study. In other studies by Maturaju N & Chandrashekhar HM63 and Sinha at el[11], found sinus tachycardia were the commonest arrhythmias seen in 30% & 31% cases respectively. Pedro Morillas et al[12] in their study found that 7.9% of young patients presented malignant ventricular arrhythmias (ventricular fibrillation/ ventricular tachycardia) without any differences with respect to the older population. On the other hand, the incidence of atrial fibrillation/flutter and atrio-ventricular block was significantly higher in >45 years group. Out of 120 patients, 17 (14.17%) were expired while 103 (85.83%) were alive. It was found that sex had no significant effect on mortality in this study. Chi-square test showed significant relationship between the age group and the outcome. Death was highest in 50-59 years age group, and least in below 30 years age group. It was found that the wall involved affect the prognosis significantly. Maximum death was observed in AWMI, followed by IWMI and the last was Combined Inferior+posterior wall MI with statistically significant difference. It was found that the type of arrhythmia significantly affects the mortality. Maximum death was observed with ventricular tachycardia (35.29%). Mortality percentages associated with various arrhythmias are CHB - 23.53%, ventricular fibrillation – 17.65%, II-degree AVB – 17.65%, LBBB – 5.88%. According to the study of Patil BM[10], the overall incidence of mortality was 15%, where majority of mortality occurred within 24 hours of hospitalization & most of the deaths occurred in VT & CHB. These findings are similar to the present study. Alam MK et al[9] in their study revealed that there was one death (2%) that occurred in a patient with anterior MI who developed VT within 12 hours of hospitalization. Advanced quality of CCU & ICU management of STEMI in University Cardiac Center, BSMMU and small sample size may have contributed to lower in-hospital mortality in their study. Limitation of the study may be period of study is minimal, due to time restrictions huge data could not be collected, Single centre study, Study group is just adequate, Biochemical parameters could not be assessed, due to lack of serial testing, Late onset arrhythmias could not be studied since the study was conducted in ICCU and the duration of stay was limited.

Conclusion:
In the practice of cardiovascular critical care, we often meet a variety of arrhythmias with a variety of clinical backgrounds. We should pay attention not only to the characteristics and mechanisms of the existing arrhythmias, but also to the upstream pathophysiology underlying the occurrence of those arrhythmias. We also have a lot of therapeutic options for the treatment of arrhythmias that often suppress them and improve the patient status. However, conversely, those therapies sometimes bring harmful results. Therefore, we should judge the necessity of the suppressive treatment of arrhythmias and select the most appropriate modality of treatment on a case-by-case.

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