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A RETROSPECTIVE ASSESSMENT OF THE CLINIC-DEMOGRAPHIC PROFILE, FREQUENCY AND OUTCOME OF ARRHYTHMIA IN AMI

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ABSTRACT

Aim: The aim of the study was to analyze the frequency and outcomes of different types of arrhythmias in AMI.

Material & Methods: A retrospective observational cohort study was conducted for the period of six months and included 200 patients were included in the study. The written consent was obtained from all patients. Patient confidentiality was ensured at all times.

Results: The mean age of our cohort was 55.25 ±15.03 years. There were 65% male and 35% females. A majority of the patients had both HTN and diabetes mellitus (DM). But, surprisingly enough, the most common risk factor for adverse cardiovascular events was smoking; 60% patients had a history of smoking. 68% of the patients presented with an NSTEMI. Seven different types of arrhythmias were encountered in our study. 52% of the patients presenting with an AMI had SA. AV blocks (first, second, and third degrees) were the second most common arrhythmia recorded. The overall mortality rate at seven days was 10%, with a mean hospital stay of 2.04 ±1.40 days. AV nodal blocks were the biggest contributors to the mortality rate.

Conclusion: AMI is associated with several types of arrhythmias. SA is the most frequent arrhythmia seen in AMI; it also has the highest survival rate. Third-degree AV block and VT have the highest mortality rates among all arrhythmias seen in AMI. All case mortality rates are aggravated by old age, a history of smoking, and DM.

Keywords: Arrhythmia, acute myocardial infarcation, non-st segment elevation myocardial infarction (nstemi), stelevation myocardial infarction (stemi)

1. INTRODUCTION

Globally, ischemic heart disease (IHD) is the leading cause of morbidity and mortality [1.] Among the atherosclerotic coronary artery diseases (CAD), the most life-threatening is acute myocardial infarction (AMI) and its associated complications. However, the majority of deaths in AMI are due to arrhythmias, which ranging from bradyarrhythmias, atrioventricular (AV) block, supraventricular tachyarrhythmias, and ventricular arrhythmias (VA).[2,3]Along with arrhythmia present in the acute phase of MI, the risk related to arrhythmia is increased more due to the reopening of an infarct related artery; this can lead to serious arrhythmia, eventually increasing the risk of mortality. [4] Both supraventricular and ventricular arrhythmias can occur in AMI. Although, with the advances in treatment, the incidence of arrhythmias has reduced significantly but still life-threatening arrhythmias occur in considerable proportion of AMI patients undergoing primary Percutaneous Coronary intervention (PCI).[5] Arrhythmias in AMI are a result of severe metabolic and electrophysiological changes induced by ischemia and infarction. [6] Arrhythmias occurring during and after primary PCI are not necessarily due to successful reperfusion or vessel patency and may indicate ongoing ischemia.[7] Fatal arrhythmias that can result in heart collapse and are major complications of AMI are ventricular arrhythmias (VT/VF).[8] Sudden arrhythmic death, often followed by 'warning' ventricular arrhythmias, can exacerbate the acute phase of AMI. Arrhythmias are more prevalent in ST elevation Myocardial infarction (STEMI) than in Non-ST elevation Myocardial infarction (NSTEMI) but still, arrhythmias occurring in NSTEMI contribute to increased overall and arrhythmic mortality.[5,9]

However, despite optimal management and development of ground breaking techniques, the mortality rates for AMI have remained steady over the last decade.[10] Mortality rates may have reached a plateau, but some aspects or complications of AMI can still generate significant morbidity and mortality, perhaps contributing to the plateau seen with recent data.[10,11] One such factor resulting in worse outcomes is AMI associated with arrhythmia(s); previously published data have conclusively proven that AMI associated or complicated with any arrhythmia leads to increased mortality even with early detection and intervention when compared to AMI without arrhythmia.[12] Furthermore, the type of arrhythmia and the level at which dissociation occurs between atrial and ventricular rhythm can significantly determine eventual outcomes.[13]

Hence the aim of the study was to analyze the frequency and outcomes of different types of arrhythmias in AMI.

2. MATERIAL & METHODS

This was a retrospective observational study conducted for the period of six months and 200 patients were included in the study. Patients who were 18 years or older and admitted with a confirmed diagnosis of AMI with an associated arrhythmia were included in the study. Patients with advanced heart failure, renal failure, previous episodes of MI, multiple organ failure, and terminally ill patients were excluded from the study. Written consent was obtained from all patients. Patient confidentiality was of the highest importance and ensured at all time. AMI was diagnosed on the basis of the adopted definition of AMI by the Joint European Society of Cardiology (ESC)/American College of Cardiology (ACC)/American Heart Association (AHA)/World Heart Federation (WHF) Task Force.[14] These guidelines have provided three definitions for AMI: ST-segment elevation definition, universal definition, and the old definition. The universal definition of MI denotes the presence of acute myocardial injury detected by abnormal cardiac biomarkers in the setting of acute myocardial

ischemia; this definition is not very specific and rarely used. The old definition has now become obsolete. For the purposes of this study, we used the ST-segment elevation definition and classified the AMIs into two groups: ST-segment elevation myocardial infarction (STEMI) and non-ST segment elevation myocardial infarction (NSTEMI). STEMI was defined as the presence of persistent ST-segment elevation in at least two contiguous leads or any equivalent [left bundle branch block de novo, or presumably de novo, or ST-segment depression in the precordial leads (V1-V3) on electrocardiogram (ECG) at admission associated with symptoms suggestive of myocardial ischemia]. NSTEMI was characterized as the absence of ECG changes found in the STEMI but with symptoms and markers suggestive of MI.

Atrioventricular (AV) block was defined as the complete or partial dissociation between atrial and ventricular rates with the atrial rate being greater than the ventricular rate and narrow escape rhythm. In patients who presented with or developed conduction defects, the site of the defect was recorded and the defect was classified as AV nodal block, first-degree AV block, second-degree AV block, third-degree AV block, or complete heart block.

A heart rate of <40 beats/minute not associated with a conduction defect and refractory to the administration of atropine was classified as bradycardia. Sinus arrhythmia (SA) was defined as a heart rate of 100 or more beats/minute with a regular rhythm along with upright P waves in leads I, II, and aVL plus negative P waves in lead aVR, and with each P wave followed by a QRS and T waves. The terms sinus tachycardia (ST) and SA are used interchangeably.

Statistical analysis

Data were analyzed using SPSS Statistics, version 25.0 (IBM, Armonk, NY). Mean and standard deviations were calculated for age and duration of hospital stay. Frequencies were calculated for gender, comorbidities, mortality, types of MI, and types of arrhythmias.

3. RESULTS

Table 1: Demographics and cardiovascular disease-specific characteristics of the patients included in the study

Variables	**Values (N=200)**
Age in years (mean ±SD)	55.25 ±15.03
Gender	
Male, n (%)	130 (65%)
Female, n (%)	70 (35%)
Comorbidities	
Smoking, n (%)	120 (60%)
HTN + DM, n (%)	70 (35%)
DM only, n (%)	40 (20%)
HTN only, n (%)	6 (3%)
AMI variants	
NSTEMI, n (%)	136 (68%)
STEMI, n (%)	64 (32%)

The mean age of our cohort was 5 5.25 ±15.03 years. There were 65% male and 35% females. A majority of the patients had both HTN and diabetes mellitus (DM). But,

surprisingly enough, the most common risk factor for adverse cardiovascular events was smoking; 60% patients had a history of smoking. 68% of the patients presented with an NSTEMI.

Table 2: Frequency of different types of arrhythmias recorded in the study

Type of arrhythmia	**Frequency, n (%); (N=500)**
Sinus arrhythmia	104 (52%)
First-degree AV block	32 (16%)
Third-degree AV block	24 (12%)
Atrial fibrillation	20 (10%)
Bradycardia	10 (5%)
Ventricular tachycardia	6 (3%)
Second-degree AV block	4 (2%)

Seven different types of arrhythmias were encountered in our study. 52% of the patients presenting with an AMI had SA. AV blocks (first, second, and third degrees) were the second most common arrhythmia recorded.

Table 3: Overall and relative mortality rates

	Mortality at one week, n (%)	**Relative mortality within the type of arrhythmia (%)**
Third-degree AV nodal block	10 (5%)	36.40%
Ventricular tachycardia	4 (2%)	66.66%
Bradycardia	2 (1%)	36.60%
Atrial fibrillation	2 (1%)	14.60%
Sinus arrhythmia	1 (0.5%)	1.70%
Second-degree AV nodal block	1 (0.5%)	19.19%
First-degree AV nodal block	Nil	Nil
Overall mortality	20 (10%)	
Length of hospital stay, days, mean ±SD	2.04 ±1.40	

The overall mortality rate at seven days was 10%, with a mean hospital stay of 2.04 ±1.40 days. AV nodal blocks were the biggest contributors to the mortality rate.

4. DISCUSSION

Cardiovascular disease (CVDs) impart the greatest burden to healthcare systems around the world; not only are CVDs costing more and more to treat but their incidence is on the rise due

to our modern-day sedentary lifestyle.[15] Ischemic heart diseases (IHDs) including myocardial infarction (MI) are the leading causes of CVD-related deaths globally, accounting for nearly nine million deaths annually.[16] IHDs are usually complicated by cerebrovascular diseases, hypertension (HTN), diabetes, smoking and other types of tobacco use, conduction defects, and other comorbidities, which all contribute to an increase in morbidity and mortality.[17] Acute myocardial infarction (AMI) represents the most life-threatening manifestation or complication of IHD. Almost all AMIs require emergency intervention, be it pharmacological or radiological. With early detection and intervention via evolving technologies such as percutaneous coronary intervention (PCI) or temporary pacemakers, survival rates for AMI have drastically improved.[18]

The mean age of our cohort was 5 5.25 ±15.03 years. There were 65% male and 35% females. It has been evident that older age is a risk factor for developing arrhythmias.[19,20] Male gender is more predominant as compared to females, which is analogous to two studies.[21,22] A majority of the patients had both HTN and diabetes mellitus (DM). But, surprisingly enough, the most common risk factor for adverse cardiovascular events was smoking; 60% patients had a history of smoking. 68% of the patients presented with an NSTEMI. The prevalence of DM and HTN was in line with previous reports.[23] Fabijanic et al. have previously reported a higher incidence of comorbidities and increased in-hospital mortality for female cardiac patients when compared to male cardiac patients.[24] Similar results were also recorded by Trappolini et al.[25] Both of these studies demonstrated an increased susceptibility among females to arrhythmia(s); arrhythmia acts as an independent risk factor for increased mortality in patients with AMI.

Seven different types of arrhythmias were encountered in our study. 52% of the patients presenting with an AMI had SA. AV blocks (first, second, and third degrees) were the second most common arrhythmia recorded. AV nodal blocks frequently complicate AMI, but they typically occur with the STEMI variant.[26] AV nodal blocks are the most commonly acquired arrhythmia seen with idiopathic fibrosis and AMI.[27] The overall mortality rate at seven days was 10%, with a mean hospital stay of 2.04 ±1.40 days. AV nodal blocks were the biggest contributors to the mortality rate. First-degree AV block is not only the most prevalent among the three subtypes but also the most benign and amenable to treatment.[28] There were no mortalities in this subgroup of AV blocks. By contrast, third degree AV block was the single largest contributor to deaths in our study. Third-degree AV blocks have a reported mortality rate of 20-30%, but these numbers jump up significantly in the presence of DM and smoking.[29] It is clear that the presence of a massive number of smokers and diabetics had an adverse effect on survival rates in our study. Second-degree AV blocks can progress to a complete heart block or third-degree heart block.[30] Unlike other arrhythmias, AF occurs in older female patients without a history of smoking. AF can either be silent or symptomatic during an AMI. The incidence of silent AF and symptomatic AF during AMI has been reported to be 5-9% and 13-16% respectively; the incidence of silent AF is probably higher as their inherent nature makes the diagnosis challenging. Irrespective of the type, AF acts as an independent factor for increased in-hospital mortality and post-AMI adverse events.[31]

5. CONCLUSION

AMI is associated with several types of arrhythmias. SA is the most frequent arrhythmia seen in AMI; it also has the highest survival rate. Third-degree AV block and VT have the highest mortality rates among all arrhythmias seen in AMI. All case mortality rates are aggravated by old age, a history of smoking, and DM.

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