ORIGINAL ARTICLE

Frequency of Arrhythmias in ST-Segment Elevation Myocardial Infarction Patients During Primary Percutaneous Coronary Intervention (PPCI) Till 48 hours Post PPCI in NICVD

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ABSTRACT

Objective: To determine the frequency of arrhythmias in patients with acute ST-segment elevation myocardial infarction primary percutaneous coronary intervention (PPCI) till 48 hours post PPCI in admitted at national institute of cardiovascular diseases (NICVD), Karachi.

Material & Methods: This was a hospital based clinical study conducted at NICVD through convenience sampling technique for the period of 6 months from 1st September 2021 to 31st March, 2022. All the adult (age more than 18 years) male and female, presented with acute ST-segment elevation myocardial infarction, and eligible for PPCI were included in this study. Cardiac arrhythmias during 48 hours post-PPCI were evaluated and documented. SPSS v. 26 was used for data entry and analysis.

Results: A total of 285 patients were included for final analysis. The overall mean age ± SD was 56.56±13.07 years. Most of the patients were belongs to age group II (age ≥55 years) as compare to age group I (age <55 years), 50.87% and 49.12%, respectively. The overall incidence of arrhythmias was 16.6% among them most of the arrhythmias were observed during the first 24 hours of PPCI (72.22%). Ventricular arrhythmias were most common as compare to atrial arrhythmias (61.11%). There was an insignificant association observed in relation to gender and incidence of arrhythmias, p 0.236. Patients having age ≥55 were significantly associated with occurrence of arrhythmias, p <0.001.

Conclusion: Frequency of cardiac arrhythmias is higher during early hours of after PPCI. Among them, ventricular arrhythmias were more common as compare to atrial arrhythmias. Older patients (age >55 years) were significantly associated with increased incidence of cardiac arrhythmias as compare to younger age group (age <55 years).

Keywords: Cardiac arrhythmias, STEMI, primary PCI, time duration, in-hospital incidence, South Asia

INTRODUCTION

Acute coronary syndrome ACS) consisted of unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). The worldwide incidence rate of ACS in America reached more than 780, 000 cases and among them UA accounts for around 60% while NSTEMI 75%, and STEMI accounts for 25% of the cases.[1] Frequency of STEMI (48%) was higher as compared to NSTEMI and UA, 30% and 22%, respectively.[2]

Treatment of acute STEMI is different from UA and NSTEMI. Patients with STEMI needs to be revascularized within 90 minutes to reduce the incidence of mortality and post-MI complications.[3,4] Primary percutaneous coronary intervention is the gold standard treatment in patients with STEMI, unless contraindicated. STEMI patients who are unable to undergo invasive revascularization on time are more likely to develop post-MI complications. These complications vary from mild to life-threatening such as atrial and ventricular arrhythmias, heart failure, valvular dysfunction, cardiogenic shock, and/or death.[5-7]

Arrhythmias in STEMI patients are very common and a recent study conducted by Jahangir A Shah,[8] has observed incidence of arrhythmia is as high as 89.1% in post-STEMI patients. Another study conducted at Mandya has observed 78% of patients had arrhythmias.[9] Frequency of lethal arrhythmias such as ventricular tachycardia and ventricular fibrillation is comparatively low but they account for more deaths as compare to other types of arrhythmias.[10] Different studies have mentioned different frequency distribution of arrhythmias in patients with STEMI and undergoing PPCI. That is why this study aims to determine the frequency of arrhythmias in STEMI patients during PPCI and up to 48 hours of PPCI at the largest cardiac hospital of Karachi.

MATERIAL AND METHODS

This was a hospital based clinical study conducted through convenience sampling technique for the period of 6 months from 1st September 2021 to 31st March, 2022. The study was approved by the hospital's ethical committee of national institute of cardiovascular diseases, Karachi where the study was conducted and consent was taken from every patient or their attendant if patient was unable to provide consent. All the adult (age more than 18 years) male and female, presented with acute ST-segment elevation myocardial infarction, and eligible for PPCI were included in this study. Patients known cases of arrhythmias, patients who presented with STEMI and arrhythmias before undergoing PPCI, patients who were discharged within 48 hours post PPCI, patients with ventricular septal rupture leading to hemodynamically instability, patients who develop cerebrovascular accident, and patients who opted fibrinolytic therapy upon PPCI were excluded from this study. Diagnosis of acute STEMI was made based on the latest guidelines proposed by the American Heart Association (AHA) in 2021 (11). Patients who were eligible for PPCI were evaluated by the interventionalist who had at least 5 years of experience in dealing such patients before shifting to cardiac catheterization laboratory. Same cardiac interventionalist performed PPCI of all the selected patients. A structured questionnaire was designed to collect the relevant baseline and clinical data including age, gender, area of residence, marital status, comorbid conditions, presence or absence of arrhythmias, types of arrhythmias, and time duration of arrhythmias. Data were entered and analysed using SPSS v. 26. Frequencies and percentages were calculated for qualitative and chi-square test or fisher's exact test was used to determine the association between variables while mean and standard deviation was calculated for continuous variables and independent t-test was used to determine the association among them, a p value of <0.05 was considered as statistically significant.

RESULTS

A total of 285 patients were included for final analysis. The overall mean age ± SD was 56.56±13.07 years. Most of the patients were belongs to age group II (age ≥55 years) as compare to age group I (age <55 years), 50.87% (n = 145) and 49.12% (n = 140), respectively. Male were more common (81.8%, n = 233) than females (18.2%, n = 52). Urban residents were 69.12% (n = 197) and rural residents were (30.87%, n = 88). Hypertension was the most common comorbid condition (29.47%, n = 84) followed by diabetes mellitus (17.89%, n = 51) and chronic obstructive pulmonary disease (COPD) (2.80%, n = 8). Table 1.

Table 1: Baseline and clinical characteristics of STUDY participants (n = 285)

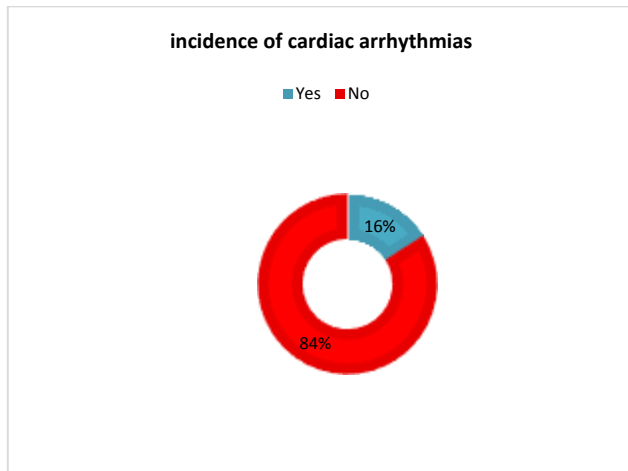| Characteristics	Mean±SD	
Age - years	56.56±13.07	
Age groups - years	Frequency	Percentage
Group I (<55)	140	49.12
Group II (≥55)	145	50.87
Gender		
Male	233	81.8
Female	52	18.2
Area of residence		
Urban	197	69.12
Rural	88	30.87
Comorbid conditions		
Hypertension	84	29.47
Diabetes mellitus	51	17.89
COPD	8	2.8

Figure 1: Overall Incidence of Cardiac Arrhythmias (n = 285)

Table 2: Types of Cardiac Arrhythmias Observed During or Within 48 Hours after PPCI (n = 36)

Type of Arrhythmias	(n = 36)	%
Non-Malignant	33	91.66
Malignant	3	8.33
Ventricular	(n = 22)	
PVCs	12	54.54
Ventricular Tachycardia	4	18.18
Ventricular Fibrillation	3	13.63
Torade de ponites	1	4.54
VT plus VF	2	9.09
Atrial	(n = 14	
SVT	4	28.57
Atrial Fibrillation	9	64.28
Atrial Flutter	1	7.14

Figure 1 & 2 shows overall incidence of arrhythmias was 16.6% (n = 36) among them most of the arrhythmias were observed during the first 24 hours of PPCI (72.22%, n = 26). Ventricular arrhythmias were most common as compare to ventricular arrhythmias (61.11%, n = 22). Also, most of the

arrhythmias were non-malignant as compare to malignant, 91.66% (n = 33) and 8.33% (n = 3). The most common atrial arrhythmia was sinus tachycardia (50.0%, n = 11/22) and the most common ventricular arrhythmia was premature ventricular contraction (54.54%, n = 12). There was an insignificant association observed in relation to gender and incidence of arrhythmias, p 0.236. Patients having age ≥55 were significantly associated with occurrence of arrhythmias, p <0.001. Table 2 & 3.
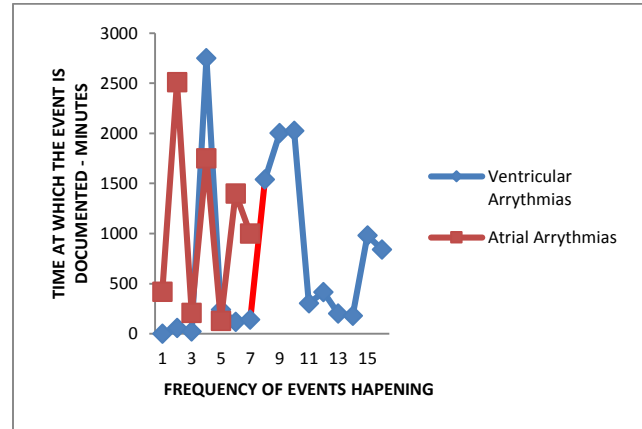

Figure 2: Time Duration of Event Happening (n = 36)

Table 3: Association of Cardiac Arrhythmias with Age and Gender (n = 285)

Gender	Arrhythmias		Total	p value
	Yes (n = 36)	No (n = 201)		
Male	32	201	233	
Female	4	48	52	0.23
Total	36	249	285	
Age groups				
<55 years	7	133	140	
≥55	29	116	145	<0.001*
Total	36	249	285	

DISCUSSION

Arrhythmias particularly ventricular fibrillation and ventricular flutter are the most common causes of death during 1st hour of acute myocardial infarction and sometimes death occur before reaching the hospital. Early identification of such patients are extremely important to reduce the risk of post-MI associated complications and mortality.[12,13]

Advancement in the treatment facilities and awareness regarding the disease, the mortality related to STEMI has reduced to 19.4% in 2022 from 30.1% in 2003.[14] The overall incidence of arrhythmias in patients with STEMI is higher than the NSTEMI and UA groups, 41.8%, 24.8%, and 13.8%, respectively.[15] Our study's findings are different from the above findings. In this study, the incidence of arrhythmias as 16.6%, which is quite low. The reason behind this difference could be the time duration from the onset of acute myocardial infarction to the commencement of treatment. Also, mean age of their patients were higher than ours, 69 years vs. 56.56±13.07 years, respectively. Our study also observed that increasing age is associated with increased incidence of arrhythmias.

In a previously conducted study, authors have observed that more than 90% of the patients with acute STEMI develop some form of arrhythmia and among them around 25% of these abnormalities present within 24 hours post-MI.[16] Our study's findings are consistent with the above study. The reason behind this phenomenon is that due to acute ischemic event, myocardium goes into hibernation and stunning phase which further reduces left ventricular function and overall performance of the heart. That leads to the development of arrhythmias in acute setting. While, after 24 hours, most of these patients who develop arrhythmias have multiple comorbid issues such as renal impairment,

underlying sepsis, incomplete revascularization, other mechanical complications, hemodynamic instability such as cardiogenic shock, and multi-vessel disease.[17]

Our study also observed that ventricular arrhythmias were more common than atrial arrhythmias. Ventricular arrhythmias were most common as compare to atrial arrhythmias (61.11%). The same findings were observed by the Bhar-Amato J[18] in 2017. Another multicenter study conducted in Denmark also observed VT/VF was the most common arrhythmia in patients with STEMI and with an incidence rate of 83%.[19] Cardiac arrhythmias that occur during or early post-PCI phase if revascularized completely does not increase mortality whereas incomplete revascularization increases mortality rate.[20] Even if the mortality does not increase after cardiac arrhythmias but it may increase fear of death and disease related anxiety which cause bad impact on the patient's health. This study was a single center study and majority of the patients were resident of Karachi. Also, risk factors leading to cardiac arrhythmias after complete revascularization should be assessed.

CONCLUSION

Frequency of cardiac arrhythmias is higher during early hours of after PPCI. Among them, ventricular arrhythmias were more common as compare to atrial arrhythmias. Older patients (age >55 years) were significantly associated with increased incidence of cardiac arrhythmias as compare to younger age group (age <55 years)

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