ORIGINAL ARTICLE

Ventricular Arrhythmias in Patients Undergoing Primary Percutaneous Coronary Intervention (PCI) for ST-Segment Elevation Myocardial Infarction (STEMI)

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ABSTRACT

Objective: To determine the frequency of ventricular arrhythmias in patients undergoing primary percutaneous coronary intervention (PCI) for ST-segment elevation myocardial infarction (STEMI) at a tertiary care hospital in Karachi, Pakistan.

Material and Methods: This descriptive case series study was done at the National Institute of Cardiovascular Disease, Karachi. All patients of either gender having an age between 18 and 70 years of diagnosis with STEMI undergoing primary PCI were included. All the patients were kept under observation for 72 hours in the hospital, and ventricular arrhythmias such as Accelerated Idioventricular Rhythm (AIVR), Frequent PVCs (premature ventricular contractions), Non-Sustained Ventricular Tachycardia, Sustained Ventricular Tachycardia, and Ventricular Fibrillation were recorded.

Results: The mean age of the patients was 54.72 ±10.75 years. The majority of the patients, 75.2%, were males and 24.8% were females. The frequency of ventricular arrhythmia was found in 89 (25.9%) of the patients. Among 89 patients with ventricular arrythmia, AIVR was found in 30 (33.71%), frequent PVCs in 18 (20.22%), non-sustained ventricular tachycardia in 23 (25.84%), sustained ventricular tachycardia and ventricular fibrillation in 9 (10.11%) each.

Conclusion: As per the study conclusion, the ventricular arrhythmias was observed to be considerably higher among patients undergoing primary PCI for ST-STEMI.

Keywords: Ventricular arrhythmias, PCI, ST-segment elevation MI

INTRODUCTION

The most common reason of the mortality in the developed world is coronary artery disease (CAD), despite significant therapeutic advancements in recent decades.[1] Although the mortality rate from coronary heart disease (CHD) has been continuously decreasing in the western nations over the period of the last few decades, this disease still accounts for roughly one-third of all mortality in adults over the age of 35.[2] The occurrence of arrhythmias during episodes of myocardial infarction is blamed for numerous of these deaths. People receiving percutaneous coronary intervention (PCI) frequently experience ventricular arrhythmias, such as increased idioventricular rhythms, ventricular fibrillation, and ventricular tachycardia.[3] Individuals who present with an acute MI plus ventricular arrhythmias are at a much higher risk of dying. Ventricular arrhythmias (VAs) have been most frequently experienced initially in ischemia.[4,5] Arrhythmias are now among the most treatable consequences of acute myocardial infarction (AMI), thanks to the development of the intensive cardiac care unit (ICU). Early detection of risky and life-threatening arrhythmias has been made possible by cardiac monitoring during the immediate post-MI phase. Acute coronary syndrome is frequently accompanied by or followed by cardiac arrhythmias.[6,7] When doing primary PCI for STEMI, severe ventricular arrhythmias are linked to early death but not delayed mortality. A higher level of early post-MI surveillance and therapies may be beneficial for these individuals at increased risk.[8] According to a study by Tatli et al.[9], among individuals diagnosed with acute ST myocardial infarction who having undergone primary percutaneous coronary treatment, 50% experienced AIVR (accelerated idioventricular rhythm), 7.4% experienced prolonged ventricular tachycardia (VT), 57.5% experienced non-sustained VT, 9.3% experienced frequent PVCs, and 3.7% experienced ventricular fibrillation. Reports on patients who present with an acute myocardial infarction and the frequency of ventricular arrhythmias after primary PCI are relatively lacking in countries like Pakistan. As a result of variations in the prevalence of the diseases, lifestyle, dietary habits, and care-seeking behaviour of our population as compared to other parts of the world, we are expecting to see differences in the results from our population. The findings of this study will help collect specific information regarding ventricular arrhythmias and its risk in AMI while the patient is being treated in the hospital, particularly in the initial 48 hours. So that better management strategies can be developed based on local data for the management of disease.

MATERIAL AND METHODS

This descriptive case series study was carried out at the National Institute of Cardiovascular Disease, Karachi, during the six months from February 2019 to August 2019 by using non probability consecutive sampling. All the patients diagnosed with STEMI and undergoing primary PCI, aged between 18 and 70 years of either gender, were included. All the patients having prior history of STEMI, history of any cardiac related surgery, non-ST elevation MI, cardiogenic shock, Survivors of cardiac arrest due to acute myocardial infarction and those who refuse give consent were excluded. The study was started after approval from the ethical review committee of NICVD. Before including anyone in the study, the goal and potential advantages of the research were thoroughly discussed with each participant, and verbally informed consent was obtained from each participant by the primary investigator. Demographic details like age and gender were obtained and a history of participants was obtained, containing diabetes mellitus, high blood pressure, being overweight, and smoking habits, as well as their family medical history and delayed treatment history were recorded. All the primary PCI procedures were performed by a consultant cardiologist of experience more than 5 years. All the patients were kept under observation for 72 hours in the hospital and ventricular arrhythmias such as AIVR, frequent PVCs (premature ventricular contractions), non-sustained ventricular tachycardia, sustained ventricular tachycardia, and ventricular fibrillation were recorded as per the operational definition by the principal investigator. All the collected information was recorded on a predefined structural proforma. Patients were counselled regarding their information being kept private and only accessible to those with proper authorization. Data was entered and analysed using SPSS version 26.

RESULTS

The mean age of the patients was 54.72 ±10.75 years. The mean weight and height of the patients were 70.17 ±5.11 kg and 1.54 ±0.06 m, respectively. The majority of the patients (75.2%) were males, and 24.8% were females. There were 212 (61.8%) patients with diabetes mellitus, 254 (74.1%) with hypertension, 192 (56%) with family history, 175 (51%) with smoking and 191 (55.7%) were obese. Table.1

The frequency of ventricular arrhythmia was found to be 89 (25.9%). Among 89 patients with ventricular arrhythmia, accelerated idioventricular rhythm (AIVR) was found in 30 (33.71%), frequent PVCs in 18 (20.22%), non-sustained ventricular tachycardia in 23 (25.84%), and sustained ventricular tachycardia and ventricular fibrillation in 9 (10.11%) each. Fig:1

Stratification was done to see the association of ventricular arrhythmia with baseline characteristics. Results are shown in detail in table 2.

Table. 1. Descriptive statistics of demographic characteristics n=343

Variables		Statistics
Age (years)		54.72 ±10.75
Weight (mean)		70.17 ±5.11 kg
Height (mean)		1.54 ±0.06 m
Gender	Males	258(75.20%)
	Females	85 (24.80%)
Comorbidities	Diabetes mellitus	212 (61.80%)
	Hypertension	254 (74.10%)
	Obesity	191 (55.70%)
	Smoking	175 (51.00%)
Family history		192 (56.00%)
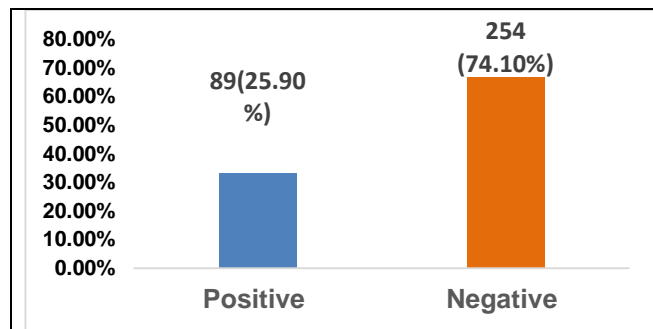
Accelerated Idioventricular Rhythm (AIVR)	30	33.71
Frequent PVCs	18	20.22
Non-sustained Ventricular Tachycardia	23	25.84
Sustained Ventricular Tachycardia	9	10.11
Ventricular fibrillation	9	10.11
Total	89	100.0%

Fig:1. Frequency of ventricular arrythmia n=343

Table.2 Frequency ventricular arrythmia according to age, gender and co-morbidities n=343

Variables		Ventricular Arrythmia		p-value
		Positive	Negative	
Age groups	≤55	51 (27.3)	136 (72.7)	
	>55	38 (24.4)	118 (75.6)	0.540
	Total	89 (25.9)	254 (74.1)	
Gender	Males	70 (27.1)	188 (72.9)	
	Females	19 (22.4)	66 (77.6)	0.383
Diabetes	Yes	82 (38.7)	130 (61.3)	
	No	7 (5.3)	124 (94.7)	0.001
Hypertension	Yes	85 (33.5)	169 (66.5)	
	No	4 (4.5)	85 (95.5)	0.001
Smoking	Yes	78 (44.6)	97 (55.4)	
	No	11 (6.5)	157 (93.5)	0.001
Obesity	Yes	86 (45)	105 (55)	
	No	3 (2)	149 (98)	0.001
Family history	Yes	81 (42.2)	111 (57.8)	
	No	8 (5.3)	143 (94.7)	0.001

DISCUSSION

Ventricular arrhythmias frequently occur among cases undergoing PCI (further following coronary artery bypass surgery and thrombolysis), such as ventricular fibrillation, ventricular tachycardia, and accelerated idioventricular rhythms. [10] The occurrence of VA during acute coronary syndrome is linked to greater in-hospital and the six months mortality. Therefore, early identification of acute coronary syndrome and rapid revascularization are essential in reducing these risks.[11,12] Arrhythmias are now considered one of the commonest treatable consequences of acute myocardial infarction, due to the development of the intense cardiac care unit.[13] Early detection of serious and life-threatening arrhythmias has been aided by cardiac monitoring during the immediate post MI phase. Acute coronary syndrome is frequently accompanied by or followed by cardiac arrhythmias.[13]

In this study, the frequency of ventricular arrhythmia was found to be 89 (25.9%). Consistently, Ahmed S et al[14] reported that ventricular arrhythmias were in 16% of the patients. In line with this study, Mhatre MA et al[13] reported that out of all, ventricular arrhythmias were observed among 33% of participants, among which VT was observed in 24% of the cases, VPB was observed in 8%, while 1% experienced ventricular bigeminy. On the other hand, Shah JA et al[15] conducted the study to assess the prevalence, risk factors, and consequences of cardiac arrhythmias among individuals with AMI receiving PCI within the initial 24 hrs of hospitalization and they observed higher occurrences of arrhythmias among 89.1% of the participants.

In this study among 89 patients with ventricular arrhythmia, accelerated idioventricular rhythm (AIVR) was found in 30 (33.71%), frequent PVCs in 18 (20.22%), non-sustained ventricular tachycardia in 23 (25.84%), Sustained Ventricular Tachycardia and sustained ventricular tachycardia and ventricular fibrillation in 9 (10.11%) each. A study conducted by Tatli et al.[9] reported AIVR (accelerated idioventricular rhythm) in 50%, Sustained ventricular tachycardia (VT) in 7.4%, Non-sustained VT in 57.5%, Frequent PVCs in 9.3%, and Ventricular fibrillation in 3.7% of the patients diagnosed with acute STEMI underwent PCI intervention. On the other hand, stated that the individuals having acute MI and cardiogenic shock who are undergoing PCI or thrombolysis intervention, sustained VT occurs in 17–21% of cases, and VF is found slightly more frequently (24–29%) of the time.[16,17]

In this study, stratification was done to see the association of ventricular arrhythmia with baseline characteristics, and it was statistically significant as per diabetes, hypertension, obesity, family history, and smoking (p= <0.05). However, in the study of Ahmed S et al[14] stated that in order to investigate the impact that factors such as age, gender, body mass index, socioeconomic status, smoking, DM, hypertension, anemia, and the TIMI score had on adverse events, the participants were divided into different strata, and they found finding statically significant. There was invented a decision-tree structure predictive that comprises the basic care and an intervention strategy following the PCI in order to forecast the complications and repercussions of the patient's condition. There are a number of potential consequences, including heart failure, DM, stroke, severe bleeding, and the effect of advancing age. According to the prediction, hospitals need to have sufficient preparation in order to cope with many outcomes.[14,18] According to the findings of certain studies, prolonged ventricular arrhythmias during the early post-MI phase could be related to a higher probability of death in the first 30 days after the event, although this risk does not persist over the long term.[3,19] There were several limitations to the current study: a number of design problems, the most notable of which as a single-center study with limited sample size. It is necessary to do studies on this subject as well as conducting effective risk assessments in order to identify patients at high risk of further VA and sudden cardiac death.[3]

CONCLUSION

The frequency of ventricular arrhythmias was considerably higher in patients undergoing primary Percutaneous Coronary Intervention (PCI) for ST-segment elevation myocardial infarction (STEMI).

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