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ARRHYTHMIAS IN PATIENTS WITH ACUTE CORONARY SYNDROME

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Contribution
UB, MNK, and KAK conceived the idea and designed the study. Data collection and manuscript writing was done by UB, KAK, MNK, NAS, KN, SA, TA, AM, SB, and MK. All the authors contributed equally to the submitted manuscript.

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ABSTRACT

Objective: To determine the frequency of arrhythmias in patients with acute coronary syndrome (ACS) in a tertiary care hospital, Karachi, Pakistan.

Methodology: This cross-sectional study was conducted at cardiology department of a tertiary care hospital of Karachi, Pakistan. A total of 189 consecutive patients of either gender presented with ACS during six months of study period were included. Continuous cardiac monitoring (telemetry) was done to record any arrhythmia within 24 hours of onset of symptoms.

Results: 189 patients with ACS were included, 152 patients (80.4%) were males with the mean age of 48.23 ± 6.717 years. This included 95 patients (50.3%) with unstable angina, 36 patients (19.1%) with ST elevation myocardial infarction (STEMI), and 58 patients (30.7%) with Non-STEMI. Arrhythmias were seen in 39 patients (20.6%), most commonly observed type of arrhythmia was premature ventricular contractions (12), atrial fibrillation (nine), ventricular tachycardia (seven), and ventricular fibrillation (five).

Conclusion: Arrhythmias were reported in 39 patients from the total, accounting for 20.63% of the entire population. The incidence of cardiac arrhythmia was more in the age group 40-60 years and male population.

Keywords: Arrhythmia, acute coronary syndrome, atrial fibrillation

INTRODUCTION

Acute Coronary Syndrome (ACS) is regarded as an epidemic throughout the world. With regards to the profile of arrhythmias in the current population, there is very little documented evidence. Based on numbers estimated by the National Commission on Health, more than 60 million patients suffered from Coronary Artery Disease (CAD) in India by the year 2016.[1] Out of these, around 20 million people or one-third of the total would belong to the age bracket of less than 40 years.[2] The chance of death for patients suffering from acute coronary syndrome (ACS) is higher for those with ventricular arrhythmia (VA) than those who do not have ventricular arrhythmia. Misiriya R.K.J et al.[3] found that in STEMI commonest arrhythmia encountered was premature ventricular complex (PVC) 40.04%. Other arrhythmias observed were accelerated idioventricular rhythm (AIVR) 18%, ventricular tachycardia (VT) 13.98%, atrial fibrillation (AF) 8.05% and ventricular fibrillation (VF) 5.36% patients.[4,5] Nevertheless, there is a dearth of information with regards to VA for patients suffering with acute coronary syndrome in countries from the Middle East.[6] The treatment technique for managing cardiac rhythm is dependent on the condition of the affected individual: whether he/she is stable or not. The various methods to treat these patients include but are not limited to medications, electrical conversion and physical maneuvers to name a few.[7] Moreover, life threatening arrhythmias may result from imbalances in electrolyte levels that might occur during the first few hours of acute coronary syndrome.[8] To prevent mortalities among our patients, it becomes imperative to study and compare the benchmark levels of electrolytes such as magnesium, sodium and potassium. The occurrence of arrhythmias is significantly linked with various predisposed cardiovascular risk factors including but not limited to old age, diabetes, hypertension and hyperlipidemia.[9] For patients with acute coronary syndrome, ventricular and atrial arrhythmias may both occur and present in patterns forming a wide spectrum.[10] These arrhythmias may occur in various forms such as atrial fibrillation, premature ventricular contractions (PVCs), sustained and non-sustained ventricular tachycardia and heart blocks of all three degrees.[11] To assure the most effective diagnosis and treatment of patients with ACS, it is pertinent to obtain an exhaustive and complete medical history. Some of the evaluation factors include previous history of CAD, gender, age, symptoms of the patient's angina and the existence of the various risk factors for ACS.[12] Alternative disease processes should be considered for patients who do not exhibit any of these risk factors.[13]

As we have lack of our own local statistics therefore, we should know the true frequency, age at onset in our population, most common risk factor, and most occurring type. So that early suspicion can be made to avoid diagnostic delay and to identify risk factors so that they can be avoided in our population.

METHODOLOGY

This cross-sectional study was conducted at a tertiary care cardiac center of Karachi, Pakistan. Sample size of 189 was calculated on the basis of the 23% expected frequency of arrhythmia in patients, at confidence level=95% and bond on error= 6%. Consecutive patients between 30 to 60 years of age of either gender with final diagnosis of acute coronary syndrome were included. Excluded patients were patients with renal insufficiency (either known creatinine clearance < 30 ml/min/1.73m² or currently on medical care for severe renal insufficiency). Subjects were admitted with sign and symptoms of ACS, the final diagnosis of acute coronary syndrome was made based on ECG and/or positive cardiac enzymes and type of ACS (unstable angina, ST elevation myocardial infarction (STEMI), or Non-ST elevation myocardial infarction (NSTEMI)) was recorded. All patients with STEMI underwent primary PCI as per the institutional protocol and all the patients were given beta blocker along with the standard treatment, unless contraindicated. Informed consent was taken once the patients stabilized at coronary care unit (CCU) before starting the continuous cardiac monitoring. Patients were recruited for this study after approval from the ethical review committee of the Institution. After admission to CCU every patient had undergone continuous cardiac monitoring to see and record any arrhythmia within 24 hours of onset of symptoms. Then the tracing was evaluated and cross checked by a cardiologist.

Different risk factors and co-morbid were recorded like diabetes mellitus, hypertension, hyperlipidemia,

smoking, family history, and heart failure. All the selected patients were kept under observation with continuous cardiac monitoring (telemetry) for 24 hours and onset of arrhythmia were recorded such as premature ventricular contractions (PVCs), atrial fibrillation (AF), ventricular tachycardia (VT), ventricular fibrillation (VF), accelerated idioventricular rhythm (AIVR), 1st degree atrioventricular block (AVB), 2nd degree atrioventricular block (AVB), and complete heart block (CHB).

All demography, clinical history was recorded by a principal investigator on a predesigned proforma. IBM SPSS version 22 was used for data analysis. Frequencies and percentages were computed for categorical variables like gender, type of ACS (unstable angina/STEMI/Non-STEMI), factors associated such as hypertension (HTN), diabetes mellitus (DM), smoking, hyperlipidemia, family history, heart failure, arrhythmia, and type of arrhythmia. Continuous variables were presented as mean ± standard deviation (SD). Effect modifiers like age, gender, duration of final diagnosis of ACS, type of ACS, co-morbid like HTN, DM, smoking, hyperlipidemia, family history, and heart failure were controlled through stratification. Chi-square test was used, level of significance was p-value ≤ 0.05.

RESULTS

In our study, 189 patients were taken into consideration with a mean age of 48.23±6.717 years, while the males represented 152 (80.4%) of the total cases. In our study co-morbid conditions were as following; diabetes in 58 patients (30.7%), 54 (28.6%) were hypertensive, hyperlipidemia was noted in 52 (27.5%), 29 (15.3%) were smokers, positive family history was seen in 54 (28.6%), and heart failure was noted in 56 (29.6%) patients. This included 95 patients (around 50.3%) with unstable angina, 36 patients (around 19.1%) with ST elevation myocardial infarction (STEMI), and 58 (around 30.7%) patients were with Non ST elevation myocardial infarction (NSTEMI).

Arrhythmia was reported in 39 patients from the total, accounting for 20.6% of the entire sample size. Type of arrhythmia was premature ventricular contractions (PVC) in 12 patients (6.3%), atrial fibrillation (AF) in nine (4.8%), ventricular tachycardia (VT) in seven (3.7%), ventricular fibrillation (VF) in five (2.6%), accelerated idioventricular rhythm (AIVR) in two (1.1%), 1st degree atrioventricular block (AVB) in two (1.1%)

and complete heart block (CHB) in two (1.1%). From the total, a quarter or 25% of the patients with VT were treated using only medication. However, for all patients with VF, defibrillation was needed. Defibrillation was used for all patients with a pulseless VT (35%) while for those patients with a stable VT, medication was used in 23% of the total cases. For patients with a stable VT, medication alone was used in 38% of the cases, medication with cardioversion was used in 45% of the cases while cardioversion alone was used in 26% of the total cases (Table 1).

Table 1: Descriptive statistics and baseline characteristics

	Descriptive Statistics
Age in years	
Mean ± SD	48.23 ± 6.717
Range (Min -Max)	30-60
Duration of symptoms (hours)	
Mean ± standard deviation	7.67 ± 1.678
Range (minimum -maximum)	6-12
Gender	
Male	152 (80.4%)
Female	37 (19.6%)
Type of acute coronary syndrome	
Unstable angina	95 (50.3%)
ST elevation myocardial infarction	36 (19.1%)
Non ST elevation myocardial infarction	58 (30.7%)
Co-morbid	
Diabetes mellitus	58 (30.7%)
Hypertension	54 (28.6%)
Hyperlipidemia	52 (27.5%)
Smoking	29 (15.3%)
Family history	54 (28.6%)
Heart failure	56 (29.6%)
Arrhythmia	
Yes	39 (20.6%)

No	150 (79.4%)
Type of Arrhythmia	
Premature ventricular contractions (PVC)	12 (6.3%)
Atrial fibrillation (AF)	9 (4.8%)
Ventricular tachycardia (VT)	7 (3.7%)
Ventricular fibrillation (VF)	5 (2.6%)
Accelerated idioventricular rhythm (AIVR)	2 (1.1%)
1st degree atrioventricular block (AVB)	2 (1.1%)
Complete heart block (CHB)	2 (1.1%)
No Arrhythmia	150 (79.4%)

With regards to the incidence of arrhythmia, statistically significant higher incidence of arrhythmia were observed for the patients with co-morbid like diabetes mellitus and hypertension and while smokers were significantly inversely associated with arrhythmia with p-values of less than 0.001. Furthermore, in our study arrhythmias were more common in age group of 40-60 years, predominant in male gender and more common in patients with duration of symptoms of 6-9 hours. Patients with positive family history were to have increased in the incidence of arrhythmia, similarly, patients with heart failure were also significantly associated with increased incidence of arrhythmia (Table 2).

Table 2: Comparison of arrhythmia among demographics, baseline, confounding factors of the study subject

Characteristics	Arrhythmia		Total	P-value
	Yes	**No**	**Total**	**P-value**
Total (N)	**N = 39**	**N = 150**	**N =189**	
Age groups				
30-45 years	15(7.93%)	60(31.74%)	75(39.68%)	0.855
46-60 years	24(12.69%)	90(47.61%)	114(60.31%)	
Gender				
Male	33(17.46%)	119(62.96%)	152(80.42%)	0.459
Female	6(3.17%)	31(16.40%)	37(19.57%)	
Duration of symptom				
6-09 hours	29(15.34%)	121(64.02%)	150(79.36%)	0.466
10-12 hours	10(5.29%)	29(15.34%)	39(20.63%)	
Type of acute coronary syndrome				
Unstable angina	17(8.99%)	78(41.26%)	95(50.26%)	
ST elevation myocardial infarction	8(4.23%)	28(14.81%)	36(19.04%)	0.668
Non ST elevation myocardial infarction	14(7.40%)	44(23.28%)	58(30.68%)	
Diabetes mellitus				
Yes	32(16.93%)	26(13.75%)	58(30.68%)	<0.001*
No	7(3.70%)	124(65.60%)	131(69.31%)	
Hypertension				
Yes	35(18.51%)	19(10.05%)	54(28.57%)	<0.001*
No	4(2.11%)	131(69.31%)	135(71.42%)	
Smoking				
Yes	6(3.17%)	25(13.22%)	31(16.40%)	0.014
No	33(17.46%)	125(66.13%)	158(83.59%)	
Hyperlipidemia				
Yes	35(18.51%)	17(8.99%)	52(27.51%)	<0.001*
No	4(2.11%)	133(70.37%)	137(72.48%)	

Family history				
Yes	35(18.51%)	19(10.05%)	54(28.57%)	<0.001*
No	4(2.11%)	131(69.31%)	135(71.42%)	
Heart failure				
Yes	36 (19.04%)	20(10.58%)	56(29.62%)	<0.001*
No	3(1.58%)	130(68.78%)	133(70.37%)	

DISCUSSION

The results from our study reported that around 20.63% of the patients were found to have arrhythmias in comparison to results from the study conducted by Winkler et al.[5] who documented that only a small percentage of the patients with ACS had arrhythmias deemed to be life-threatening and only 15% were documented to have isolated PVCs. Incidence of arrhythmia was significantly associated with comorbids like diabetes mellitus 32 (16.93%), hypertension 35 (18.51%) and smoking were significantly inversely associated female gender (3.17%) with a p-value less than 0.001. Patients who had family history of ACS observed that increased in the incidence of arrhythmia accounted for 35 (18.51%) were significantly associated with p-value<0.001, similarly heart failure were also significantly increased arrhythmia p-value<0.001 respectively.

Another study indicate that statistically significant relationship between length of stay and PVCs was found on an independent level.[14] A few of the independent indicators included age in excess of 60 years and a predisposed AMI being diagnosed.[15] Arrhythmias was found to be in a much higher percentage for patients belonging to the 40 to 60 years age bracket in comparison to a similar study conducted by Patil et al.[16] who documented that MI was more frequent in the age bracket of 50 to 60 years old. Above the age of 50 years, the combined incidence of MI was found to be in excess of 75%. The American Heart Association's years of research and studies suggests that the older population is more susceptible to developing AMI.[17, 18] The frequency of occurrence of AMI is greater in patients who are aged 45 years and above. Only 10 patients or just 5% of the total were reported to experience premature ventricular complex (PVC) in comparison to a study conducted by Winkler et al.[5] which documented that 20% of the patients experienced in excess of 50 PVCs per hour. This is regardless of the fact that different from previous investigations, we counted PVCs both manually and using a computer from the ECG data that was collected as soon as the patient was admitted in to the emergency department. The results from our study revealed that the males were predominantly the ones who suffered from arrhythmias which were similar to findings of a study conducted by Patil et al.[16] who documented that males accounted for three-quarters or 75% of the total population suffering from arrhythmias. These results were in line with results from the studies conducted by Shlash RF et al.[19] who also documented males to the more predominant gender amongst the population. For treating patients with ACS, time is crucial since more than 95% of patients with AMI go through some type of arrhythmias resulting in chest pain which may last more than two days.[1, 5, 7, 11, 12] Our study showed that irrespective of the origin, the frequency of arrhythmias was found in 20.63% of the patients of 39 from a total of 189 patients being admitted. The development of a diabetes and hypertension is considered as one of the serious morbidities associated with arrhythmias. A study carried out in the recent past showed that less than 3% of the total admitted patients experienced a diabetes and hypertension and out of these 30% were fatal while numbers were much higher in patients with STEMI than those who did not have STEMI.[20-22] Another study reported that, the percentage of stroke occurrence in complex ACS patients due to arrhythmias was found to be a meager 5%.[12, 23] Another institute based study reported arrhythmia in Holter monitoring was reported in 100 patients from the total, accounting for 67% of the entire sample size.[24] With regards to the incidence of arrhythmia, statistically significant differences were observed for STEMI (40%), NSTEMI (25%) and UA (15%) groups with a p-value less than 0.001.[25]

CONCLUSION

Arrhythmias are commonly associated with acute coronary syndrome and may often result in serious complications along with damage to the myocardium. Arrhythmias were recorded in a significant number of patients with ACS. The incidence of cardiac arrhythmia was more in the age group 40-60 years and male population.

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