Section: General Medicine

Original Research Article

STUDY OF ARRHYTHMIA DURING FIRST 72 HOURS OF HOSPITALISATION IN ACUTE CORONARY SYNDROME AND ITS CORRELATION WITH SERUM POTASSIUM LEVELS

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Abstract

Background: Acute coronary syndrome (ACS) is a leading cause of morbidity and mortality worldwide. Arrhythmias are a common complication of ACS, and serum potassium levels have been implicated in their development. The objective is to study the incidence of arrhythmias during the first 72 hours of hospitalization in patients with ACS and to correlate it with serum potassium levels. **Materials and Methods:** This observational study was conducted at Government Virudhunagar Medical College and Hospital, Virudhunagar, India. A total of 100 patients with ACS were enrolled, and their electrocardiograms (ECGs) were monitored for arrhythmias during the first 72 hours of hospitalization. Serum potassium levels were measured within first 72hrs of admission. The correlation between arrhythmias and serum potassium levels was analyzed. **Result:** The incidence of arrhythmias during the first 72 hours of hospitalization was 75%. Ventricular premature contractions (VPCs) were the most common type of arrhythmia (32%), followed by sinus bradycardia (12%). Serum potassium levels were found to be significantly lower in patients with arrhythmias compared to those without arrhythmias ($p < 0.001$). A significant negative correlation was observed between serum potassium levels and the incidence of arrhythmias ($r = -0.5$, $p < 0.001$). **Conclusion:** This study highlights the high incidence of arrhythmias during the first 72 hours of hospitalization in patients with ACS and its correlation with serum potassium levels. Hypokalemia may be a contributing factor to the development of arrhythmias in these patients, and monitoring of serum potassium levels may help identify patients at risk of arrhythmias.

INTRODUCTION

Acute Coronary Syndrome (ACS) refers to a spectrum of critical cardiac conditions and is a leading cause of morbidity and mortality worldwide. The early phase of ACS is critical due to the high risk of adverse events, including the development of arrhythmia. The relationship between serum potassium levels and the development of arrhythmias in the context of ACS has been a subject of interest recently. While previous studies have explored this relationship, there remains a need for comprehensive data specific to the critical initial period of hospitalization. The first 72 hours following the onset of ACS are particularly vital, as this is the window during which patients are most vulnerable to developing complications, including arrhythmias.[1-6] Hypokalemia can cause increased risk of ventricular arrhythmias and hyperkalemia, can precipitate bradyarrhythmias or even asystole.[6] Previous research has highlighted the importance of monitoring electrolytes in patients with ACS, but there is a paucity of data on how fluctuations in potassium levels during the first 72 hours correlate with the incidence and type of arrhythmias.[7,8] By identifying specific potassium thresholds associated with arrhythmia risk, clinicians can better tailor their therapeutic strategies to mitigate this risk. Additionally, the study could contribute to the development of guidelines for electrolyte management in the acute phase of ACS, ultimately improving patient outcomes.[9-15]

Aim and Objectives: To study the incidence of arrhythmia in patients with acute coronary syndrome in first 72 hours of hospitalization and correlation with serum potassium levels. To study the incidence

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of arrhythmia in patients with acute coronary syndrome in first 72 hours of hospitalization .To analyse the correlation between cardiac arrhythmias with serum potassium levels.

MATERIALS AND METHODS

Our Observational study was conducted at department of General medicine, Government Medical College Hospital, Virudhunagar .100 patients with acute coronary syndrome who got admitted with acute coronary syndrome in the first 72 hours of their admission in Virudhunagar medical college in Department of General Medicine from October 2022 to September 2023 were included.

Inclusion Criteria

Patients in whom a clinical diagnosis of MI was made based upon typical signs and symptoms. ECG findings suggesting STEMI or NSTEMI with elevated cardiac biomarkers

Exclusion Criteria

Patients with valvular heart disease,on antiarrhythmic drugs, thyroid disorders, chronic kidney disease

Method Of Data Collection: After obtaining Informed Consent, basic information of each patient was collected through a structured proforma.Type of ACS and the different regions of ventricular wall affected was noted with echocardiogram. Patients were put on Cardiac Monitor and pattern of Arrhythmias was noted during the first 72 hours of hospital stay. Routine blood investigations including cardiac biomarkers and serum potassium at time of admission were collected. Serum potassium levels was repeated daily for first 3 days and when arrhythmias developed.

Data Analysis & Interpretation: Statistical analysis was performed using SPSS software version 28. Descriptive statistics was expressed in percentage. For finding out the association between the variables chi square test was used. P value of less than 0.05 was considered to be statistically significant.

RESULTS

In our study, the study population was more in the age category of 51-60 years accounting to 37% of the total population followed by 29% of them in the 41-50 years age category. 75% of them were males and 25% of them were females. Chest pain was the predominant symptom (93%), followed by sweating (65%), dyspnea (42%) and palpitation (54%). Diabetes mellitus was present in 22% of the study population, followed by systemic hypertension in 26%, both diabetes mellitus and systemic hypertension was present in 20% .Smoking habit was present in 45% of the cases, with frequent alcohol consumption in 44% and tobacco chewing was present in 8% .

In our study, STEMI occurred in 83% of the patients followed by 17% with NSTEMI. Troponin levels were found to be positive in 79% of the patients. Anterior wall MI among the STEMI accounted for 35% , inferior wall MI in 24% and 8% had anterolateral wall MI, 7% had both inferior wall with posterior wall, 7% had lateral wall MI,2% had posterior wall MI. NSTEMI was seen in 17% of the patients

Ventricular Premature Contractions was documented in 32%, Sinus bradycardia in 12%, Atrial Fibrillation was present in 9%, Sinus tachycardia in 7%, Ventricular tachycardia in 4% and remaining had various types of heart block.

Table 1: Association of categorical variables with arrhythmias.

Variables	Sub Category	Arrhythmia N (%)		Odds Ratio (95% CI)	p value
		No	Yes		
Sex	Female	8 (32)	17 (68)	1.606 (0.591-4.361)	0.425
	Male	17 (22.7)	58 (77.3)		
Diabetes mellitus	No	20 (25.6)	58 (74.4)	1.172 (0.383-3.590)	1.000
	Yes	5 (22.7)	17(77.3)		
SHT	No	18 (24.3)	56 (75.7)	0.872 (0.316-2.411)	0.797
	Yes	7 (26.9)	19 (73.1)		
DM/SHT	No	18 (22.5)	62 (77.5)	0.539 (0.187-1.553)	0.260
	Yes	7 (35)	13 (65)		
Smoking	No	18 (22.5)	62 (77.5)	2.641 (1.988-7.061)	0.044
	Yes	7 (35)	13 (65)		
Alcohol	No	16 (28.6)	40 (71.4)	1.556 (0.611-3.959)	0.486
	Yes	9 (20.5)	35 (79.5)		
Tobacco Chewing	No	22 (23.9)	70 (76.1)	0.524 (0.116-2.370)	0.409
	Yes	3 (37.5)	5 (62.5)		

The association between the variables like sex, diabetes mellitus, SHT, DM/SHT, Alcohol, Smoking, tobacco chewing with arrhythmia was seen and it was statistically significant only with smoking as the p value was less than 0.05, implying that smokers had 2.641 times higher risk of developing arrhythmias when compared to non smokers.

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Table 2: Association of serum potassium levels with arrhythmia

Variables	Sub Category	Arrhythmia N (%)		p value
		No	Yes	
Potassium levels	Hypokalemia	18 (37.5)	30 (62.5)	0.017
	Normal	5 (11.6)	38 (88.4)	
	Hyperkalemia	2 (22.2)	7 (77.8)	

The association between potassium levels and arrhythmia was seen and it was found to be statistically significant with hypokalemia as the p value was less than 0.05, hypokalemia was suggested increased risk of arrhythmia.

Table 3: Association of ACS with arrhythmias

Variables	Sub Category	Arrhythmia N (%)		Odds Ratio (95% CI)	p value
		No	Yes		
ACS	NSTEMI	8 (50)	8 (50)	3.941 (1.292-12.021)	0.023
	STEMI	17 (20.2)	67 (79.8)		

The association between ACS and arrhythmia was seen and it was found to be statistically significant as the p value was less than 0.05, implying that those who had STEMI had increased risk of developing arrhythmias.

DISCUSSION

Arrhythmias were a significant concern in ACS patients across several studies. Karthika A et al. reported arrhythmias in 61% of their cohort, with ventricular premature contractions (VPCs) being the most common type at 31.1%. Xu X et al. identified various arrhythmia types, including ventricular tachyarrhythmias (3.4%), bradyarrhythmias (2.44%), and atrial tachyarrhythmias (1.78%), highlighting the diverse spectrum of cardiac rhythm disturbances in ACS.[16-22] Hypokalemia was observed in 48% of the study participants, whereas hyperkalemia was observed in 9% of cases, and normal potassium levels were seen in 43%. The mean serum potassium level was 3.71 (SD ± 0.71). The analysis showed a significant association between serum potassium levels and arrhythmias. Hypokalemia was significantly correlated with a higher incidence of arrhythmias (p=0.017).

Studies provided significant insights into potassium levels and their clinical implications in ACS. Ke B et al,[17] reported higher serum potassium levels associated with increased risks of major adverse cardiovascular and cerebral events (MACCE) and all-cause mortality. Fan Y et al,[18] highlighted a U-shaped association between potassium levels and mortality, emphasizing optimal potassium ranges for improved outcomes. Perez PC et al,[20] noted dyskalemia (hypo- and hyperkalemia) at admission as predictors of adverse outcomes in ACS patients, highlighting the importance of electrolyte balance in ACS management.

CONCLUSION

The results of the study highlight the possibility of occurrence of arrhythmia in the first 72 hours of an acute coronary event and association with abnormal serum potassium levels thereby emphasizing the importance of vigilant monitoring for arrhythmia after an acute coronary syndrome and maintaining a normal serum potassium level.These findings show that prompt identification of arrhythmia by continuous cardiac monitoring and immediate treatment by trained personal helps in managing this complication and will provide better outcome. Further studies are necessary to show , how frequent monitoring of Sr. Potassium during initial 72hrs of ACS is ideal and what would be optimal level of Sr. Potassium to be maintained to prevent the occurrence of arrhythmia of myocardial infarction .

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