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Assessment of electrolyte imbalance in acute myocardial infarction patients

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Abstract
Background: Acute myocardial infarction is associated with high morbidity and mortality in hospitalized patients. The present study was conducted to assess electrolyte imbalance in acute myocardial infarction patients.
Materials & Methods: 80 patients of AMI of both genders were included. Electrolytes such as sodium, Potassium, Calcium were measured within 48 hours of admission.
Results: Out of 80 patients, 44 were males and 36 were females. Out of 80 patients, STEMI was seen in 64 and NSTEMI in 16. In STEMI, 50 were normal, 14 were hyponatremia and in NSTEMI, 10 were normal and 6 had hyponatremia. The difference was significant (p<0.05). In STEMI, 52 were normal, 12 were hypokalemia and in NSTEMI, 12 had no electrolyte abnormality and 4 had hypokalemia. The difference was significant (p<0.05). In STEMI, 44 had no electrolyte abnormality, 8 were hypocalcemia and in NSTEMI, 20 had no electrolyte abnormality and 8 had hypocalcemia. The difference was significant (p<0.05).
Conclusion: Hypocalcemia was present in maximum cases as compared to hyponatremia and hypokalemia.

Keywords: Acute myocardial infarction, hyponatremia, electrolyte

Introduction
Acute myocardial infarction is associated with high morbidity and mortality in hospitalized patients. Worldwide there are 3 million sudden cardiac deaths per year due to acute myocardial infarction [1]. Serum sodium, potassium and calcium are considered to be major electrolytes associated with electrophysiological properties of myocardial membrane [2]. The sarcolemma is impermeable to Na in the resting state. It has a Na^+ K^+ ATPase pump that plays an important role in establishing the resting potential. This pump exports Na^+ from the cell out and imports K^+ inside the cell against their concentration gradient [3]. Thus, intracellular K is relatively high and Na is low and extracellular Na^+ is high and K^+ is low. There are 4 phases of action potential dependent on sodium, potassium and calcium. Serum electrolyte imbalances after an episode of acute myocardial infarction are common [19].
Acute ST-segment elevation myocardial infarction (STEMI) is the formation of occlusive thrombi on the basis of coronary atherosclerotic plaque lesions, resulting in continuous or complete obstruction of the coronary artery lumen and leading to myocardial injury and necrosis, cardiac insufficiency, and so on, whose ECG shows abnormal ST-segment elevation [5, 6]. Hyponatremia has been shown to be a predictor of cardiovascular mortality among patients with heart failure. In these patients, hyponatremia has been related to the nonosmotic release of vasopressin, activation of the renin-angiotensin system and catecholamine production [7]. The present study was conducted to assess electrolyte imbalance in acute myocardial infarction patients.

Materials & Methods
The present study consisted of 80 patients of AMI of both genders. All gave their written consent for the participation in the study.
Data such as name, age, gender etc. was recorded. History and physical examination was performed. Electrolyte such as sodium, potassium, calcium levels, random blood sugar, blood urea and serum creatinine were measured within 48 hours of admission. Biochemical analysis was done using ion selective electrodes (ISE) standard methods.

Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table 1: Distribution of patients

Total- 80		
Gender	**Males**	**Females**
Number	44	36

Table 1 shows that out of 80 patients, 44 were males and.

Table 2: Sodium imbalance in acute MI patient

MI	Normal	Hypon	Hypernatremia	P value
STEMI	50	14	0	0.01
NSTEMI	10	6	0	0.02

Table 2 shows that out of 80 patients, STEMI was seen in 64 and NSTEMI in 16. In STEMI, 50 had no electrolyte abnormalities, 14 were hyponatremic and in NSTEMI, 10 were normal and 6 had hyponatremia. The difference was significant (p<0.05).

Table 3: Potassium imbalance in acute MI patient

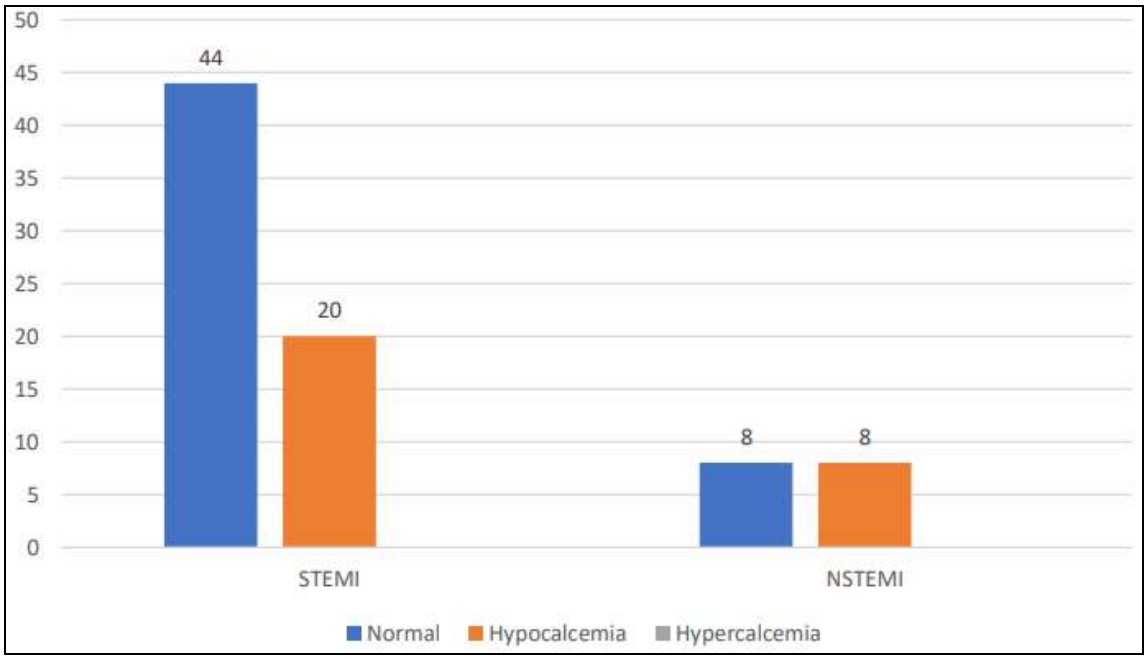
MI	Normal	Hypokalemia	Hyperkalemia	P value
STEMI	52	12	0	0.01
NSTEMI	12	4	0	0.02

Table 3 shows that in STEMI, 52 were normal, 12 had hypokalemia and in NSTEMI, 12 had no electrolyte abnormality and 4 had hypokalemia. The difference was significant (p<0.05).

Table 4: Calcium imbalance in acute MI patient

MI	Normal	Hypocalcemia	Hypercalcemia	P value
STEMI	44	20	0	0.01
NSTEMI	8	8	0	0.02

Table 4, graph 1 shows that in STEMI, 44 were normal, 8 were hypocalcemia and in NSTEMI, 20 were normal and 8 had hypocalcemia. The difference was significant (p<0.05).



Graph 1: Calcium imbalance in acta MI patient

Discussion

Cardiovascular disease is one of the leading causes of morbidity and mortality across the world. World Health Organization (WHO) has declared cardiovascular disease as a modern epidemic.[8] AMI is one of the manifestations of coronary heart disease leading to morbidity and mortality [9, 10]. In India, the prevalence of ischemic heart disease among adults (based on clinical and ECG criteria) was estimated at 96.7 per 1000 population in the urban and 27.1 percent in rural areas. Several systemic metabolic changes occur in AMI [11]. These changes include increased plasma concentrations of catecholamines, free fatty acids, glucose, glycerol, cortisol and cyclic-AMP. There is decreased triglycerides concentration and an initial fall in plasma insulin concentration, followed by an early return to normal value [12, 13]. The present study was conducted to assess electrolyte imbalance in acute myocardial infarction patients.

We found that out of 80 patients, males were 44 and females were 36. Out of 80 patients, STEMI was seen in 64 and NSTEMI in 16. In STEMI, 50 were normal, 14 were hyponatremia and in NSTEMI, 10 were normal and 6 had hyponatremia. Walim *et al.* [14] determined correlation of serum sodium and potassium in the severity and outcome of AMI. 100 people were included in the study divided equally in study and control groups. Study group confirmed diagnosis of recent onset of AMI. The blood samples of both the groups were analyzed for Serum electrolytes (Na^+, K^+) by flame-photometry (Bio-Lab Diagnostic kit). There was a statistically significant decrease in sodium and potassium levels across all age groups and in both sexes of the study group compared to the control group. Significant high level of sodium was observed in AMI patients who are smokers and AMI patients with diabetes whereas the level was low in AMI patients with hypertension. Potassium levels were low in AMI patients with diabetes whereas the

change was insignificant in patients who are smokers and hypertensive.

We found that in STEMI, 52 had no electrolyte abnormality, 12 were hypokalemic and in NSTEMI, 12 had no electrolyte abnormality and 4 had hypokalemia. Patil *et al*. [15] determined the relation between in hospital mortality and electrolyte changes in cases and controls. Cases Included 100 clinically diagnosed and angiographically proven cases of AMI. Controls are patients who are admitted to general wards with minor illness. 27% of all MI patients were found to be hyponatremic. Around 24% found to be hypokalaemic and 49% of cases found to be hypocalcaemic.

We found that in STEMI, 44 were normal, 8 were hypocalcemia and in NSTEMI, 20 were normal and 8 had hypocalcemia. Nikhil Rathi *et al*., [16] found that high serum calcium was found to have correlation with myocardial infarction and serum calcium was found to be an independent prospective risk factor for MI suggesting that extracellular calcium plays a role in the atherosclerotic process. Flear and Hilton [17] reported a progressive fall in the mean daily serum sodium concentration until day 4 and rise thereafter in all cases. In a study done by

Goyal *et al* [18], hospital mortality in MI patients was found to be the least in patients with normal potassium levels (3.5-4.5 mmol/l).

The limitation of the study is small sample size.

Conclusion

Authors found that hypocalcemia was present in maximum cases as compared to hyponatremia and hypokalemia.

Conflict of Interest

Not available

Financial Support

Not available

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