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Original Research Article.

Evaluation of Serum Electrolyte Profile of AMI Patients at a Tertiary Care Hospital: A Case Control Study

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ABSTRACT

Background: Acute myocardial infarction (AMI) is one of the leading causes of death in the developed world. The present study was planned to assess serum electrolyte profile of AMI patients.

Materials & Methods: A total of 55 AMI patients and 55 age-matched and gender-matched healthy controls were included in the present study. Complete medical and past family history of all the subjects was obtained. At the time of admission, blood samples were obtained from all the AMI patients. In case of healthy controls, blood samples were obtained as a part of routine medical check-up. All the samples were sent for assessment of serum potassium and sodium levels.

Results: Mean electrolyte profile of the subjects of the AMI group was found to be significantly lower than that of subjects of the healthy control group.

Conclusion: Fall in the levels of serum sodium and potassium levels might increase the probability of occurrence of AMI.

Key words: Acute Myocardial Infarction, Potassium, Sodium.

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INTRODUCTION

Myocardial necrosis due to myocardial ischemia is defined as myocardial infarction. Detection of a rise and a fall of troponin, expressed in ng/L or pg/mL, is essential to the diagnosis of acute MI. Blood samples for the measurement of cTn should be drawn during the initial patient assessment and repeated 3-6 h later.[1-3]

Acute myocardial infarction (AMI) is one of the leading causes of death in the developed world. Acute myocardial infarction can be divided into two categories, non-ST-segment elevation MI (NSTEMI) and ST-segment elevation MI (STEMI). Unstable angina is similar to NSTEMI. However, cardiac markers are not elevated. Potassium homeostasis is critical to prevent adverse events in patients with cardiovascular disease.[4,5] Government agencies, expert panels and health associations routinely recommend lower sodium intake to reduce blood pressure in order to reduce the risk of cardiovascular disease.[6, 7]

Under the light of above mentioned data, we planned the present study to assess serum electrolyte profile of AMI patients.

MATERIALS & METHODS

The present study was carried out in the Department of Biochemistry, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh (India) with the aim of assessing the serum sodium and potassium and chloride levels in AMI patients. For the present study, we obtained ethical clearance from the ethical committee of the institution. A total of 55 AMI patients and 55 age-matched and gender-matched healthy controls were included in the present study. Complete medical and past family history of all the subjects was obtained. At the time of admission, blood samples were obtained from all the AMI patients. In case of healthy controls, blood samples were obtained as a part of routine medical check-up. All the samples were sent for assessment of serum potassium and sodium levels. All the results were summarized in Microsoft excel sheet and was analyzed with SPSS software version 17.0. Mann-whiney U test and chi- square test was used for evaluation of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS

In the present study, a total of 110 subjects were analyzed. Among these 110 subjects, 55 were AMI patients, while the remaining 55 were healthy controls. Mean age of the AMI patients was 49.5 years, whereas mean age of the healthy controls was

48.1 years. 35 patients among the AMI group, while 33 subjects among the healthy controls were males while the remaining were females.

Mean Sodium levels among the subjects of the AMI group was found to be 125.25 mEq/L, while mean sodium levels among the subjects of the healthy control group was found to be 139.41 mEq/L respectively. Mean potassium levels among the subjects of the AMI group was found to be 3.11 mEq/L while the mean potassium levels of the subjects of the control group was found to be 3.9 mEq/L respectively.

Mean chloride levels among the subjects of the AMI group was found to be 94.27 mEq/L while the mean potassium levels of the subjects of the control group was found to be 101.42mEq/L respectively. Mean electrolyte profile of the subjects of the AMI group was found to be significantly lower than that of subjects of the healthy control group.

Table 1: Demographic parameters

Parameter		AMI group	Control group
Number of subjects		55	55
Mean age (years)		49.5	48.1
Gender	**Males**	35	33
	Females	20	22

Table 2: Comparison of serum electrolyte profile

Electrolyte profile	AMI group	Control group	p- value
Sodium (mEq/L)	125.25	139.41	0.02 (Significant)
Potassium (mEq/L)	3.11	3.9	0.03 (Significant)
Chloride (mEq/L)	94.27	101.42	>0.05

DISCUSSION

Our understanding of the causes, diagnosis, and treatment of acute myocardial infarction (AMI) has evolved significantly over the last 40 years. In the early 20th century, AMI was generally considered a fatal event diagnosed only at autopsy. Until the 1970s, with appropriate understanding of its usual clinical presentation and diagnosis, it was conservatively managed with prolonged bed rest and afterwards with a sedentary lifestyle. Since then, there has been an explosion of information which has changed our understanding of its pathogenesis and markedly altered our treatment options, leading to vastly improved outcomes.[8,9] In the present study, a total of 110 subjects were analyzed. Among these 110 subjects, 55 were AMI patients, while the remaining 55 were healthy controls. Mean age of the AMI patients was 49.5 years, whereas mean age of the healthy controls was 48.1 years. 35 patients among the AMI group, while 33 subjects among the healthy controls were males while the remaining were females. ECG diagnosis of STEMI can be difficult, particularly in patients with a left bundle branch block and pacemakers. Sgarbosa described criteria that can assist the physician or practitioner in diagnosing STEMI in these patients. Isolated ST-elevations in aVR are indicative of left main coronary artery occlusion in the appropriate clinical setting. Wellens noted deeply biphasic T waves in V2, V3, and found they are often predictive of an impending proximal left anterior descending artery occlusion which may lead to devastating anterior wall myocardial infarction.[10]

In the present study, Mean Sodium levels among the subjects of the AMI group was found to be 125.25 mEq/L, while mean sodium levels among the subjects of the healthy control group was found to be 139.41 mEq/L respectively. Mean potassium levels among the subjects of the AMI group was found to be 3.11 mEq/L while the mean potassium levels of the subjects of the control group was found to be 3.9 mEq/L respectively.

Ramasamy R et al evaluated serum Mg+ and other electrolytes as adjuvant markers in the diagnosis of AMI. Study includes sixty patients with AMI and 100 controls. Serum electrolytes were estimated using electrolyte analyzer. Data were compared by using student 't' test. ROC was drawn to find out optimum cutoff for diagnosing AMI. Pearson's correlation was done to see the association among the markers. Serum Ca, Mg, K and Na electrolytes were significantly lower ('p'<0.001) in AMI. Ca: Mg, K: Mg, and Na: K ratios were significantly higher when compared to controls ('p'<0.001). There was significant correlation of serum Mg levels with other cardiac markers (Total CK, CK-Mb, Troponin -T) of AMI ('p' <0.05). ROC analysis of Na: Mg (40.9), Ca: Mg (3.43) and K: Mg (2.74) ratios showed optimum cutoffs in diagnosis of AMI. Serum Mg, Ca: Mg, K: Mg and Na: K ratios could be useful adjuvant markers in diagnosis of AMI.[11]

In the present study, mean electrolyte profile of the subjects of the AMI group was found to be significantly lower than that of subjects of the healthy control group. Pourmoghaddas A et al determined the relationship between serum potassium level and frequency of ventricular tachycardia in early stages of AMI. Ina cross-sectional study on 162 patients with AMI in the coronary care unit (CCU) of Nour Hospital (Isfahan, Iran), the patients' serum potassium level was classified into three groups: 1) K<3.8 mEq/l, 2) 3.8≤K<4.5 mEq/l and 3) K≥4.5 mEq/l. The incidence of ventricular tachycardia in the first 24 hours after AMI was determined in each group by chi-square statistical method. The frequency of ventricular tachycardia in the first 24 hours after AMI in K< 3.8 mEq/l, 3.8≤K<4.5 mEq/l and K≥4.5 mEq/l groups were 19.0%, 9.6% and 9.9% respectively. The high frequency of this arrhythmia in the first group as compared with the second and the third group was statistically significant. Hypokalemia increased the probability of ventricular tachycardia in patients with AMI.[12]

The influence of chloride on the cardiovascular system may be important for clinicians for several reasons: first, chloride loading may contribute to catecholamine need in critically ill patients. Second, cardiac function may be influenced by chloride levels in a "U-shaped" response curve with both hypo- and hyperchloremia being detrimental for cardiovascular stability (and function). Third,

the effect of chloride-"loading" on hemodynamic stability may be dose-dependent. Fourth, in preclinical models, it was shown that simple hyperchloremia may trigger increased blood pressures. However, only concomitant hyperchloremia with metabolic acidosis results in decreased systemic pressures.[13]

CONCLUSION

Under the light of above obtained data, the authors conclude that fall in the levels of serum sodium and potassium levels might increase the probability of occurrence of AMI. However; further studies are recommended.

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