

To evaluate the serum sodium level in patients with AMI and its complication

Dr. Subhash Chandra Jha¹, Dr. Saborni Dey², Dr. Rajesh Ranjan³

¹Assistant professor, Dept of General Medicine, Saraswathi institute of medical sciences
Pilkhuwa, hapur, UP, India, Email: Subhashjha952@gmail.com

²Associate Professor, Dept. Of Pharmacology, Saraswathi Institute of Medical Sciences,
Pilkhuwa, Hapur, U.P, India, Email: sabornidey7@gmail.com

³Professor, Dept. of Community Medicine, Noida international institute of medical sciences,
Greater Noida UP, India, Email: rajesh.dr.ranjan@gmail.com

Corresponding author: Dr. Subhash Chandra Jha

ABSTRACT

Aim: To evaluate the serum sodium level in patients with AMI and its complication.

Methods: The study was conducted on 60 patients with recent onset of acute myocardial infarction in accordance with the European Society of Cardiology (ESC), the American College of Cardiology (ACC), the American Heart Association (AHA), and the World Heart Federation (WHF) jointly. A comparison of serum and potassium levels was performed between the control category and AMI, patients and AMI patients with and without a history of smoking, hypertension, and diabetes mellitus, as well as a study to evaluate the variations in serum electrolyte levels in AMI patients aged less than 52 years and more than 52 years.

Results : A significantly lower amount of potassium was detected in AMI patients 52 years of age than in normal healthy control categories, although a greater level of potassium was identified in AMI cases > 52 years of age. Both sexes saw a statistically significant drop in serum electrolyte levels. Serum sodium levels were significantly higher in smokers than in nonsmokers in AMI. There was no significant difference in serum potassium levels in AMI between smokers and nonsmokers .

Conclusion: Acute myocardial infarction is characterised by hyponatremia and hypokalemia. Serum sodium and potassium levels are prognostic markers, indicating that a rebound in sodium levels following an initial drop was predictive of clinical improvement.

Keywords: AMI, Serum sodium, potassium

Introduction

Myocardial infarction (MI) is the major cause of adult death and disability in both urban and rural India, and it occurs at a younger age than in Western cultures. ¹ The most prevalent electrolyte problem in hospitalised patients across a variety of clinical settings is hyponatremia. ^{2,3} Severe hyponatremia is a potentially fatal and life-threatening condition that can result in severe neurological consequences. ^{4,5} Hyponatremia is typically a symptom of serious underlying illness and is thus linked with a poor short-term prognosis, even when blood sodium levels are only modestly lowered. ^{1,6}

Serum sodium and potassium concentrations play an essential role in instances of myocardial infarction, including various complications that can lead to death. In the case of an acute myocardial infarction, sodium imbalance can result from factors that existed prior to the incident, such as a salt-restricted diet, previous diuretic use, and the presence of overt or incipient renal failure, as well as slowly occurring cardiac failure prior to the infarction.

Materials and methods

The study was conducted on 60 patients with recent onset of acute myocardial infarction in accordance with the European Society of Cardiology (ESC), the American College of Cardiology (ACC), the American Heart Association (AHA), and the World Heart Federation (WHF) jointly. ⁷ With the support of a physician's opinion, 60 patients were chosen for the research group based on age, gender, duration of AMI symptoms, and any history indicative of vascular problems. This study comprised 60 normal non-hypertensive people with no indications of AMI in the control group.

Methodology

In both groups, venous blood samples were collected within 12 hours of admission from the antecubital vein using all aseptic precautions in plain vacutainers for serum electrolytes, namely Na⁺ and K⁺. After allowing blood to coagulate at room temperature for 30 minutes, it was centrifuged at 3000 rpm for five minutes. For the estimate, the serum that had been isolated was employed. Flame-photometry was used to test serum electrolytes (Na⁺, K⁺).

A comparison of serum and potassium levels was performed between the control category and AMI, patients and AMI patients with and without a history of smoking, hypertension, and diabetes mellitus, as well as a study to evaluate the variations in serum electrolyte levels in AMI patients aged less than 52 years and more than 52 years.

Statistical investigation

The data from 60 AMI patients and 60 non-AMI individuals (Control category) were analysed, with correlations of serum Na⁺ and K⁺ parameters displayed as cross-tabulations. The mean and standard deviations of SBP, DBP, serum electrolytes (Na⁺, K⁺), and the 'cut-off' values for determining a normal range were computed.

Results

The AMI cases were studied in the Intensive Cardiac Care Unit, and their serum electrolytes values were measured and compared to a normal healthy control group. Serum salt and potassium levels in the study group were statistically significantly lower across all ages when compared to the normal healthy control group. A significantly lower amount of potassium was detected in AMI patients 52 years of age than in normal healthy control categories, although a greater level of potassium was identified in AMI cases > 52 years of age [Table 1]. Both sexes saw a statistically significant drop in serum electrolyte levels [Table 2].

Serum sodium levels were significantly higher in smokers than in nonsmokers in AMI. There was no significant difference in serum potassium levels in AMI between smokers and nonsmokers [Table 3]. Serum sodium levels were lower in AMI with hypertension than in AMI without hypertension. There was no significant difference in serum potassium levels between AMI with hypertension and AMI without hypertension [Table 4]. This comparison, however, was statistically insignificant. AMI with diabetes mellitus and AMI without diabetes mellitus both had statistically insignificant findings. Serum sodium levels in AMI with diabetes mellitus were greater than in AMI without diabetic mellitus. Serum potassium levels were lower in AMI with diabetes mellitus compared to AMI without diabetes mellitus.

Table 1. Sodium and potassium levels on the basis of age

		<52 years		>52 years
	Control category =25	AMI= 20	Control category =35	AMI =40
Sodium (mEq / L)	138.18 ±3.55	131.01 ± 6.33	137.04 ± 4.03	130.11 ± 5.36
Potassium (mEq / L)	4.22 ± 0.77	3.29 ± 2.02	4.71 ± 0.88	4.22 ± 0.71

Table 2. Sodium and potassium levels on the basis of Sex

	Male		Female	
	Control category =32	AMI =40	Control category =28	AMI 20
Sodium (mEq / L)	138.11 ± 4.03	130.17 ± 6.34	137.15 ± 4.63	130.22 ± 3.96
Potassium (mEq / L)	4.22 ± 0.69	3.81 ± 0.88	4.21 ± 0.62	3.31 ±1.11

Table 3. Sodium and potassium levels on the basis of smoking habits

	AMI without smoker= 45	AMI with smoker =15	p-value
Sodium (mEq / L)	129.25 ± 5.32	136.11 ± 3.22	p < 0.001*
Potassium (mEq / L)	4.23 ± 0.67	4.11 ± 0.74	p > 0.05**

Table 4. Sodium and potassium levels on the basis of hypertension

	AMI without hypertension =28	AMI with hypertension =32	P value
Sodium (mEq / L)	131.23 ± 4.89	130.12 ± 3.89	P >0.05**
Potassium (mEq / L)	4.11± 0.58	4.32 ± 0.69	P > 0.05**

DISCUSSION

Among these changes are increased plasma concentrations of catecholamines, free fatty acids, glucose, glycerol, cortisol, and cyclic-AMP. There is a decline in triglyceride concentration and an initial drop in plasma insulin concentration, followed by a quick return to normal. Changes in serum electrolytes in AMI have not been well investigated, and there is a paucity of information in the literature. The drop in sodium level on the day of admission in AMI is comparable to the data reported by Shah and his colleagues et al.⁸, who found hyponatremia on the first day. In all patients, Flear and Hilton found a gradual decline in the mean daily blood sodium concentration until day 4 and then an increase.⁹

Flear and Singh also discovered a significant drop in serum sodium levels in both sexes.¹⁰ There were 15 smokers whose serum sodium content was considerably greater than non-smokers. There is no evidence in the literature to suggest the link between smoking and sodium concentration. Serum potassium levels were lower in individuals under the age of 52 than in those beyond the age of 52. Potassium levels have a propensity to rise with age.¹¹ Serum potassium levels were found to be low in AMI patients of both ages. During the first three days after AMI, Flear and Hilton observed a decrease in mean daily serum potassium concentrations.⁹

Serum potassium levels in females were substantially lower than in males. Others have found a greater prevalence of hypokalemia in women than in males in AMI, although the explanation is unknown.^{12,13} Nonsmokers had considerably greater serum potassium levels than smokers.

Smoking was shown to have a substantial correlation with blood potassium levels. Wannamethee and his colleagues reported a higher amount in a typical middle-aged individual.¹¹ In cardiovascular illness, they also documented an increase in mortality with increased blood potassium levels. Serum potassium levels were not substantially higher in AMI with hypertension patients compared to AMI without hypertension instances.

Although hypokalemia is not a symptom of hypertension, the plasma potassium level is always elevated in hypertensive individuals.¹⁴ Ikram and colleagues found a low serum potassium level in hypertensive coronary heart disease after an acute myocardial infarction.¹⁵

Conclusion

Acute myocardial infarction is characterised by hyponatremia and hypokalemia. Serum sodium and potassium levels are prognostic markers, indicating that a rebound in sodium levels following an initial drop was predictive of clinical improvement. As a result, estimating sodium and potassium levels in acute MI patients can aid in determining their prognosis.

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