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Original Research

Serum sodium levels in acute myocardial infarction and their relationship to the severity and consequences of myocardial infarction

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ABSTRACT:
Aim: Serum sodium levels in acute myocardial infarction and their relationship to the severity and consequences of myocardial infarction. **Methods:** After receiving ethical approval from the institute, this study was conducted. The research comprised 100 individuals with acute myocardial infarction. On admission, the patients were clinically assessed with a full history, particularly the symptoms and history of risk factors for the occurrence of acute myocardial infarction, and a thorough physical examination was performed. On admission, all patients' serum sodium concentrations were measured and compared to hyponatremia against normonatremia. Individuals who had clinical history of ischemic chest pain lasting for > 20 min., electrocardiographic changes or elevation of serum cardiac biomarkers such as creatinine phosphokinase MB fraction and/or troponin were included in the study. **Results:** Acute myocardial infarction was most prevalent in those aged 50 to 60 years old, and it was shown to be more common in men. It was linked to modifiable risk factors such as cigarette addiction, diabetes, hypertension, and dyslipidemia. Serum sodium levels were low in patients with acute myocardial infarction, and lower values were reported in patients with myocardial infarction accompanied with heart failure ($p<0.05$). Sixteen of the twenty patients were in group B, and three of the five patients with biventricular failure were in group B. P value 0.05 indicates significance. Serum sodium levels and the degree of heart failure were shown to have a positive connection (p0.05). Serum sodium levels in fatal patients were substantially lower than in non-fatal instances. All the fatal cases were in group B, and all were males. ($p<0.05$). Hence, there was significant correlation observed with serum sodium level and adverse outcomes of acute myocardial infarction. **Conclusions:** There was a clear link between acute myocardial infarction accompanied by ventricular failure and arrhythmias associated with hyponatremia. Serum sodium levels are associated with the severity, complications, and prognosis of a myocardial infarction.
Keywords: Myocardial infarction, Serum sodium, Heart failure

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INTRODUCTION

Cardiovascular disease is a primary cause of morbidity and death worldwide. Cardiovascular disease has been named a contemporary epidemic by the World Health Organization (WHO). AMI is a symptom of coronary heart disease that causes morbidity and death. In India, the prevalence of ischemic heart disease among adults was estimated to be 96.7 per 1000 people in urban regions and 27.1 percent in rural areas (based on clinical and ECG criteria). AMI causes a number of systemic metabolic alterations.[1,2] Increased plasma concentrations of catecholamines, free fatty acids, glucose, glycerol, cortisol, and cyclic-AMP are among these alterations. There is a decrease in triglyceride concentration and an initial drop in plasma insulin concentration, which

is followed by a rapid recovery to normal. Changes in serum electrolytes in AMI have not been fully researched, and there is a scarcity of evidence in the literature in this area. There is scant evidence in the literature concerning the predictive significance of serum electrolytes in ischemic heart disease.

MATERIALS AND METHODS

After receiving ethical approval from the institute, this study was conducted. The research comprised 100 individuals with acute myocardial infarction. On admission, the patients were clinically assessed with a full history, particularly the symptoms and history of risk factors for the occurrence of acute myocardial infarction, and a thorough physical examination was performed. On admission, all patients' serum sodium concentrations were measured and compared to hyponatremia against normonatremia. The researchers looked at the links between hyponatremia and in-hospital mortality as well as heart failure.

INCLUSION CRITERIA

Individuals who had clinical history of ischemic chest pain lasting for > 20 min., electrocardiographic changes or elevation of serum cardiac biomarkers such as creatinine phosphokinase MB fraction and/or troponin were included in the study.

EXCLUSION CRITERIA

Individuals who were suffering from long standing heart failure or chronic renal failure were excluded.

METHODOLOGY

In both groups, venous blood samples were collected within 12 hours of admission from the anticubital 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 determine the electrolytes (Na+, K+) in serum (Bio-Lab Diagnostic kit). A comparison of serum and potassium levels was conducted between controls and AMI, patients and AMI patients with and without a history of smoking, hypertension, and diabetes mellitus, as well as a research to examine the differences in serum electrolyte levels in AMI patients under the age of 50 and above 50 years. ECGs were taken at the time of admission, twice daily afterwards, and as necessary. Serum sodium and potassium levels were measured at the time of admission, as well as after 12 hours, 24 hours, and 48 hours. The average of the four readings was calculated. Serum sodium cases were divided into two groups based on the mean value: Group A had a serum sodium level greater than 137mmol/l and Group B had a serum sodium level less than 137mmol/l. Other biochemical markers such as blood sugar, blood urea, serum aspartate amino transferase, serum alanine transferase, serum cholesterol, and so on were considered.

RESULT

Acute myocardial infarction was most prevalent in those aged 50 to 60 years old (Table 1), and it was shown to be more common in men. It was linked to modifiable risk factors such as cigarette addiction, diabetes, hypertension, and dyslipidemia. Serum sodium levels were low in patients with acute myocardial infarction, and lower values were reported in patients with myocardial infarction accompanied with heart failure (p0.05). Sixteen of the twenty patients were in group B, and three of the five patients with biventricular failure were in group B. P value 0.05 indicates significance. (See Table 3) Serum sodium levels and the degree of heart failure were shown to have a positive connection (p0.05). (See Table 4) Serum sodium levels in fatal patients were substantially lower than in non-fatal instances.

All the fatal cases were in group B, and all were males. ($p<0.05$). Hence, there was significant correlation observed with serum sodium level and adverse outcomes of acute myocardial infarction.

Table 1: Age distribution

Age Group (in yrs)	No. of patients	Percentage
Below 30	10	10
30-40	20	20
40-50	20	20
50-60	30	30
60-70	17	17
Above 70	3	3

Table 2: Showing serum sodium in cases of ami (acute myocardial infarction

Type of failure	Group A (n=30)		Group B (n=70)	
	AWMI	IWMI	AWMI	IWMI
LVF	2	0	8	5
RVF	0	0	0	0
Biventricular failure	2	0	3	0

Table 3: relation of cases of heart failure in killip's classification with different group

Killip's Classes	Group A(n=30)	Group B(n=70)
I	20	50
II	5	4
III	0	8
IV	5	8

Table 4: relation of mortality rate with serum sodium level

Serum sodium level (mmol/l)	Male	Female	Total
Group A (n=30)	20	10	30
Group B (n=70)	50	20	70

DISCUSSION

The youngest patient in the current research was 30 years old. 40 percent of the patients were 40 years old, which is consistent with Singh et al. (2003)[3], who found prematurity to be a risk factor for acute myocardial infarction, and Gupta et al 1996, who found the same. The age group 50-60 years had the highest incidence of myocardial infarction. Enas et al (2001) reported a similar observation.[4] In the current investigation, 30 out of 100 patients, or 30%, were females. Females have a lesser risk of having an acute myocardial infarction. Singh et al (1997)[5] discovered a similar pattern in the frequency of coronary artery disease and coronary risk factors in rural and urban populations of north India.

High blood sugar levels were observed in 10 instances among known diabetics and 30 cases among non-diabetics in the current investigation. There were 29 occurrences of anterior wall MI out of 30. Stress hyperglycemia, which is more common in anterior wall MI due to increased sympathetic activation and catecholamine production, may be to blame. (p value = 0.05) B Complications such as supraventricular tachycardia, ventricular tachycardia, fibrillations, complete heart block, and heart failure were found in 45 percent of hyperglycemic patients and 16 percent of normoglycemic patients, according to Bala Raju et al (2008).

According to VK Katyal et al (2008)[6], acute hyperglycemia at admission in ACS patients had a significant influence on their outcome regardless of whether they were previously diagnosed with diabetes or not. This observation corresponded to the current inquiry. Serum Cholesterol - High blood cholesterol was discovered in 16 individuals, accounting for 16% of all cases. According to Salehuddin et al (2008)[7], dyslipidemia was diagnosed in 18% of individuals. The association between high cholesterol and ischemic heart disease is well known. According to the Pooling Project Research Group (1975), coronary risk remains constant, which implies that the higher the plasma cholesterol, the higher the risk of coronary artery disease.

The mean serum sodium level in group A was 137.1mmol/l, while it was 129.7mmol/l in group B. Severe hyponatremia (serum sodium was hyponatremic for 6 hours). When instances of MI with hyponatremia were further investigated, those who reported within 6 hours of start had significantly lower blood sodium levels than those who presented after 6 hours. The current study additionally looked at the relationship between blood sodium levels and various sequelae of myocardial infarction. In the current study, 16 of the 20 patients were in group B, and 3 of the 5 patients with biventricular failure were in group B. P value 0.05 indicates significance.

Thus, there was a link between serum sodium levels in MI patients who had cardiac failure and those who had simple MI. The relationship between serum sodium and arrhythmia was investigated. In the current investigation, eight of the twelve individuals with premature complexes were hyponatremic. Hyponatremic conditions were present in all cases of total cardiac block, supraventricular tachycardia, and ventricular tachycardia. Six of the ten conduction irregularities were hyponatremic. However, in patients with a myocardial infarction who developed arrhythmia, blood sodium levels did not vary significantly as compared to simple infarction. The current investigation supports the role of serum sodium in determining the severity of acute myocardial infarction.

According to Singh A K et al (2008)[8], the bad result in the hyponatremic group was 10 (23.8 percent), while the unfavourable outcome in the nonhyponatremic group (178) was 24 (13.48 percent) of acute MI. M Salehuddin et al (2008)10 discovered that 31 patients (31%) died in the hyponatremic group compared to 9 patients (9%) in the nonhyponatremic group with acute MI. Singh A K et al (2009)8 discovered that the incidence of adverse events in the hyponatremic group (136 cases) was 31 (22.79 percent), whereas it was 66 (15.4 percent) in the nonhyponatremic group (428 cases) (p 0.05). The conclusion was consistent with the findings of Flear CTG (1979)[9], who discovered a substantial difference in serum sodium levels in fatal and non-fatal patients.

The current investigation found a substantial link between hyponatremia in the early stages of MI and long-term mortality in acute MI survivors. After controlling for recognised clinical indicators of bad outcome, such as LVEF, hyponatremia remained a substantial and independent predictor of death. Furthermore, the link between hyponatremia and unfavourable outcome remained strong in both low-risk and high-risk patients (preserved LVEF and

Killip class I at admission) (reduced LVEF and clinical evidence of HF at admission). Our findings also corroborate the underlying pathophysiological link between hyponatremia and neurohormonal activation by showing that hyponatremia in the acute phase of MI predicts future admissions for HF therapy. Readmission for late HF in patients following MI is especially concerning since these individuals have a several fold increase in mortality risk when compared to other MI survivors.

CONCLUSION

There was a clear link between acute myocardial infarction accompanied by ventricular failure and arrhythmias associated with hyponatremia. Serum sodium levels are associated with the severity, complications, and prognosis of a myocardial infarction.

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