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ORIGINAL RESEARCH

Effect of hyponatremia in patients with suspected acute coronary syndrome

[1]Dr. Ashutosh Kumar, [2]Dr. Rahul Ranjan, [3]Dr.(Prof) Ashok Kumar, [4]Dr. Gyan Prakash, [5]Dr. Tanya

[1,2]Senior Resident, [3]Professor, [4,5]Post graduate, Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India

Corresponding Author
Dr. Rahul Ranjan
Senior Resident, Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India
Email: drsss200584@gmail.com

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ABSTRACT

Background: Hospitalized individuals frequently have hyponatremia, which frequently indicates a poor prognosis. It has recently been demonstrated that hyponatremia can predict death in patients with ST-elevation myocardial infarction (STEMI) and is a known predictor of mortality in patients with heart failure. The present study was conducted to assess the effect of hyponatremia in patients with suspected acute coronary syndrome. **Materials & Methods:** 70 patients of acute myocardial infarction of both genders were selected. Serum potassium and sodium levels were measured upon admission, as well as after 12, 24, and 48 hours. Hyponatremia was considered if sodium level was <135 mEq/L. **Results:** Out of 70, hyponatremia was present in 28 and absent in 52 patients. Among hyponatremia and non- hyponatremia patients, anemia at admission was seen in 27% and 21%, left ventricular ejection fraction <35% in 22% and 19%, diuretic use before admission was seen in 38%and 31%, coronary artery disease in 54% and 50%, myocardial infarction in 20% and 18%, hypertension in 67% and 70%, diabetes mellitus in 68% and 36%, smoker were 24% and 20%, congestive heart failure in 16% and 15%, chronic renal insufficiency in 52% and 46%, death or myocardial infarction in 14% and 7% patients respectively. The difference was significant (P< 0.05).Adverse events were maximum in patient with hyponatremia (52%). The difference was significant (P< 0.05).Predictors of death or myocardial infarction at 30 days was age >65 yrs, pulmonary edema at admission, systolic blood pressure <90 mm Hg and hyponatremia. **Conclusion:** Hyponatremia on admission is associated with 30-day adverse outcome in patients presenting with suspected acute coronary syndrome/non-STEMI.

Keywords: Acute coronary syndrome, chronic renal insufficiency, Hyponatremia

INTRODUCTION

Hospitalized individuals frequently have hyponatremia, which frequently indicates a poor prognosis. It has recently been demonstrated that hyponatremia can predict death in patients with ST-elevation myocardial infarction (STEMI) and is a known predictor of mortality in patients with heart failure.[1] In acute myocardial infarction, the renin-angiotensin system is activated, atrial natriuretic peptide and catecholamines are released, and there is complicated neurohormonal activation.[2] These processes, which cause peripheral vasoconstriction and myocardial hypertrophy and may make acute myocardial infarction patients less likely to survive, are comparable to those in heart failure.[3]

Hyponatremia has been shown to be a predictor of cardiovascular mortality among patients with heart failure.[4] In these patients, hyponatremia has been related to the nonosmotic release of vasopressin, activation of the renin-angiotensin system and catecholamine production. Serum potassium and sodium concentrations have a number of significant effects in myocardial infarction instances, including many complications that can be deadly.[5] When a person has an acute myocardial infarction, sodium imbalance may result from pre-existing conditions such as a diet low in salt, a history of diuretics, the presence of overt or incipient renal failure, or slowly developing cardiac failure before the infarction.[6]The present study was conducted to assess the effect of hyponatremia in patients with suspected acute coronary syndrome.

MATERIALS & METHODS

The study was carried out on 70patients of acute myocardial infarction of both genders.All family members were informed regarding the study and their written consent was obtained.

Data such as name, age, gender etc. was recorded. At the time of admission, twice a day after that, and whenever needed, an ECG was taken. Serum potassium and sodium levels were measured upon

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admission, as well as after 12, 24, and 48 hours. Hyponatremiawas considered if sodium level was <135 mEq/L. Results thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Patient characteristics

Parameters	Hyponatremia		P value
	Yes (28)	No (42)	
Anemia at admission	27%	21%	0.05
Left ventricular ejection fraction <%	22%	19%	0.62
Diuretic use before admission	38%	31%	0.90
Coronary artery disease	54%	50%	0.82
Myocardial infarction	20%	18%	0.68
Hypertension	67%	70%	0.73
Diabetes mellitus	68%	36%	0.01
Smoker	24%	20%	0.90
Congestive heart failure	16%	15%	0.82
Chronic renal insufficiency	52%	46%	0.17
Death or myocardial infarction	14%	7%	0.01

Table I shows that out of 70, hyponatremia was present in 28 and absent in 52 patients. Among hyponatremia and non- hyponatremia patients, anemia at admission was seen in 27% and 21%, left ventricular ejection fraction <35% in 22%and19%, diuretic use before admission was seen in 38% and 31%, coronary artery disease in 54% and 50%, myocardial infarction in 20% and 18%, hypertension in 67% and 70%, diabetes mellitus in 68% and 36%, smoker were 24% and 20%, congestive heart failure in 16% and 15%, chronic renal insufficiency in 52% and 46%, death or myocardial infarction in 14% and 7% patients respectively. The difference was significant (P< 0.05).

Graph I Patient characteristics

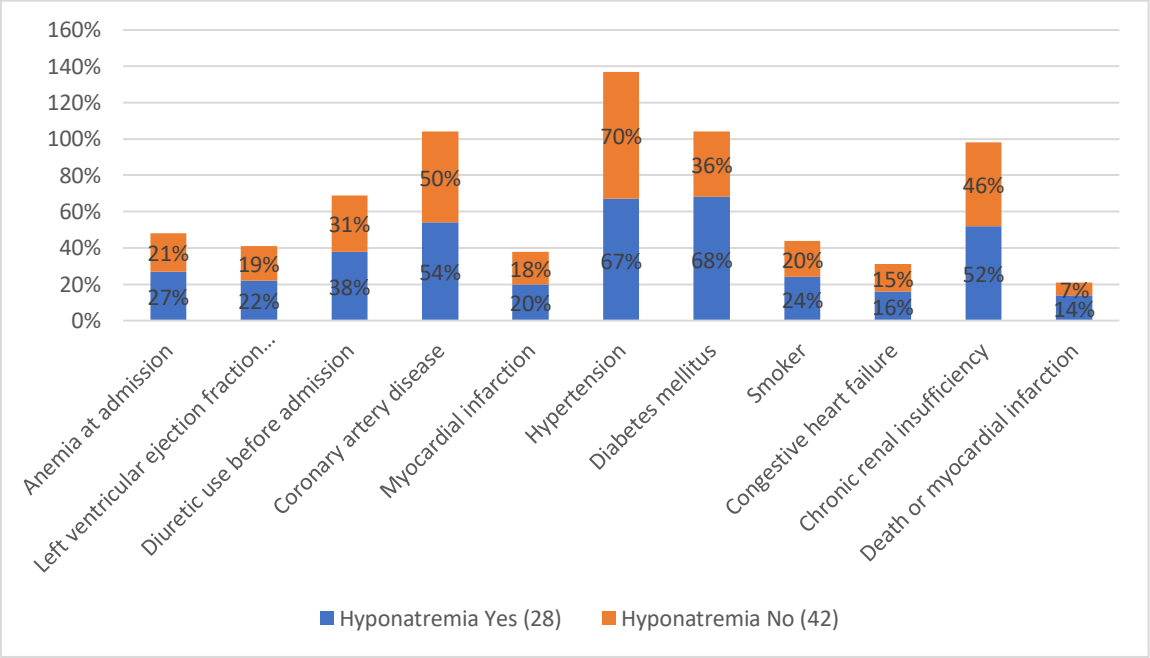

Table II Severity of hyponatremia and adverse outcome

Sodium level (mEq/L)	Number	P value
<135	52%	0.01
130-135	16%	
>135	10%	

Table II shows that adverse events were maximum in patient with hyponatremia (52%). The difference was significant (P< 0.05).

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Table III Multivariate analysis for predictors of death or myocardial infarction at 30 days

Variable	Odds Ratio	95% CI	P value
Age >65 yrs	1.7	0.4-1.5	0.05
Pulmonary edema at admission	3.1	1.5-4.8	0.01
Systolic blood pressure <90 mm Hg	2.7	1.3-4.4	0.02
Chronic renal insufficiency	1.6	1.1-2.0	0.81
Hyponatremia	1.9	1.2-2.4	0.02

Table III shows that predictors of death or myocardial infarction at 30 dayswas age >65 yrs, pulmonary edema at admission, systolic blood pressure <90 mm Hg and hyponatremia. The difference was significant (P< 0.05).

DISCUSSION

Coronary artery disease is one of the world's most hazardous health conditions, and it is unchecked in rapidly emerging countries like India. Although less frequent, high sodium levels can happen, especially in individuals who are dehydrated or receiving an excessive amount of salt through intravenous fluids.[7] Serum sodium levels in MI patients must be closely watched because both hyponatremia and hypernatremia can significantly affect heart function and overall prognosis. 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. 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.[9]The present study was conducted to assess the effect of hyponatremia in patients with suspected acute coronary syndrome.

We found that out of 70, hyponatremia was present in 28 and absent in 52 patients. Among hyponatremia and non- hyponatremia patients, anemia at admission was seen in 27% and 21%, left ventricular ejection fraction <35% in 22% and 19%, diuretic use before admission was seen in 38% and 31%, coronary artery disease in 54% and 50%, myocardial infarction in 20% and 18%, hypertension in 67% and 70%, diabetes mellitus in 68% and 36%, smoker were 24% and 20%, congestive heart failure in 16% and 15%, chronic renal insufficiency in 52% and 46%, death or myocardial infarction in 14% and 7% patients respectively. Singla et al[10]evaluated the effect of hyponatremia on outcomes in patients with suspected acute coronary syndrome and non-STEMI. All patients had a sodium level determined at time of admission, at 24 and 48 hours, and at discharge. Of 1,478 patients, 341 (23.1%) were hyponatremic (sodium <135 mEq/L) onpresentation. Patients who had hyponatremia on admission were significantly more likelyto die or have recurrent myocardial infarction in the next 30 days (odds ratio 1.98, 95%confidence interval 1.35 to 2.89, p <0.001). This relation persisted after adjusting forfactors such as age, left ventricular ejection fraction, use of diuretics before admission, hypotension on presentation, anemia, chronic renal insufficiency, pulmonary edema, and high troponin levels.

We found that adverse events were maximum in patient with hyponatremia (52%). Predictors of death or myocardial infarction at 30 days was age >65 years, pulmonary edema at admission, systolic blood pressure <90 mm Hg and hyponatremia.Patel et al[11]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. 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.

Walim et al[12] determined correlation of serum sodium and potassium in the severity and outcome of AMI. 100 people were included in study divided equally in study and control groups. Study group comprised confirmed diagnosis of recent onset of AMI. The blood samples of both the groups were analysed for Serum electrolytes (Na+, K+) by flame-photometry (Bio-Lab Diagnostic kit).There was statistically significant decrease in sodium and potassium levels in across all age groups & in both sexes of study group compared to 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 association with smoking and hypertension.

The shortcoming of the study is small sample size.

CONCLUSION

Authors found that hyponatremia on admission is associated with 30-day adverse outcome in patients presenting with suspected acute coronary syndrome/non-STEMI.

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