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Research Article

THE PREVALENCE OF HYPONATREMIA IN PATIENTS OF ACUTE CORONARY SYNDROME AND ITS ASSOCIATION WITH THE PATIENT OUTCOME

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A B S T R A C T

Aims: To study the prevalence of hyponatremia in the patients admitted with Acute Coronary Syndrome (ACS) and its association without come of patient sat30 days and 90days follow up.
Methods: Total 68 patients, admitted with ACS, were studied. The serum sodium levels were measured at the time of admission, at 24 hours and at the time of discharge. All the patients were followed up telephonically at day 30 and day 90 of index event.
Results: Of the 68 patients, 62% were male; most common age of presentation was 41-60 years in 45.5%. Smoking and dyslipidemia were the common risk factors for ACS. Hyponatremia was noted in 29.4% patients among the study population.
Patients of ACS with hyponatremia had higher pulse rate at presentation which was statistically significant (p-0.018).Among hyponatremic group 13(65%) patients and among non-hyponatremic group 33(69%) patients stayed in the hospital for 4-7days. The duration of hospital stay, readmission on follow up at Day 30 was similar in both groups. On follow up at day 90, 5(25%) of 20 patients of ACS with hyponatremia were re-admitted where as 3(6%) of total 48 patients in non-hyponatremia group were re-admitted however difference was not statistically significant. There was increased mortality among patients of ACS with hyponatremia at follow up period at 90 days than those without hyponatremia (20% vs 8%) which was statistically significantly (p-0.006).
Conclusion: The patients of ACS with hyponatremia at time of hospitalization had significantly higher pulse rate at presentation and had significantly higher all cause mortality on follow up at day 90 after discharge from the hospital.

INTRODUCTION

The Coronary heart disease has been classified as Stable angina, Acute Coronary Syndrome (ACS) and Sudden death. ACS encompasses different clinical entities associated with acute myocardial ischemia including, ST segment elevation myocardial infarction (STEMI), non ST elevation MI (NSTEMI) and unstable angina.[1]

Hyponatremia is defined as serum sodium levels <135mEq/L[12], is a very common disorder occurring in up to 22% hospitalized patients. This disorder is almost always the result of an in creaseincirculating Arginine Vasopressin (AVP) and/or increased sensitivity to AVP, combined with the intake of free water.[2]

Hyponatremia is associated with exaggerated activation of bar receptor mediated harmones, including AVP, catecholamines, and renin angiotensin aldosterone system.[3,4]

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The underlying pathophysiology for the exaggerated or "inappropriate" AVP response differs in patients with hyponatremia as a function of their extra cellular fluid volume.[5,6] Hyponatremia is thus broadly subdivided into three groups depending upon clinical history and volume status i.ehypovolumic, euvolumic and hypervolumic. However clinically hyponatremia may be classified into mild, moderate and sever depending upon the severity and it can make the prognosis worse depending upon the background. [7]

Worldwide acute myocardial infarction is associated with high morbidity and mortality in hospitalized patients leading to three million sudden cardiac deaths per year. Serum sodium, potassium and calcium are considered to be major electrolytes associated with the electrophysiological properties of myocardial membrane. Serum electrolyte imbalance after an episode of acute myocardial infarction is common. But clinical importance of these imbalances in STEMI, NSTEMI has not been fully understood. These electrolytes play an important role inaltering the prognosis of such myocardial infarction patients. In patients with acute myocardial infarction, after

successful thrombolysis, baroreceptor mediated hormonal activation is similar to that in patients with CHF and has a prognostic value[8, 9]

This study aimed to find the incidence of hyponatremia among all the patients admitted for ACS and to study its association with the outcome of patients at day 30 and day 90.

METHODS

The present study was conducted to study the prevalence of hyponatremia in patients admitted with ACSS and its association with outcome of patients at 30days and 90days follow up from January1st, 2019 to June 30th 2019.

The study had been conducted in patients admitted to the Department of Medicine IGMC Shimla for acute coronary syndrome and who satisfied the inclusion criteria.

A structured proforma was used to record the information ascertained. It included demographic information and a brief history regarding presenting complaints, relevant past history, personal history and family history. The patients were subjected to detailed clinical examination, hematological and biochemical investigations at admission. Serum sodium level was collected on day of admission, at 24 hours and at the time of discharge. The patients were telephonically contacted at day 30 and day 90 after discharge from the hospital.

Hyponatremia was defined as

Mildhyponatremia -130-134mEq/l
Moderate hyponatremia-125-129mEq/l Severe hyponatremia-<125mEq/l

Inclusion criteria

1. Patients with acute coronary syndrome admitted to Medicine Department IGMCSHIMLA.
2. Patients aged ≥ 18years
3. Those who consent to participate in the study were included.

Exclusion criteria

1. Patients with valvular heart disease, congenital heart disease and cardiomyopathy.
2. Patients with major non cardiovascular disorder which causes hyponatremia such as renal diseases, vomiting, dirrhoea, SIADH.
3. Any systemic infection.
4. Patients not willing to give consent.

RESULTS

The present study was aimed to determine the prevalence of hyponatremiain the patients admitted with Acute Coronary Syndrome and its association without come of patients at 30 daysand90days follow up. A total of 68 patients were included in the study at Department of Medicine, IGMC Shimla. Results of the study have been described below.

Of the total 68 patients admitted for ACS in Cardiac Care Unit, most common age group affected at presentation was 40-60 years 31 (45.58%), with patientsinagegroupbetween61-80were28(41.19%).Mean age of the patients with ACS was 60.3824 ±13.8489 years. Of total 68 patients in the study group, 42(62%) were males and remaining 26(38%) were females. Smoking (either current or reformed smoker) was the major modifiable risk factor present in 38 (56%) of the patients. The details of laboratory investigations in patients of study group are given in Table1.

Table 1 Laboratory parameters of the patients admitted with Acute Coronary Syndrome

	Non-hyponatremia Group (n=48)	Hyponatremia group (n=20)	p-value
Hemoglobin(g/dl)	13.79±13.78	12.66±3.00	0.983
Random blood sugar (mg/dl)	126.17±133.25	52.04±50.41	0.608
Blood urea nitrogen(mg/dl)	18.31±21.75	9.171±0.93	0.188
Creatinine (mg/dl)	0.89±1.11	0.52±0.62	0.135
Billirubin (mg/dl)	0.78±0.82	0.38±0.44	0.713
Cholestrol (mg/dl)	198.42±191.65	52.33±60.88	0.645
Triglyceride (mg/dl)	53.31±139.30	97.56±48.21	0.537
High density lipoprotein(mg/dl)	44.77±47.75	8.38±11.42	0.236
Low density lipoprotein (mg/dl)	133.27±148.15	139.37±69.14	0.266
Thyroid stimulating harmone (uIU/l)	5.61±2.60	7.86±1.11	0.118
Troponin I (pg/ml)	12433.20±10070.14	16901.27±14984.88	0.589

Among all the patients admitted with ACS, 41(60.3%) had STEMI, followed by NSTEMI 24(35.3%), 1(1.5%) were unstable angina patients and the remaining 2(2.9%) had q wave MI. Among the STEMI patients, 16(39%) were having anterior wall MI, 14(34%) with inferior wall MI, 6(15%) had anterior plus lateral wall MI and the 5(12%) were presented with inferior wall plus RVMI.

Out of 68 patients included in our study, 20 (29.4%) patients had hyponatremia at the time of admission to hospital. Fifteen (22.06%) patients had mild hyponatremia, 2(2.94%) had moderate and 3(4.41%) had severe hyponatremia. Of total 20 patients with hyponatremia 14 were males and 6 were females. Of total 20 patients of ACS with hyponatremia, 14(70%) had STEMI, 5(25%) patients had NSTEMI, and 1(5%) patient had q wave MI.

Among the patients admitted with ACS, 16 of 20 (80%) patients in hyponatremic group and 41of 48 (85.4%) patients in non-hyponatremic group were presented with Killip class 1(p 0.316), and only 1/20 (5%) patient in hyponatremic group were having Killip class 4. The mean levels of cardiac Troponin-I level were 16901.27±14984 pg/ml in patients with hyponatremia and 12433.20±10070.14 pg/ml in patients without hyponatremia (p0.589). The mean LDL cholesterol was 139.37±69.14 mg/dl as compared to 133.27±148.15 mg/dl in patients without hyponatremia (p 0.266).

The comparison of various investigations in patients of ACS with hyponatremia with those without hyponatremia is given on Table-.

Of total 14 patients of STEMI with hyponatremia, 4(28.5%) patients were treated with thrombolysis, whereas of total 27 patients of STEMI without hyponatremia patients 12(44.4%) patients had undergone thrombolysis (p 0.412). Remaining patients were presented to the hospital out of window period for thrombolysis, hence were not thrombolysed.

Hospital Stay

Of total 68 patient of ACS in the study group, 50(67.65%) were discharged within 7 days of hospitalization and 18 (26.4%) patients stayed in hospital for duration > 7days. In hyponatremia group, 5(25%) of 20 patients stayed for

>7dayswhereas in non-hyponatremia group, 13 (27.0%) of 48 patients stayed for >7days in hospital.

Follow up

The patients were followed up at day 30th and the day 90th after discharge from the hospital, through telephonic conversation with the patients or their attendants regarding re-admission to hospital or all cause mortality. The details of follow up at day 30 and outcome at Day 90 are given in Table 2.

Table 2 Follow up at Day 30 and Day 90 in study group

Stay (days)	Non hyponatremia Group (n=48) (%)	Hyponatremia Group (n=20) (%)	p- value
>7	13 (27)	5 (25)	0.480
1to3	2 (4)	2 (10)	
4to7	33 (69)	13 (65)	
Follow up Day 30			
Stable and active	43 (89.5)	19 (95)	0.473
Readmitted	5 (11.5)	1 (5)	
Follow up &Outcome Day90			
Stable &Active	41 (85.4)	11 (55)	0.433
Re-admitted	3 (6.3)	5 (25)	
Died	4 (8.3)	4 (20)	0.006

On follow up of patients at day 30 after discharge from hospital, 5(10.4%) of total 48 patients without hyponatremia were re-admitted to the hospital whereas in hyponatremia group only 1 (5%) of total 20 patient was re-admitted and there was no mortality among study population.

On follow up at day 90, 5(25%) of 20 patients of ACS with hyponatremia were re-admitted where as 3(6%) of total 48 patients in non-hyponatremia group were re-admitted (p 0 .433). Of total 20 patients in hyponatremia group, 4(20.0%) died where as in non-hyponatremia group 4(8.3%) of total 48 patients died. The difference in all cause mortality at 90 day was significantly higher in patients of ACS with hyponatremia (p 0 .006).

DISCUSSION

The study was conducted on 68 patients were studied, was aimed to find the prevalence of hyponatremia among patients with ACS. In our study prevalence of hyponatremia was 29.4%.

Goldberg *et al* reported in a large study of 1047 patients of STEMI reported hyponatremia in on admission in 131 patients (12.5%). Singla *et al*. in study of 1478 patients of suspected ACS reportedhyponatremia in 341 (23.1%).[8]Goldberg *et al*. in another study of 978 patients of STEMI without heart failure reported hyponaremia in 108 (11.0%).[10]

The average hospital stay of the patients were almost equal in both the groups with most the patients stayedforaperiodof4-7days,probablyduetotheprotocoloftreatingwithlowmolecularweight heparin for 5 days to all patients with ACS.

On follow up at day 90, 5(25%) of 20 patients of ACS with hyponatremia were re-admitted where as 3(6%) of total 48 patients in non-hyponatremia group were re-admitted (p 0 .433). Of total 20 patients in hyponatremia group, 4(20.0%) died where as in non-hyponatremia group 4(8.3%) of total 48 patients died. The difference in all cause mortality at 90 day was significantly higher in patients of ACS with hyponatremia (p 0 .006).

Singla *et al*. studied the effect of hyponatremia on outcome in patients with acute coronary syndrome. They concluded that the patients who had hyponatremia on admission were significantly more likely to 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 for factors 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 (odds ratio 1.7, 95% confidence interval 1.1 to 2.5, p = 0.01). [8]

Goldberg *et al*. in a study of hyponatremia in STEMI reported that hyponatremia was independently associated with 30-day mortality. The risk of 30-day mortality increased with the severity of hyponatremia, with an odds ratio of 2.1 in patients with sodium levels between 130 and 134 mmol/L and 3.4 in those with levels <130 mmol/L.[9]

Goldberg *et al*. performed a multivariable Cox proportional hazards model adjusting for other potential clinical predictors of mortality and for left ventricular ejection fraction in patients of acute ST-elevation myocardial infarction and without a history of heart failure who survived the index event.The presence of hyponatremia during admission was independently associated with post-discharge readmission for heart failure. They concluded that hyponatremia in the early phase of ST-elevation myocardial infarction was a predictor of long-term mortality and admission for heart failure after hospital discharge, independent of other clinical predictors of adverse outcome and left ventricular ejection fraction.[10]

Of the total 68 patients included in the study, six patients re-admitted during the 30 day follow up period while 14 patients re-admitted during the whole 90 day follow up period. There was mortality of 8 patients during the 90 day follow up period, 4 each in hyponatremic as well as in non- hyponatremic group. Mortality rate was 20% among hyponatremic patients and it was 8 % among non hyponatremic patients (p 0.006), which was statistically significant. The result was similar to that find by, where mortality among patients with hyponatremia at admission was 19.8% and it was 16.8% in patients who developed hyponatremia after admission to hospital.[11, 12]

Shah *et al*. conducted a review on 26 cohort studies, four clinical trials, four review articles, and six RCTs of 7,06,899 patients with STEMI/heart failure to study the prognostic significance of hyponatremia in STEMI/Heart Failure Patients. The aim of this review was to assess its existence and comparing survival difference between hypo and normonatremic patients. They concluded that hyponatremia was significantly linked to causing short and long term all-cause mortality. The rates of rehospitalization were also higher along with prolonged hospital stays as well as a greater cost burden as compared to patients with normal serum sodium. This relationship was noted in patients with reduced ejection fraction (HFrEF) as well as in those with preserved ejection fraction (HFpEF).The rise in sodium levels at the time of discharge from hospital and of first follow-up did not improve survival. They concluded that hyponatremia was the most frequently encountered electrolyte abnormality in clinical practice and had a poor prognosis in both STEMI and heart failure patients. It exacerbated short and long term mortality, re-hospitalization rates, as well as the average length of stay in the hospital.[13]

CONCLUSION

In this study the patients of ACS with hyponatremia at time of hospitalization had significantly higher all cause mortality on follow up at day 90 after discharge from the hospital than those without hyponatremia.

Limitations

This study was conducted in a single center with small sample size.

Conflict of Interest: all authors, no conflict

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