**SAS Journal of Medicine**
Abbreviated Key Title: SAS J Med
ISSN 2454-5112
Journal homepage: https://saspjournals.com/sasjm/

OPEN ACCESS

# ST Elevation Myocardial Infarction: Hyponatremia and its Prognostic Importance at New Civil Hospital, Surat

Dr. Kunal Kumar*, Dr. Mahesh Solu, Dr. Ankit Kakadiya, Dr. Tushar Dhori, Dr. Ruta Savaj

Department of General Medicine, Govt. Medical College, Surat, Gujarat, India

***Corresponding author:** Dr. Kunal Kumar
| **Received:** 27.02.2019 | **Accepted:** 05.03.2019 | **Published:** 30.03.2019
**DOI:** 10.21276/sasjm.2019.5.3.1

**Abstract** | **Original Research Article**

Hyponatremia is common after MI, and clinical improvement is accompanied by rise in plasma sodium concentration. Aim is to find out the prognostic importance of hyponatremia in acute ST Elevation myocardial infarction. Patients with ECG suggestive of ST elevation myocardial infarction with considering the inclusion and exclusion criteria. Plasma sodium concentrations were obtained on admission and at 24, 48 and 72 hours thereafter. In our study we concluded that hyponatremia on admission or early development of hyponatremia in patients with acute ST elevation myocardial infarction is an independent predictor of 30 day mortality.
**Keywords**: Hyponatremia, acute ST Elevation myocardial infarction.


## INTRODUCTION

Myocardial infarction is one of the most fatal diseases which are worldwide in distribution, affecting all races and nationalities.

Hyponatremia is a common electrolyte disorder amongst hospitalized patients [1], especially in post-operative period [2] and in patients with heart failure, nephritic syndrome or cirrhosis [3,4]. Hyponatremia has been shown to be a predictor of cardiovascular mortality among patients with heart failure.

Hyponatremia is common after MI, and clinical improvement is accompanied by rise in plasma sodium concentration [5].

### Aim

The Aim was to find out the prognostic importance of hyponatremia in acute ST Elevation myocardial infarction.

### Objectives

- To identify patients came with acute ST elevation myocardial infarction.
- To assess serum sodium concentration level at various level.
- To correlate hyponatremia with acute ST elevation myocardial infarction.

## MATERIALS AND METHODS

Patients with ECG suggestive of ST elevation myocardial infarction admitted to MICU or general ward and then patients or their relative explained about study and proper consent taken with considering the inclusion and exclusion criteria.

### Inclusion criteria

All acute myocardial infarction patients presenting to new civil hospital Surat, having

- age more than 18 years of both sex
- chest pain lasting more than 20 minutes
- diagnostics ECG changes with characteristic ECG
  - ST elevation > 1mm in >2 contigious limb leads.
  - ST elevation > 2mm in >2 contigious precordial leads.
- Elevated creatine kinase MB level or elevated cardiac troponin –T.

### Exclusion criteria

- Age less than 18 years of both sexes
- All patients diagnosed as a case of acute coronary syndrome without ST elevation.
- Patients on diuretics, vaptans or demeclocycline therapy, known case of nephritic, hypothyroidism or malabsorption syndrome and pregnant syndrome.

Qualifying patients underwent detailed history and clinical examination. Patients of acute myocardial

infarction received thrombolytic therapy (tissue plasminogen activator or streptokinase). Plasma sodium concentrations were obtained on admission and at 24, 48 and 72 hours thereafter.

## RESULTS

The youngest age was 30 years; the eldest age was 85 years. The maximum numbers of patients were in the age group 51-60 which is 37% of the cases followed by in the age group 61-70(25%).

Among 100 patients studied, 82% were males and 18% were females. In this study, ratio is M:F = 4:1. In our study, maximum numbers of male patients were found in age group of 51-60 years and maximum numbers of female patients were in age group of 61-70 years.

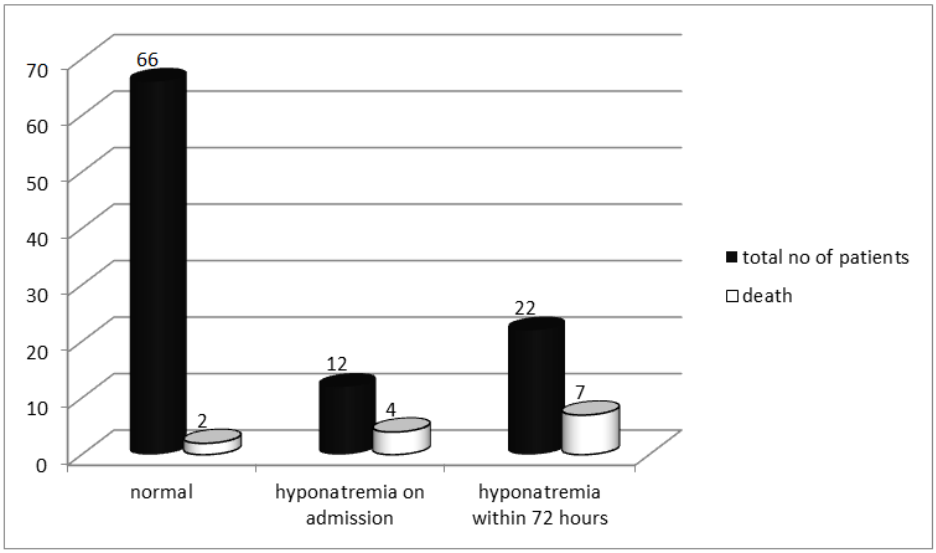
Among 100 patients 34 was hyponatremic. Maximum numbers of patients are in age group of 51-70 years. Out of which 29(85.29) was male and 5(14.70) was female.

The severity of hyponatremia was categorised as: 130-134 mmol/L (mild), 125-129 mmol/L (moderate) and <125 mmol/L (severe). Maximum numbers of patients had mild hyponatremia. In our study, 12 patients were hyponatremic on admission with mean sodium level (129.58) and 22 patients were become hyponatremic within 72 hours with mean sodium level (130.31).

**Table-1: Distribution of hyponatremia according to severity with duration**

| Severity | On admission | Within 72 hours | Total |
|---|---|---|---|
| Mild | 6 | 16 | 22 |
| Moderate | 4 | 4 | 8 |
| Severe | 2 | 2 | 4 |
| Total | 12 | 22 | 34 |

The mortality among 100 patients is as follows: Total of 13 patients was died out of which 2 patients was died among normal, 4 patients was died among hyponatremia on admission (P-VALUE-0.008), 7 patients was died among hyponatremia within 72 hours (P-VALUE-0.001). So, mortality increases as hyponatremia develops.




**Graph-1: Serum sodium status in relation to mortality**

The mortality according to severity of hyponatremia is as follows: Among patients with < 130 mmol/L, 6 patients (50%) died whereas among patients with 131-134 mmol/L, 7 patients (31.8%) died. So, above study shows that as severity increases mortality increases.

Patients presented with hyponatremia on admission were older than patients with normal sodium levels. Males made up 83.3% of patients who presented with hyponatremia on admission and 86.6% of patients who developed hyponatremia within 72 hours.

**Table-2: Comparision of various factors among survivors and non-survivors**

| | Survivors | Non survivors | P value |
|---|---|---|---|
| N | 87 | 13 | |
| Age(years)(mean±SD) | 57.89±11.92 | 61.23±11.80 | 0.35 |
| Sex: M<br>F | 74(85.05%)<br>13(14.94%) | 8(61.53%)<br>5(38.46%) | 0.027 |
| Hyponatremia (mean±SD) | 136.71±2.69 | 133.61±4.95 | 0.045 |
| Smoking | 63(72.41%) | 9(69.23%) | 0.99 |
| Diabetes | 21(24.13%) | 3(23.07%) | 0.99 |
| Hypertension | 3(3.44%) | 5(38.46%) | 0.001 |
| Infarct site: anterior<br>posterior | 60(68.96%)<br>27(31.03%) | 8(61.53%)<br>5(38.46%) | >0.05 |
| Killip class: one<br>Two | 83(95%)<br>4(5%) | 7(63%)<br>3(37%) | 0.001 |
| EF (%) (mean± SD) | 47.7±13.07 | 42.15±9.8 | 0.08 |

## DISCUSSION

Our study suggests that patients presenting with acute myocardial infarction who had hyponatremia on admission or developed hyponatremia after admission represent high risk population.

In the current study, most of the patients; 37% were belonging to the age group 51-60 years, followed by 25% in 61-65 years, 24% in 65-74 years, 18% in 41-50 years. In the present study, 82% of the patients were males and 18% were females. Males are more frequently affected than females.

In our study, substantial proportion of patients who presented with acute ST elevation myocardial infarction was hyponatremic on admission or developed hyponatremia shortly after admission. In our study, hyponatremia was present on admission in 12 patients (12%). Hyponatremia developed in 22 Patients (22%) during the first 72 hours of hospitalisation. In similar study conducted by Goldberg [6] *et al*. hyponatremia was present on admission in 131 patients (12.5%) and hyponatremia developed in 208 (19.9%) during the first 72 hours of hospitalisation.

Patients who presented or developed hyponatremia had diabetes, anterior infarction and higher Killip class and lower ejection fraction. This is in accordance to the study conducted by Goldberg *et al.* In our study, a total of 13 deaths (13%) occurred within 30 days of admission. 3.03% (2/66) of patients without hyponatremia, 33.33% (4/12) of patients with hyponatremia on admission, 31.81% (7/22) of patients who developed hyponatremia after admission. In study done by Goldberg *et al*. a total of 105 deaths (10%) occurred within 30 days of admission. 6.2% (44/708) of patients without hyponatremia, 19.8% (26/131) of patients with hyponatremia on admission and 16.8% (35/208) of patients who developed hyponatremia after admission.

In comparison with the above study, our study had higher mortality in patients with hyponatremia on admission and within 72 hours of hyponatremia. In our study, odd's ratio for 30 day mortality in patients who developed hyponatremia on admission and patients who developed hyponatremia was high (11.00 and 10.5). This was in concordance with study done by Goldberg *et al.*

In our study, we found a trend of increasing mortality with the severity of hyponatremia. We stratified patients into 2 groups depending on the mean sodium level. The group with sodium level <130 mmol/L had 50% mortality and those with serum sodium in the range of 131-134 mmol/L suffered 31.8 % deaths. This was in concordance with the study conducted by Goldberg *et al*. who showed increasing mortality with severity of hyponatremia.

When we compared the various risk factors and outcomes among the survivors and the non-survivors, we found, apart from age, sex, diabetes, hypertension, Killip class on admission, ejection fraction, hyponatremia was significant risk factor in determining mortality. All the variables among the survivors and the non-survivors that were significantly associated with mortality were included in the multivariate logistic regression analysis. Hyponatremia remained a significant independent predictor of mortality. This is in concordance to similar study conducted by Goldberg *et al*. They found that hyponatremia was independently associated with 30 day mortality.

In a similar study of 235 patients admitted to a coronary care unit, Flear et al, found higher in hospital mortality rates among patients with minimum plasma sodium levels <= 130 mmol/L. Thus Goldberg *et al*. concluded in their study that the development hyponatremia is a marker that most likely incorporates different prognostic entities, including the severity of the left ventricular dysfunction, hemodynamic alterations and the extent of neurohumoral activation.

Hence in our study, we concluded that hyponatremia on admission or early development of

hyponatremia in patients with acute ST elevation MI is an independent predictor of 30 day mortality.

## CONCLUSION

In our study we concluded that hyponatremia on admission or early development of hyponatremia in patients with acute ST elevation myocardial infarction is an independent predictor of 30 day mortality. Plasma sodium levels may serve as a simple marker to identify patients at risk.

These results reinforce the available evidence and point towards a potential use of hyponatremia, as a marker for prognostic outcome in case of acute ST Elevation myocardial infarction.

## REFERENCES

1. Anderson RJ, Chung HM, Kluge R, Schrier RW. Hyponatremia: a prospective analysis of its epidemiology and the pathogenetic role of vasopressin. Annals of internal medicine. 1985 Feb 1;102(2):164-8.
2. Chung HM, Kluge R, Schrier RW, Anderson RJ. Postoperative hyponatremia: a prospective study. Archives of internal medicine. 1986 Feb 1;146(2):333-6.
3. Schrier RW. Body fluid volume regulation in health and disease: a unifying hypothesis. Annals of internal medicine. 1990 Jul 15;113(2):155-9.
4. Schrier RW, Abraham WT. Hormones and hemodynamics in heart failure. New England Journal of Medicine. 1999 Aug 19;341(8):577-85.
5. Flear CT, Hilton P. Hyponatraemia and severity and outcome of myocardial infarction. Br Med J. 1979 May 12;1(6173):1242-6.
6. Goldberg A, Hammerman H, Petcherski S, Zdorovyak A, Yalonetsky S, Kapeliovich M, Agmon Y, Markiewicz W, Aronson D. Prognostic importance of hyponatremia in acute ST-elevation myocardial infarction. The American journal of medicine. 2004 Aug 15;117(4):242-8.