# Changes in Serum Sodium Level in Patients with Acute Myocardial Infarction

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**Abstract**

**Background**: Acute myocardial infarction (AMI) is defined as the death of cardiac muscle due to prolong ischemia. It is more commonly known as heart attack, is a medical emergency and the leading cause of death for both men and women all over the world. There is a correlation between changes in the serum sodium in acute myocardial infarction. Changes in serum sodium in AMI have not been studied extensively and paucity of information in the literature in this regard.

**Objectives:** This study was undertaken to evaluate the changes in serum sodium status in patients with acute myocardial infarction.

**Methods**: The present cross sectional study was carried out in the Department of Biochemistry, Mymensingh Medical College, Mymensingh with the collaboration of the Department of Cardiology, Mymensingh Medical College Hospital, Mymensingh, during the period of July-2019 to June 2020. A total of 100 subjects were included in this study among them, 50 were diagnosed AMI patients denoted as case group & 50 were normal healthy individuals denoted as control group. Serum Sodium was determined by colorimetric method by using electrolyte analyzer for each sample. All statistical analysis was done by using SPSS (statistical package for social science) windows package version 21. P value <0.05 was considered significant.

**Results**: The mean ± SD values of serum sodium were 136.78 ± 1.63 mmol/L and 130.28 ± 1.82 mmol/L in control group and case group respectively. The analysis showed that, there was highly significant decrease in mean serum sodium level between two groups ($p<0.001$).

**Conclusion:** This was a cross sectional study. Analyzing the findings of the present study, highly significant decrease in serum sodium level were observed in AMI patients. A large scale prospective study with the application of more sophisticated technology may be planned to find out the relationship of this biochemical variables with AMI.

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## Introduction

Angina and acute coronary syndrome is most commonly caused by coronary artery disease (CAD) and the leading cause of death worldwide.[1] Myocardial infarction (MI),is defined pathologically as the irreversible death of myocardial cells caused by ischaemia, commonly known as a heart attack.[2] Onset of myocardial ischaemia is the initial step in the development of MI and results from an imbalance between oxygen supply and demand.[3] The mechanism of an MI involves the complete blockage of a coronary artery caused by a rupture of an atherosclerotic plaque.[4] Electrolytes may be altered in acute myocardial infarction.[5] Sodium is the main cation of extracellular fluid. About 90% of total body sodium present in ECF. It is an essential nutrients involved in maintenance of normal homeostasis and in the regulation of fluid and electrolyte balance. It also maintains osmotic pressure and viscosity of blood.[6]

In acute myocardial infarction, serum sodium may be altered due to non-osmotic release of vasopressin due to the acute development of left ventricular dysfunction in response to pain, nausea, and major stress, or in response to the administration of analgesics and diuretics. This could result in low sodium level in blood.[7]

## Methods

After obtaining the clearance from the Institutional Review Committee of the institute the study was conducted. The present study was a cross sectional analytical study. It was carried out in the Department of Biochemistry, Mymensingh Medical College & sample were collected from the Department of cardiology, Mymensingh Medical College & Hospital, Mymensingh, Bangladesh during the period from July 2019 to June 2020. The subjects were selected on the basis of inclusion & exclusion criteria by purposive (non-random) sampling method. A total of 100 subjects were included in this study. Out of them 50 were case (patients with acute myocardial infarction) and 50 were control (apparently healthy volunteers). The diagnosis was based on history taking, clinical examination, ECG findings & changes of cardiac biomarkers.

*Inclusion criteria*

Group-I (control) apparently healthy people age range from 48-68 years.

Group- II (case) diagnosed AMI patients of same age group.

*Exclusion criteria*

- Patients suffering from organic (Heart failure, cardiomyopathy) heart disease other than AMI.
- Patients having history of chronic diuretic therapy.
- Patients with other serious co-morbid disease (severe infection, major surgery, renal failure, malnutrition, malignancy etc).
- Patients suffering from diarrhea & vomiting.

All the subjects were clinically examined. Their age, sex, pulse and blood pressure were recorded. Everyone completed questionnaire concerning their occupation, educational status, drug history, personal history, history of recent or chronic illness etc. Data were collected by direct interview from study subjects or from their attendants. Informed written consent were taken from them. Serum Sodium was determined by colorimetric method by using electrolyte analyzer. All statistical analysis was done by using SPSS (statistical package for social science) windows package version 21. Statistical significance of difference between case and control were done by using Student's unpaired t-test. P value $<0.05$ was considered significant.

**Result**

Total study subjects were 100 which were divided into two groups. Group-I consists of healthy subjects of both gender denoted as control group and group-II consists of 50 hospital admitted AMI patients of both gender denoted as case group. The age of the subjects was ranged from 48 to 68 years, with a mean age of 54.32 ± 4.02 for group- I and 57.8 ± 4.58 for group- II. Some clinical parameters are shown in table 1.

Table I: Shows Mean ± SD of different clinical characteristics of the study subjects

| Variables | Control (group I) Mean ± SD | Case (group II) Mean ± SD | p-value |
|---|---|---|---|
| Age (years) | 54.32 ± 4.02 | 57.08 ± 4.58 | 0.126 ns |
| BMI (kg/m$^2$) | 24.23 ± 1.20 | 24.31 ± 1.14 | 0.753 ns |
| Systolic BP (mm of Hg) | 128.42 ± 8.26 | 130.32 ± 8.08 | 0.205 ns |
| Diastolic BP (mm of Hg) | 87.33± 7.28 | 89.01 ± 6.03 | 0.174 ns |

Group- I: Apparently healthy people.
Group- II: Admitted AMI patients.

The study revealed that serum sodium levels were lower in case (Group II) when compared to control (Group I). The mean ± SD values of serum sodium were 136.78±1.63 mmol/L and 130.28±1.82 mmol/L in control group and case group respectively. The analysis showed that, the difference in mean serum sodium levels between two groups were highly significant ($p<0.001$). Analysis of mean serum sodium levels were presented in table 2.

Table II: Comparison of mean serum sodium in the study population

| Variable | Group I (control) Mean ± SD | Group II(case) Mean ± SD | P value |
|---|---|---|---|
| Serum sodium (mmol/L) | 136.78 ± 1.63 | 130.28 ± 1.82 | <0.001** |

p value less than 0.05 taken as level of significance
** = highly significant
SD = standard deviation

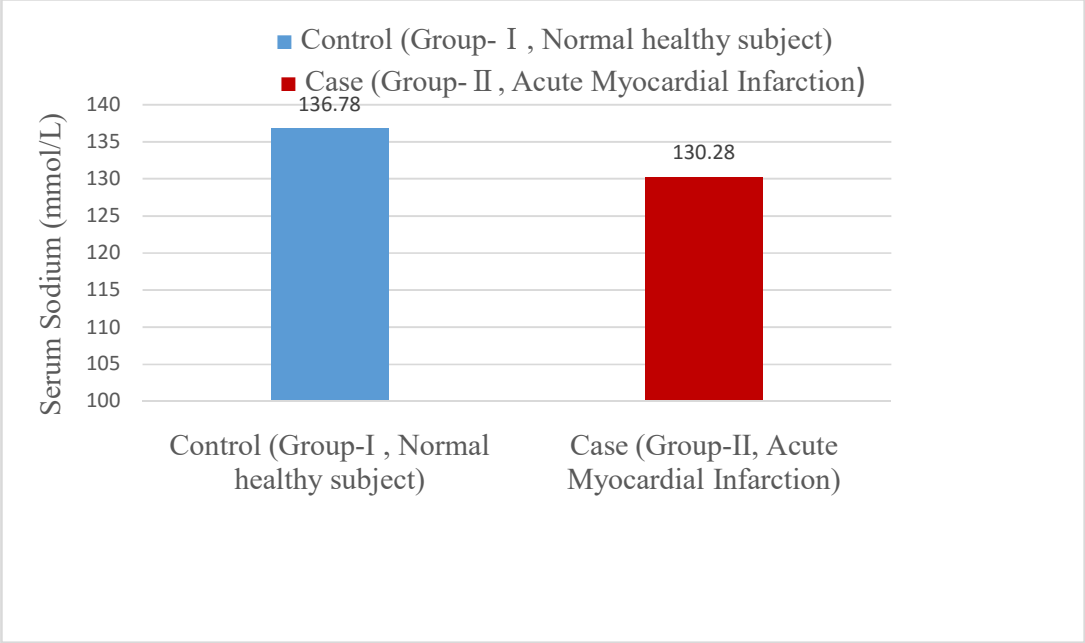


Figure 1. Comparison of mean serum sodium levels in the study population

**Discussion**:

Myocardial infarction (MI) is one of the dangerous manifestations of coronary artery disease and one of the commonest causes of mortality. MI is defined as myocardial necrosis in a clinical setting consistent with myocardial ischemia. Acute ischemia is usually, but not always caused by atherosclerotic plaque rupture, fissuring, erosion or a combination superimposed intra coronary thrombosis and is associated increase risk of cardiac death and myonecrosis.[8] The mean values of serum sodium were 136.78±1.63 mmol/L and 130.28 ± 1.82 mmol/L in control group and case group respectively. Serum sodium level was significantly decreased in case group when compared with control group. This finding is supported by the studies of Amrita et al. (2015), Mati et al. (2012), Aziz et al. (2011), Tang et al. (2011) and Goldberg et al. (2004) they all found that serum sodium level decreased significantly in patients with AMI.[(9-13)]

Similar finding was observed by Amrita et al. (2015) who reported hyponatremia in cases of AMI patient when compared with control, decrease in sodium level was due to hypoxia and ischaemia.[9]

According to the study done byTang et al. (2011) hyponatremia is linked to poor outcomes in patients with STEMI and non ST elevation coronary syndromes and the risk of mortality increased with severity of hyponatremia.[12]

Similar studies done by Goldberg et al. (2004) observed that hyponatremia on admission or during the first 72 hours of hospitalization in STEMI was independently associated with increased 30-day mortality risk and more post discharge re-admission for heart failure and death in long-term follow-up. It was similarly found that hyponatremia was more often associated with increased morbidity and mortality in MI patients.[13]

*Conclusion*

Coronary heart disease is the most important form of heart disease and single most common cause of death.Acute myocardial infarction (AMI) is the most

important consequence of coronary artery disease and it can lead to complications such as ventricular arrhythmia and congestive heart failure. The purpose of this study was to evaluate the serum sodium levels in AMI and compared with healthy volunteer. Analyzing the findings of the present study, significant decrease in serum sodium level (130.28 mmol/L) were observed in AMI patients. Therefore, it may be recommended that estimation of this biochemical parameters may help the clinicians for better management of the patient of AMI.

*Limitations of the study*

1) The sample size relatively small,
2) parameters were measured only once, thus changes over time and other aspects (physical and biochemical parameters) could not be evaluated.

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