# Original Research

## A clinical study to assess Serum Potassium levels in Acute Myocardial Infarction patients

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**ABSTRACT:**
**Background:** Chronic diseases have one or more of the following characteristics: they are persistent and leave residual disability; they are caused by non-reversible pathological conditions; and they require special training of the patient on rehabilitation, or may be expected to require prolonged medical supervision, observation or health care. An AMI is a subset of a spectrum of IHD that includes unstable angina and AMI with or without ST elevation. Hence; the present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction (AMI) patients. **Materials & methods:** 30 patients with acute myocardial infarction who presented to the emergency department and fulfilled the inclusion criteria of the study and matched control group of 30 healthy individuals. Collection of venous blood samples was done in the study group on the day of admission within 12 hours from anticubital vein with all aseptic precautions in plain and vacutainers for the purpose of routine baseline blood investigations. The serum separated was used for the estimation of serum potassium levels. All the results were recorded and analysed by SPSS software. **Results:** Mean serum potassium levels were higher in the control group (4.56mEq/L) in comparison to the study group (3.85 mEq/L0), the values of which were found to be statistically significant (P- value < 0.05). **Conclusion:** Potassium plays a definitive role in the pathogenesis of AMI.
**Key words:** Potassium, Acute myocardial infarction

## INTRODUCTION

Chronic diseases have one or more of the following characteristics: they are persistent and leave residual disability; they are caused by non-reversible pathological conditions; and they require special training of the patient on rehabilitation, or may be expected to require prolonged medical supervision, observation or health care. An AMI is a subset of a spectrum of IHD that includes unstable angina and AMI with or without ST elevation. Progression of atherosclerosis is triggered and enhanced by several factors, which can cause mediating diseases or directly affect the arterial wall. In advanced stages of the disease process, atherosclerotic plaques develop.[1-3]

Initially, normal lumen cross-sectional area will be preserved, since coronary arteries undergo compensatory outward remodelling in relation to plaque area. Sodium and potassium have played key roles in the development and maintenance of essential cellular functions throughout more than 2 million years of human evolution. The critical role of potassium in cardiovascular diseases and the importance of maintaining a normokalemic state are increasingly being recognized, particularly as relates to new and emerging cardioprotective and renoprotective therapies that promote potassium retention.[4-6] Hence; the present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction (AMI) patients.

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## MATERIALS & METHODS

The present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction patients. 30 patients with acute myocardial infarction who presented to the emergency department and fulfilled the inclusion criteria of the study and matched control group of 30 healthy individuals. Ethical approval was taken from institutional ethical committee in written and written consent was obtained from all the patients after explaining in detail the entire research protocol.

Inclusion criteria:

* Patients with acute myocardial infarction and who gave written consent for participating in the study.
* Chest pain lasting more than 20 minutes
* Diagnostic ECG changes with characteristic ECG alterations consisting of (in Absence of LVH and LBBB)

For the control purpose, 30 normal non-hypertensive and non- diabetic persons with negative history of smoking, and without symptoms of AMI were carefully selected. On admission, detailed history and thorough physical examination of the patients was done. Physical examination included height and weight measurement for calculating Body Mass Index (BMI). Estimation of levels of serum potassium was done. Collection of venous blood samples was done in the study group on the day of admission within 12 hours from anticubital vein with all aseptic precautions in plain and vacutainers for the purpose of routine baseline blood investigations. The serum separated was used for the estimation of serum potassium levels. All the results were recorded and analysed by SPSS software.

## RESULTS

Majority of the subjects of both the AMI group and the control group belonged to the age group of 41 to 60 years. Mean age of the patients of the AMI group and the control group was 43.9 years and 46.8 years respectively. Majority of the patients of both the study group were males. Mean serum potassium levels were higher in the control group (4.56mEq/L) in comparison to the study group (3.85 mEq/L0), the values of which were found to be statistically significant (P- value < 0.05).

**Table 1:** Distribution of AMI subjects on the basis of age group

| Age group | AMI group | Control group |
|---|---|---|
| <40 | 6 | 8 |
| 41- 50 | 13 | 11 |
| 51- 60 | 12 | 11 |
| 61- 70 | 10 | 13 |
| >70 | 9 | 8 |
| Total | 30 | 30 |

**Table 2:** Comparison of mean serum Potassium levels in between the AMI group and the control group

| Group | Study group | Control group | P- value |
|---|---|---|---|
| Mean Serum potassium levels (mEq/L) | 3.85±0.75 | 4.56±0.68 | 0.000 (S) |

S: Significant

## DISCUSSION

AMI is an event of myocardial necrosis caused by an unstable ischemic syndrome. In practice, the disorder is diagnosed and assessed on the basis of clinical evaluation, the electrocardiogram, biochemical testing, invasive and non-invasive imaging, and pathological evaluation. Potassium is a main component of cellular fluid. This positive electrolyte helps to regulate neuromuscular function and osmotic pressure, approximately 98% of this electrolyte is intracellular. Its main regulation is by the renal excretion and shift between the intracellular and extracellular compartments. Potassium is one of the electrolytes that play an important role in cardiac

disease specially AMI.[6-9] Hence; the present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction patients.

In the present study, majority of the subjects of both the AMI group and the control group belonged to the age group of 41 to 60 years. Mean age of the patients of the AMI group and the control group was 43.9 years and 46.8 years respectively. Majority of the patients of both the study group were males. Choi JS et al retrospectively studied 1,924 patients diagnosed with AMI. The average serum potassium levels measured throughout the hospitalization were obtained and statistically analysed. Patients were

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categorized into 5 groups to determine the relation between mean serum potassium and long-term mortality: <3.5, 3.5 to <4.0, 4.0 to <4.5, 4.5 to <5.0, and ≥5 mEq/L. The long-term mortality was lowest in the group of patients with potassium levels of 3.5 to <4.0 mEq/L, whereas mortality was higher in the patients with potassium levels≥4.5 or <3.5 mEq/L. In a multivariate Cox-proportional regression analysis, the mortality risk was greater for serum potassium levels of >4.5 mEq/L compared with patients with potassium levels of 3.5 to <4.0 mEq/L. The mortality risk was also higher for patients with potassium levels<3.5 mEq/L. In contrast to the association with long-term mortality, there was no relation between serum potassium levels and the occurrence of ventricular arrhythmias. The results of their analysis suggested that there is a need for change in our current concepts of the ideal serum potassium levels in patients with AMI.[10]

In the present study, mean serum potassium levels were higher in the control group (4.56mEq/L) in comparison to the study group (3.85 mEq/L0), the values of which were found to be statistically significant (P- value < 0.05). Krogager ML et al examined the relation between different levels of potassium and mortality. From Danish national registries we identified 2596 patients treated with loop diuretics after their first MI episode where potassium measurement was available within 3 months. All-cause mortality was examined according to seven predefined potassium levels: hypokalaemia <3.5 mmol/L, low normal K 3.5-3.8 mmol/L, normal K 3.9-4.2 mmol/L, normal K 4.3-4.5 mmol/L, high normal K 4.6-5.0 mmol/L, mild hyperkalaemia 5.1-5.5 mmol/L, and severe hyperkalaemia: >5.5 mmol/L. Follow-up was 90 days and using normal K 3.9-4.2 mmol/L as a reference, we estimated the risk of death with a multivariable-adjusted Cox proportional hazard model. After 90 days, the mortality rates in the seven potassium intervals were 15.7, 13.6, 7.3, 8.1, 10.6, 15.5, and 38.3%, respectively. Multivariable-adjusted risk for death was statistically significant for patients with hypokalaemia, and mild and severe hyperkalaemia. Low and high normal potassium were also associated with increased mortality. Potassium levels outside the interval 3.9-4.5 mmol/L were associated with a substantial risk of death in patients requiring diuretic treatment after an MI.[11] Verma S et al studied twenty-five patients of AMI with a mean age of 55 years. Twenty five age and sex matched healthy controls were also included in the study. In patients of AMI, hypokalaemia was present in 29.3% cases. Serum K concentration was decreased significantly in patients of AMI with arrhythmia. Hypokalaemia was fairly common finding among acute MI patients, while serum sodium concentration showed no significant difference among the two groups. Mortality was more in males (31.4%) as compared to females (19%). Mortality was more in hypokalemic patients (27.2%). Therefore it was recommended by the authors that K levels which affect the clinical outcomes in patients of AMI should be monitored, and potassium replaced whenever required.[12]

## CONCLUSION
Potassium plays a definitive role in the pathogenesis of AMI.

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