

ORIGINAL RESEARCH

EVALUATION OF SERUM POTASSIUM LEVELS IN AMI PATIENTS

¹Sehrish Khan, ²Jaspreet Singh, ³Kamalpreet Kaur, ⁴Ankush Kimmatkar, ⁵Harnoor Singh, ⁶Simrat Bhullar, ⁷Ashish Gupta, ⁸Sheetal Shrestha, ⁹Wajiha Noor Syed

¹Karachi Medical and Dental College, Pakistan

^{2,3}Medical Officer (CMCH), ⁵MBBS, Government Medical College, Patiala, India

⁴Medical student, Capital Medical University, Beijing, China

⁶Junior Resident, Gian Sagar Medical College and Hospital, Government Medical College, Patiala, India

⁷MBBS, Punjab Institute of Medical Sciences, India

⁸Medical Graduate, Comilla Medical College, Bangladesh

⁹MBBS, Medical Officer Pakistan King Edward Medical University Lahore, Pakistan

Corresponding author

Sehrish Khan

Karachi Medical and Dental College, Pakistan

Email: khansehrish9992@gmail.com

ABSTRACT

Aim: To assess serum potassium levels in Acute myocardial infarction patients.

Materials & methods: 50 confirmed cases of AMI were included in the present study. Another set of 50 age and gender-matched healthy subjects were taken as control. Collection of venous blood samples was done in the study group on the day of admission within 12 hours from antecubital vein with all aseptic precautions in plain and vacutainers for the purpose of routine baseline blood investigations. For serum potassium levels, blood was allowed to clot at room temperature for half an hour and then centrifuged at 3000 rpm for five minutes. The serum separated was used for the estimation of serum potassium levels. **Results:** Mean serum potassium levels among the patients of the study group and control group were 3.89mEq/L and 4.56 mEq/L respectively. While comparing statistically, significant results were obtained. Out 50 patients of the AMI group, hypokalaemia was seen in 24 percent of the patients.

Conclusion: It is recommended that potassium levels which affect the clinical outcomes in patients of acute myocardial infarction should be monitored, and potassium replaced whenever required.

Key words: Acute myocardial infarction, Potassium

INTRODUCTION

Over the past couple of decades, in comparison to acute pathologies, chronic diseases continue to plague the global populace. Biomedical model and pharmaceuticals are limited when dealing with the health crisis resulting from chronic diseases. However; most chronic diseases are largely related to lifestyle factors, and can be minimized or prevented, for the most part, by lifestyle changes.¹

Among the most common chronic diseases that afflict humans worldwide are diabetes, cardiovascular diseases (CVDs), osteoporosis, arthritis, obesity, chronic obstructive pulmonary disease, inflammatory bowel disease, central nervous system degenerative diseases and some cancers. Ischemic heart disease (IHD) is one of the predominant types of CVD. The two leading manifestations of IHD are angina and acute myocardial infarction.^{2,3}

An acute myocardial infarction (AMI) is a subset of a spectrum of Ischemic Heart Disease (IHD) that includes unstable angina and AMI with or without ST elevation.^{4,5}

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. In general, changes in plasma potassium concentration are related inversely to changes in the negative voltage across cell membranes, and this in turn influences many crucial functions in the body, especially in excitable tissues such as nerve and muscle. The critical role of potassium (K⁺) in cardiovascular (CV) disease and the importance of maintaining a normokalemic state are increasingly being recognized, particularly as relates to new and emerging cardio-protective and reno-protective therapies that promote K⁺ retention. Several studies have demonstrated a relationship between low serum potassium levels, usually less than 3.5 mEq/L, and the risk of ventricular arrhythmias in patients with acute myocardial infarction (AMI). On the basis of these studies, experts and professional societies have recommended maintaining potassium levels between 4.0 and 5.0 mEq/L, or even 4.5 to 5.5 mEq/L, in AMI patients.⁶⁻⁸ Hence; on the basis of above-mentioned data, the present study was undertaken for evaluating serum potassium levels in acute myocardial infarction patients.

MATERIALS & METHODS

The present study was conducted with the aim of analysing the serum potassium levels in AMI patients. A total of 50 confirmed cases of AMI were included in the present study. Another set of 50 age and gender-matched healthy subjects were taken as control. Inclusion criteria for AMI patients included diagnostic ECG changes with characteristic ECG alterations consisting of (in Absence of LVH and LBBB)

1. ST elevation:

- New ST elevation at the J point in two contiguous leads with the cut-points.
- ≥ 0.1 mV in all leads other than leads V2–V3 where the following cut points apply. ≥ 0.2 mV in men ≥ 40 years; ≥ 0.25 mV in men < 40 years, or ≥ 0.15 mV in women.

2. ST depression and T wave changes:

- New horizontal or down-sloping ST depression ≥ 0.05 mV in two contiguous leads and/or T inversion ≥ 0.1 mV in two contiguous leads with prominent R wave or R/S ratio 1.

Detailed history and thorough physical examination of the patients was done. Physical examination included height and weight measurement. Blood pressure was measured in the

right upper limb in sitting position with appropriate size cuff. Collection of venous blood samples was done in the study group on the day of admission within 12 hours from antecubital vein with all aseptic precautions in plain and vacutainers for the purpose of routine baseline blood investigations. For serum potassium levels, blood was allowed to clot at room temperature for half an hour and then centrifuged at 3000 rpm for five minutes. The serum separated was used for the estimation of serum potassium levels. All the results were recorded and analysed using SPSS Software. Student t test was used for evaluation of level of significance.

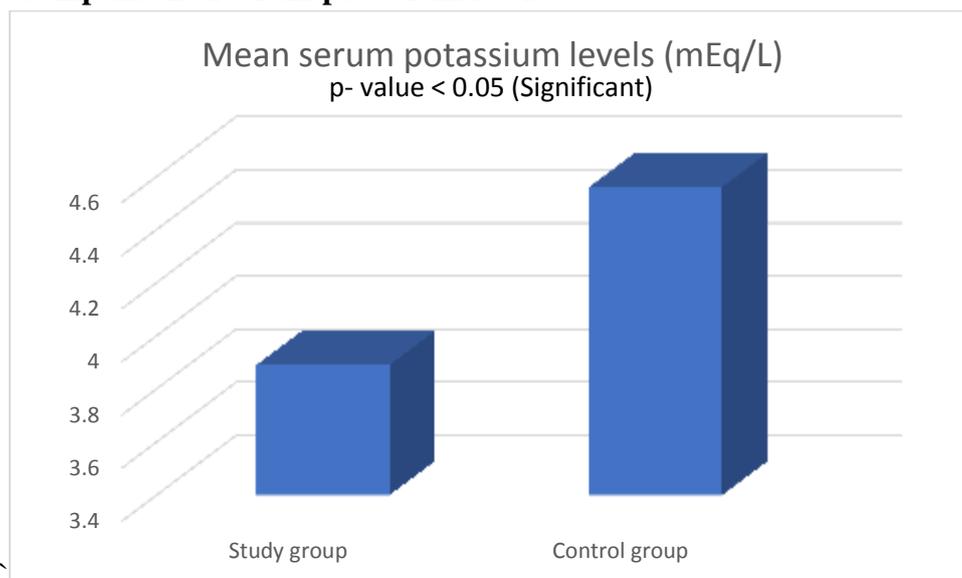
RESULTS

Mean age of the subjects of the study group and control group was 43.5 years and 44.9 years respectively. Majority of the subjects of both the study groups belonged to the age group of more than 50 years. Majority proportion of subjects of both the study groups were males. Mean serum potassium levels among the patients of the study group and control group were 3.89 mEq/L and 4.56 mEq/L respectively. While comparing statistically, significant results were obtained. Out of 50 patients of the AMI group, hypokalaemia was seen in 24 percent of the patients.

Table 1: Demographic details

Variable		Study group; n (%)	Control group; n (%)
Age group	Less than 30	12 (24%)	13 (26%)
	30 to 50	18 (36%)	16 (32%)
	More than 50	20 (40%)	21 (42%)
Gender	Males	31 (62%)	29 (58%)
	Females	19 (38%)	21 (42%)

Graph 1: Comparison of serum potassium levels



DISCUSSION

Acute myocardial infarction is one of the leading causes of death in the developed world. The prevalence of the disease approaches three million people worldwide, with more than one million deaths in the United States annually. Acute myocardial infarction can be divided into two categories, non-ST-segment elevation MI (NSTEMI) and ST-segment elevation MI (STEMI). Unstable angina is similar to NSTEMI. However, cardiac markers are not elevated. An MI results in irreversible damage to the heart muscle due to a lack of oxygen. An MI may lead to impairment in diastolic and systolic function and make the patient prone to arrhythmias. In addition, an MI can lead to a number of serious complications. The key is to reperfuse the heart and restore blood flow. The earlier the treatment (less than 6 hours from symptom onset), the better the prognosis. The etiology of acute myocardial infarction is decreased coronary blood flow. The available oxygen supply cannot meet oxygen demand, resulting in cardiac ischemia. Decreased coronary blood flow is multifactorial. Atherosclerotic plaques classically rupture and lead to thrombosis, contributing to acutely decreased blood flow in the coronary.⁷⁻⁹ Potassium (K) 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.⁵⁻⁷ Hence; on the basis of above-mentioned data, the present study was undertaken for evaluating serum potassium levels in acute myocardial infarction patients.

In the present study, mean age of the subjects of the study group and control group was 43.5 years and 44.9 years respectively. Majority of the subjects of both the study groups belonged to the age group of more than 50 years. Majority proportion of subjects of both the study groups were males. Our results were in concordance with the results obtained by previous authors who also reported similar demographic findings. In a study conducted by Mati E et al, authors reported a mean age of 55.44 years in their AMI group of patients.¹⁰ In another study conducted by Marzoq LFA et al, the mean age of the subjects was 56.34 years, which was in correlation with our results.¹¹ Both Mati E et al and Marzoq LFA et al also reported male preponderance in their respective studies.^{10,11}

In the present study, mean serum potassium levels among the patients of the study group and control group were 3.89 mEq/L and 4.56 mEq/L respectively. While comparing statistically, significant results were obtained. Out 50 patients of the AMI group, hypokalaemia was seen in 24 percent of the patients. Our results were in concordance with the results obtained by Patil S et al, who reported the presence of hypokalaemia in 24% of the AMI patients.¹² 24.5% of the AMI patients of the study conducted by Clausen TG et al were hypokalaemic, which is in correlation with our results.¹³ In another study conducted by Verma S et al, hypokalaemia was reported to be present in 29.3% of the AMI cases.¹⁴ The main reason for hypokalemia in the early phase of an acute myocardial infarction is most likely an activation of the sympathetic nervous system leading to an influx of potassium from the extracellular to the intracellular body fluid compartment.^{13,14} Shiyovich A et al evaluated potassium levels and outcomes following AMI and concluded that increasing number of contemporary observational reports consistently support a strong relationship between K levels and outcomes following AMI; both reduced K levels, and possibly more prominently increased K

levels are associated with increased mortality and other negative outcomes for short- and long-term follow-up periods.¹⁵ Patil S et al assessed dyselectrolytemia occurring in AMI patients. They evaluated a total of 100 subjects and 100 controls. They observed hypernatremia, hypokalemia and hypocalcaemia in 27%, 24% and 49% of the AMI patients respectively. Hypokalaemia, in their study, was evident in a large number of patients in the early phase of AMI.¹⁶

CONCLUSION

It is recommended that potassium levels which affect the clinical outcomes in patients of acute myocardial infarction should be monitored, and potassium replaced whenever required.

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