Assessment of Serum Potassium Levels in Acute Myocardial Infarction Patients: An Institutional Based Study

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ABSTRACT

Background: An Acute Myocardial Infarction (AMI) is a subset of a spectrum of IHD that includes unstable angina and AMI with or without ST elevation. Potassium is critical to the maintenance of cardio-vascular health. Several studies have demonstrated a relationship between low serum potassium levels and the risk of ventricular arrhythmias in patients with AMI. Hence; under the light of above mentioned data, the present study was undertaken for assessing levels of serum potassium levels in acute myocardial infarction patients.

Materials and Methods: 100 patients with AMI were selected for the present study as Cases. 100 age and sex matched apparently healthy individuals were selected as Controls. Venous blood samples were collected from all the participants. Samples were collected on the day of admission within 12 hours from anti-cubital vein under aseptic precautions. All the samples were sent for analysis in laboratory.

Results: Mean serum potassium levels were higher in the control group (4.52 mEq/L) in comparison to the study group (3.99mEq/L), the values of which were found to be statistically significant (P- value < 0.05).

Conclusion: Changes in potassium levels, even to a milder extent, might act as a predictor for assessing the prognosis.

KEYWORDS: Myocardial Infarction, Potassium.

INTRODUCTION

The Third Universal Definition of myocardial infarction (MI) expert consensus document was published in October 2012 by the global Myocardial Infarction Task Force.[1] The definition of MI requires cardiac myocyte necrosis with an increase and/or a decrease in plasma of cardiac troponin (cTn). At least one cTn measurement should be greater than the 99th percentile normal reference limit during: (1) symptoms of myocardial ischemia; (2) new (or presumably new) significant ECG ST-segment/T-wave changes or left bundle branch block; (3) the development of pathological electrocardiographic (ECG) Q waves; (4) new loss of viable myocardium or regional wall motion abnormality identified by an imaging procedure; or (5) identification of intracoronary thrombus by angiography or autopsy.[1]

Cardiac biomarkers should be measured for all patients who present with chest discomfort or other symptoms suggestive of ACS. Measurements of the cardiac-specific troponins T and I allow for highly accurate, sensitive, and specific determination of myocardial injury in the context of ischemic symptoms; these troponins have replaced CK-MB as the preferred marker for the detection of myocardial necrosis. However, troponin measurements have some drawbacks.[2-4]

An Acute Myocardial Infarction (AMI) is a subset of a spectrum of IHD that includes unstable angina and AMI with or without ST elevation. Potassium is critical to the maintenance of cardio-vascular health. Several studies have demonstrated a relationship between low serum potassium levels and the risk of ventricular arrhythmias in patients with AMI.[5]

Hence; under the light of above mentioned data, the present study was undertaken for assessing levels of serum potassium levels in acute myocardial infarction patients.

MATERIALS AND METHODS

The present study was conducted in the Department of General Medicine, Narayan Medical College, Jamuhar, Sasaram, Bihar (India) with an aim to assess 'serum

potassium levels in AMI patients. 100 patients with AMI were selected for the present study as Cases. 100 age and sex matched apparently healthy individuals were selected as Controls. Only those individuals (cases and controls) were included in the study who gave written consent. Written ethical approval was taken from institutional ethical committee and informed written consent was obtained from all the patients after explaining in detail the entire research protocol. For the control purpose, 100 normal non-hypertensive and non-diabetic persons with negative history of smoking, and without symptoms of AMI were carefully selected and examined in detail with age and gender matched, who were not obese, non-predisposed and physically active. Physical examination included height and weight measurement for calculating Body Mass Index. Complete demographic details of all the patients were obtained. Venous blood samples were collected from all the participants. Samples were collected on the day of admission within 12 hours from anti-cubital vein under aseptic precautions. All the samples were sent for analysis in laboratory.

All the results were analyzed by SPSS software version 17.0. Chi- square test was used for assessment of level of significance. P- Value of less than 0.05 was taken as significant.

Table 1: Demographic data

Parameter		Study group	Control group
Age group (years)	Less than 40	39	40
	More than 40	61	60
Gender	Males	45	52
	Females	55	48

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)	3.99±0.75	4.52±0.56	0.00 (Significant)

S: Significant

RESULTS

In the present study, in the study group, 61 percent of the patients belonged to the age group of more than 40 years, while 39 percent of the patients belonged to the age group of less than 40years. In the control group, 60 percent of the patients belonged to the age group of more than 40 years, while 40 percent of the patients belonged to the age group of less than 40years. In the study group, 45 percent of the patients were males while the remaining were females. In the control group, 52 percent of the patients were males while the remaining were females.

In the present study, Mean serum potassium levels were higher in the control group (4.52 mEq/L) in comparison to the study group (3.99mEq/L), the values of which were found to be statistically significant (P- value < 0.05).

DISCUSSION

Myocardial infarction (MI) is a term used for an event of heart attack which is due to formation of plaques in the interior walls of the arteries resulting in reduced blood flow to the heart and injuring heart muscles because of lack of oxygen supply. The symptoms of MI include chest pain, which travels from left arm to neck, shortness of breath, sweating, nausea, vomiting, abnormal heart beating, anxiety, fatigue, weakness, stress, depression, and other factors. The immediate treatment of MI include, taking aspirin, which prevents blood from clotting, and nitro-glycerin to treat chest pain and oxygen. The heart attack can be prevented by taking an earlier action to lower those risks by controlling diet, fat, cholesterol, salt, smoking, nicotine, alcohol, drugs, monitoring of blood pressure every week, doing exercise every day, and loosing body weight. Potassium is important in physiological homeostatic control of cardiac function. The importance of potassium in maintaining stable cardiac function is a clinically understood phenomenon.[6-8]

In the present study, in the study group, 61 percent of the patients belonged to the age group of more than 40 years, while 39 percent of the patients belonged to the age group of less than 40years. In the control group, 60 percent of the patients belonged to the age group of more than 40 years, while 40 percent of the patients belonged

to the age group of less than 40years. In the study group, 45 percent of the patients were males while the remaining were females. In the control group, 52 percent of the patients were males while the remaining were females.

In a retrospective study done by Friedensohn A et al, authors evaluated 11 patients presenting with AMI. Thirteen percent of the overall patients 11 studied had significant hypokalemia (serum potassium level less than 3.5 mmol/liter). The average initial level of potassium in patients who developed malignant arrhythmias was (4.10 mmol/liter) significantly lower (P less than 0.01) than those patients who did not develop such arrhythmias (4.19 mmol/liter). To determine whether the level of potassium was, in itself, the primary cause of malignant arrhythmias following MI, a subgroup analysis of factors influencing these levels was performed. It was determined that diabetics have a higher level of potassium than non-diabetics (4.2 mmol/liter versus 4.11 mmol/liter - P = 0.01) and a lower incidence of malignant arrhythmias.[9]

The relationship between plasma potassium and magnesium concentrations and VF was prospectively studied by Higham PD et al in a previous study. Plasma potassium and serum magnesium concentrations were measured on admission to their CCU. Drug therapy, time from onset of symptoms, ECG, enzyme changes and clinical status were all recorded. From the results, they concluded that low plasma potassium concentration is associated with increased risk of VF, but low serum magnesium concentrations are not.[10]

In the present study, Mean serum potassium levels were higher in the control group (4.52 mEq/L) in comparison to the study group (3.99mEq/L), the values of which were found to be statistically significant (P- value < 0.05). In a study, Singh RB et al tested whether magnesium and potassium administration can decrease both early and late cardiac event rates in 355 patients with suspected AMI. The study was conducted by a primary and secondary care research centre as a randomized, initially double-blind comparison for 4 weeks followed by a single blind period for 2 years. It is possible that magnesium and potassium infusion immediately after AMI and addition of Magnesium and potassium salts to the AMI regimen may enhance tissue levels of these cations, leading to significant reduction in complications and mortality after 2 years.[11]

CONCLUSION

From the above results, it can be concluded that changes in potassium levels, even to a milder extent, might act as a predictor for assessing the prognosis.

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