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Original Research

Evaluation of Serum Potassium levels in Acute Myocardial Infarction patients: A case control study

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ABSTRACT:

Background: The present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction (AMI) patients. **Materials & methods:** 65 patients with acute myocardial infarction who presented to the emergency department and fulfilled the inclusion criteria of the study and matched control group of 65 healthy individuals. Venous samples were collected 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. Control group comprised of patients who came for routine haematological check-up and analysis. 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 (4.69 mEq/L) in comparison to the study group (3.93 mEq/L), 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

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INTRODUCTION

The Third Universal Definition of myocardial infarction (MI) expert consensus document was published in October 2012 by the global Myocardial Infarction Task Force. 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.[1-3]

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.[4-6]Cardiac troponin (I or T) has high myocardial tissue specificity as well as high clinical sensitivity because cTn T and I are essential contractile components of myocardial cells and are expressed almost exclusively in the myocardium. Release of cardiac troponin from the myocardium can result from normal turnover of myocardial cells, myocyte apoptosis, myocyte release of troponin degradation products, increased myocyte wall permeability and bleb formation, or myocyte necrosis.[1-3]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.

MATERIALS & METHODS

The present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction patients. 65 patients with acute myocardial infarction who presented to the emergency department and fulfilled the inclusion criteria of the study and matched control group of 65 healthy individuals. Complete demographic and clinical details of all the subjects were obtained. Venous samples were collected 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. Control group comprised of patients who came for routine haematological check-up and analysis. The serum separated was used for the estimation of serum potassium levels. All the results were recorded and analysed by SPSS software. All the results were recorded and analysed by SPSS software.

RESULTS

Mean age of the patients of the AMI group and the control group was 48.5 years and 45.1 years respectively. There were 39 males and 26 females in the AMI group while 41 males and 24 females in the control group. Mean serum potassium levels were higher in the control group (4.69 mEq/L) in comparison to the study group (3.93 mEq/L), 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

Variable	Study group	Control group
Mean age (years)	48.5	45.1
Males (n)	39	41
Females (n)	26	24

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)	3.93±0.51	4.69±0.11	0.0001 (S)

S: Significant

DISCUSSION

About 1–3% of primary healthcare (PHC) patients experience chest pain. Chest pain can have many different causes; most of them are of non-cardiac origin. In 10–18% of cases, the chest pain is caused by ischaemic heart disease, of which 2–4% as the result of myocardial infarction (MI) or unstable angina, conditions that require immediate attention. In some countries, general practitioners (GP) play a major role in the early care of acute MI and are often the first to be contacted by patients. In most settings, however, consultation with a GP, instead of a direct call to the emergency medical services (EMS), increases pre-hospital delay. Many cases of sudden cardiac death occur outside a hospital. Therefore, prompt action when patients experience symptoms indicating acute cardiac ischemia is of great importance. According to existing European clinical guidelines on cardiovascular disease prevention, the GP should evaluate the risk factors and clinical findings when a patient contacts PHC with chest pain, and decide if the patient should be transferred to hospital. However, the low prevalence of acute MI can make the diagnosis difficult, particularly because the medical history, symptom presentation, and findings from an electrocardiogram (ECG) are not always indicative.[6- 10]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.[7- 10]Hence; the present study was conducted with the aim of assessing Serum Potassium levels in Acute Myocardial Infarction patients.

Mean age of the patients of the AMI group and the control group was 48.5 years and 45.1 years respectively. There were 39 males and 26 females in the AMI group while 41 males and 24 females in the control group. Mean serum potassium levels were higher in the control group (4.69 mEq/L) in comparison to the study group (3.93 mEq/L), the values of which were found to be statistically significant (P- value < 0.05).Our results were in concordance with the results obtained by Roos M et al who also reported similar findings. They investigated the influence of potassium levels on infarct size measured with single photon emission computed tomography (SPECT) in patients with ST-segment elevation acute myocardial infarction (STEMI) after mechanical reperfusion. The study included 598 patients. Potassium measurements at baseline and 2 SPECT examinations, at baseline and 7-14 days after intervention, were performed. Infarct size in the 7-14 days SPECT and salvage index were the primary outcome analyses. From the results, they

concluded that in patients with STEMI, higher baseline potassium levels are associated with a larger scintigraphic infarct size.[11]In a similar study conducted by Krogager ML et al, authors examined the relation between different levels of potassium and mortality. From Danish national registries they 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 potassium 3.5-3.8 mmol/L, normal potassium 3.9-4.2 mmol/L, normal potassium 4.3-4.5 mmol/L, high normal potassium 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 potassium 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.[12]

CONCLUSION

From the above results, the authors concluded that Potassium plays a definitive role in the pathogenesis of AMI.

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