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A Study to Evaluate the Role of Hypokalemia in Acute Myocardial Infarction Patients: A Prospective Hospital Based Study

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Abstract

Background: Congestive heart failure (CHF) is a common comorbidity following acute myocardial infarction (AMI), and CHF complicating AMI has an unfavourable outcome. Several studies have demonstrated a relationship between low serum potassium levels and the risk of ventricular arrhythmias in patients with acute myocardial infarction (AMI). Hence; under the light of above obtained results, we planned the present study to assess the role of hypokalemia in AMI patients. **Subjects and Methods:** A total of 38 AMI patients and 38 healthy controls were included in the present study. Only patients within the age group of 20 years to 60 years were included. Detailed demographic and clinical data of all the subjects was obtained. Fresh blood samples were obtained from all the subjects and were sent to the laboratory for assessment. Serum potassium levels were analyzed by using an auto-analyzer. **Results:** Mean serum potassium levels among the subjects of the AMI group was found to be 85.6 mmol/L, which was significantly lower than that of mean serum potassium levels of the subjects of the control group, which was found to be 93.4 mmol/L. 20 subjects of the AMI group had hypokalemia. Therefore, prevalence of hypokalemia among the subjects of the AMI group was 52.6%. **Conclusion:** AMI patients are significantly associated with hypokalemia, thereby, indicating its role in the pathogenesis of the disease.

Keywords: Acute myocardial infarction, Hypokalemia, Potassium.

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Introduction

Congestive heart failure (CHF) is a common comorbidity following acute myocardial infarction (AMI), and CHF complicating AMI has an unfavourable outcome. Water and sodium retention are the key pathophysiological events leading to 'congestion' in CHF. It is now clear that CHF is the result of a systemic neurohormonal response involving the heart, kidneys, and vasculature.[1-3]

Potassium is the major cation inside the cells and is hugely important for regulating heartbeat and muscle function. It forms the other half of the electrical pump that keeps electrolytes in balance and allows conductivity between the cells, also making potassium a critical part of neuron transmission.[4-6]

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).1-7 On the basis of these studies, experts and professional societies have recommended maintaining potassium levels between 4.0 and 5.0 mEq/L,[8,9] or even 4.5 to 5.5 mEq/L,10 in AMI patients.[7-9]

Hence; under the light of above obtained results, we planned the present study to assess the role of hypokalemia in AMI patients.

Subjects and Methods

The present study was commenced in the department of general medicine of Government District Hospital, Dungarpur, Rajasthan, India. It included assessment of role of hypokalemia in AMI patients. A total of 38 AMI patients and 38 healthy controls were included in the present study. Only patients within the age group of 20 years to 60 years were included. Detailed demographic and clinical data of all the subjects was obtained. Fresh blood samples were obtained from all the subjects and were sent to the laboratory for assessment. Serum potassium levels were analyzed by using an auto-analyzer. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Chi-square test was used for assessment of level of significance.

Results

A total of 76 subjects were analyzed in the present study, among which, 38 belonged to the AMI group, while the remaining 38 belonged to the control group. Mean age of the subjects of the AMI group was 48.9 years, while mean age of the subjects of the control group was 47.2 years. There were 20 males and 18 females in the AMI group, while there were 22 males and 16 females in the control

group. Mean serum potassium levels among the subjects of the AMI group was found to be 85.6 mmol/L, which was significantly lower than that of mean serum potassium levels of the subjects of the control group, which was found to be 93.4 mmol/L. 20 subjects of the AMI group had hypokalemia. Therefore, prevalence of hypokalemia among the subjects of the AMI group was 52.6%.

Table 1: Demographic data

Parameter	AMI group	Control group
Mean age	48.9	47.2
Males	20	22
Females	18	16
Mean BMI (Kg/m2)	26.5	25.7

Table 2: Comparison of mean potassium levels among the two study groups

Parameter	AMI group	Control group	p- value
Serum potassium levels (mmol/L)	85.6	93.4	0.02

Table 3: Prevalence of hypokalemia among the subjects of the AMI group

Parameter	Number of subjects	Percentage of subjects
Hypokalemia	20	52.6

Discussion

Fluctuations in potassium levels are common in patients with AMI and CHF; therefore, is a single potassium level the best predictor for mortality? Although potassium predicts mortality, does it cause death per se? It is indeed possible that potassium levels are a marker for worse disease rather a mechanism of disease.[7-9]

A total of 76 subjects were analyzed in the present study, among which, 38 belonged to the AMI group, while the remaining 38 belonged to the control group. Mean age of the subjects of the AMI group was 48.9 years, while mean age of the subjects of the control group was 47.2 years. There were 20 males and 18 females in the AMI group, while there were 22 males and 16 females in the control group. Shlomai G et al evaluated whether different levels of serum potassium, within the normal range, are associated with worse outcomes. The study comprised 1277 patients with AMI and normal-range admission potassium levels (3.5–5.2 mEq/L), who were enrolled and prospectively followed up in the Acute Coronary Syndrome Israeli Survey between 2010 and 2013. Patients were divided into 4 quartiles based on admission potassium levels; "normal-low" (K≥3.5 and K≤3.9), "normal-moderate" (K>3.9 and K≤4.18), "normal-high" (K>4.18 and K≤4.45), and "normal-very high" (K>4.45 and K≤5.2). We analyzed the association between admission serum potassium levels and 7 days in-hospital complication rates, and 30-day and 1-year all-cause mortality rates. Patients with "normal-very high" potassium displayed increased frequency of baseline clinical risk factors and experienced a higher rate of acute kidney injury during hospitalization compared with the "normal-low" group (7.7% vs 2.4%; P = 0.002). However, the rate of in-hospital ventricular arrhythmias was similar across the range of admission potassium levels (overall P = 0.26), Multivariate analysis showed that compared with "low-normal" potassium values, patients with "normal-very high" potassium levels experienced increased risk for 30-days (adjusted hazard ratio 2.88, 95% confidence interval 1.05–7.87, P = 0.039) and 1-year all-cause mortality (adjusted hazard ratio 1.98, 95% confidence interval 1.05–3.75, P = 0.034). In patients admitted with AMI, admission serum potassium levels of 4.45 to 5.2 mEq/L are not associated with in-hospital ventricular arrhythmias, but are associated with increased short and long-term mortality.10

In the present study, mean serum potassium levels among the subjects of the AMI group was found to be 85.6 mmol/L, which was significantly lower than that of mean serum potassium levels of the subjects of the control group, which was found to be 93.4 mmol/L. 20 subjects of the AMI group had hypokalemia. Therefore, prevalence of hypokalemia among the subjects of the AMI group was 52.6%. Colombo MG et al examined the association between serum potassium concentration (SPC) and long-term mortality following AMI in patients recruited from a population-based registry. Included in the study were 3347 patients with AMI aged 28–74 years consecutively hospitalized between 1 January 2000 and 31 December 2008 and followed up until 31 December 2011. Patients were categorized into five SPC groups (<3.5, 3.5 to <4.0, 4.0 to <4.5, 4.5 to <5.0, and ≥5.0 mEq/l). The outcome of the study was all-cause mortality. In our study population, 249 patients (7.4%) had a low SPC (<3.5 mEq/l) and 134 (4.0%) patients had a high SPC (≥5.0 mEq/l). Patients with SPC of ≥5.0 mEq/l had the highest long-term mortality (29.9%) and in the adjusted model, their risk of dying was significantly increased (HR 1.46, 95% CI 1.03 to 2.07) compared to patients with SPC between 4.0 and <4.5 mEq/l. Analyses of increasing observation periods showed a trend towards a higher risk of dying in patients with SPC between 4.5 and <5.0 mEq/l. An admission SPC of ≥5.0 mEq/l might be associated with an increased mortality risk in patients with AMI.[11]

Conclusion

Under the light of above obtained results, the authors concluded that AMI patients are significantly associated with hypokalemia, thereby, indicating its role in the pathogenesis of the disease. However; further studies are recommended.

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