Prevalence of Hypokalaemia in Acute Myocardial Infarction Patients

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A B S T R A C T

Introduction: An acute myocardial infarction (AMI) is a subset of a spectrum of Ischemic Heart Disease that includes unstable angina and AMI with or without ST elevation. The critical role of potassium (K+) in cardiovascular (CV) disease and the importance of maintaining a normo-kalemic state are increasingly being recognized, particularly as relates to new and emerging cardio-protective and reno-protective therapies that promote K+ retention. Hence; we planned the present study to assess the prevalence of hypokalaemia in acute myocardial infarction patients.

Material and methods: We planned the planned the present study to assess prevalence of hypokalaemia in acute myocardial infarction patients. A total of 25 AMI patients were included in the present study. 25 patients with absence of any pathology were taken as normal controls. 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 analyzed by SPSS software.

Results: Mean age of the patients of the AMI group and control group was 48.5 and 47.1 years respectively. Mean serum potassium levels among subjects of AMI group and control group was 4.02 and 4.52 mEq/L respectively. Hypokalaemia was found to be present in 24 percent of the AMI group patients.

Conclusion: AMI patients have significantly lower potassium levels in comparison to healthy population, hypokalaemia affecting a significant AMI population.

Key words: Acute, Hypokalaemia, Myocardial Infarction

INTRODUCTION

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. CVDs and chronic obstructive pulmonary disease not only contribute largely to morbidity and mortality but also put a heavy economic burden on the health care system both at a global and a national level.[1,2]

Ischemic Heart Disease (IHD) is one of the predominant types of CVD. The two leading manifestations of IHD are angina and acute myocardial infarction. An acute myocardial infarction (AMI) is a subset of a spectrum of IHD that includes unstable angina and AMI with or without ST elevation.[3-5]

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. The Na+/K+ adenosine triphosphatase (sodium pump) present in all human cells generates potassium gradient across the cell membrane, which is the main determinant of the resting membrane potential.[6,7] The critical role of potassium (K+) in cardiovascular (CV) disease and the importance of maintaining a normo-kalemic state are increasingly being recognized, particularly as relates to new and emerging cardio-protective and reno-protective therapies that promote K+ retention.[8]

Hence; we planned the present study to assess the prevalence of hypokalaemia in acute myocardial infarction patients.

MATERIAL AND METHODS

We planned the planned the present study in the department of Medicine of the medical institute and included evaluation of prevalence of hypokalaemia in acute myocardial infarction patients. We obtained the ethical approval from institutional ethical committee and written consent after explaining in detail the entire research protocol. A total of 25 AMI patients were included in the present study. Inclusion criteria for the present study included:

Patients with acute myocardial infarction

Chest pain lasting more than 20 minutes

Diagnostic ECG changes with characteristic ECG

Parameter	AMI group	Control group
Mean age (years)	48.5	47.1
Males (n)	13	12
Females (n)	12	13
Total (n)	25	25

Table-1: Age and gender distribution of subjects of the study group and control group

Group	Study group	Control group	P- value
Mean Serum potassium levels (mEq/L)	4.02	4.52	0.02*

*: Significant

Table-2: Comparison of mean serum potassium levels in between the AMI group and the control group

Parameter	Frequency	Percentage
Hypokalemia	6	24
Normo-kalemia	17	68
Hyperkalemia	2	8
Total	25	100

Table-3: Distribution of AMI subjects on the basis of serum potassium levels

alterations consisting of [in Absence of Left ventricular hypertrophy (LVH) and Left bundle branch block (LBBB)] 25 patients with absence of any clinical pathology were taken as normal controls. On admission, detailed history and thorough physical examination of the patients 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. 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 analyzed by SPSS software. Chi- square test was used for assessment of level of significance. P-value of less than 0.05 was taken as significant.

RESULTS

In the present study, we analyzed a total of 25 AMI patients and 25 healthy controls. Mean age of the patients of the AMI group and control group was 48.5 and 47.1 years respectively. Mean serum potassium levels among subjects of AMI group and control group was 4.02 and 4.52 mEq/L respectively. Significant results were obtained while comparing the mean serum potassium levels among AMI group and control group respectively. Hypokalaemia was found to be present in 24 percent of the AMI group patients.

DISCUSSION

In the present study, we observed that mean serum potassium levels among subjects of AMI group and control group was 4.02 and 4.52 mEq/L respectively. Hypokalaemia was found to be present in 24 percent of the AMI group patients. Hulting J conducted an observational study on 1315 patients out of which, 537 patients were diagnosed with suffering from AMI and 46 were found to be having VF. Fourteen of these had their VF before admission to the CCU. The incidence of VF within 12 h after CCU admission (early VF) was significantly raised (p less than 0.01) in patients with an initial serum K^+ less than 3.9 mmol/ l. They observed a strong correlation between myocardial infarction size and the risk of VF. However; they didn't observe any significant relationship between infarction size and initial serum K^+ levels.[9]

Nordrehaug JE et al assessed correlation of hypokalaemia and VF in AMI. Serum K^+ concentrations obtained on admission to hospital were inversely related to the incidence of VF in 289 women and 785 men with AMI, 92 of whom developed VF. Hypokalaemia (serum K^+ concentration less than or equal to 3.5 mmol/l) was found in 122 patients (11.4%). The incidence of VF was significantly greater in patients with hypokalaemia compared with those classified as normokalaemic (serum K^+ concentration greater than or equal to 3.6 mmol/l) (17.2% v 7.4%). The increased risk of VF in the hypokalaemic group was about the same for women and men. While they were in hospital patients with hypokalaemia developed VF significantly earlier than did normokalaemic patients (median 0.3 hours v 7 hours). Hypokalaemia was more common in women (17.3%) than in men (9.2%), and 55% of the hypokalaemic patients had been treated with diuretics before admission compared with 22% of the normokalaemic group. Hypokalaemia on admission to hospital predicts an increased likelihood and early occurrence of VF in patients with AMI.[10] Cooper WD et al reviewed the relationship between the initial serum K^+ level and the incidence of cardiac arrhythmias following myocardial infarction in a coronary care unit setting. The incidence of arrhythmias in general, and VF, ventricular tachycardia and frequent ventricular ectopic beats in particular, were inversely related to the initial serum K^+ level. Hyperkalaemia was also significantly associated with VF and ventricular tachycardia. Hypokalaemia was significantly more common in patients previously treated with diuretics, though most patients with hypokalaemia had not been so treated. The occurrence of an acute hypokalaemic syndrome, independent of, but exacerbated by, diuretic therapy, is further supported by these results.[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 K^+ replaced whenever required.[12]

Peng Y et al investigated patients with acute coronary syndromeand analysed the relationship between admission serum K levels and long-term mortality. The serum K^+ level was evaluated within first 24 h after admission. They

observed the lowest mortality in those with admission serum K⁺ levels of between 3.5 and < 4.5 mEq/L compared with those who had higher or lower K⁺ levels.[13] Shlomai G et al evaluated AMI patients and assessed their serum K⁺ levels. The present study comprised 1277 patients with AMI and normal-range admission K⁺ levels (3.5-5.2mEq/L). Patients were divided into 4 quartiles based on admission K⁺ 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). In patients admitted with AMI, admission serum K⁺ levels of 4.45 to 5.2mEq/L were not associated with in-hospital ventricular arrhythmias, but were associated with increased short and long-term mortality.[14]

CONCLUSION

From the above results, the authors concluded that AMI patients have significantly lower potassium levels in comparison to healthy population, hypokalaemia affecting a significant AMI population. However; future studies are recommended.

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