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Prevalence of Hypokalemia among Acute Myocardial Infarction Patients: An Hospital Based Study

Janardan Singh[1]

[1]Principal Specialist & PMO, General Medicine, Swatantra Sainani late Dr. Mangal Singh District Hospital, Dholpur, Rajasthan, India.

Abstract

Background: In the setting of myocardial ischemia, adrenergic stimulation activates the Na–K ATPase pump, lowering plasma potassium levels. Several small, observational studies have suggested that in the setting of acute coronary syndrome (ACS), hypokalemia, typically defined as potassium levels <3.5 mEq/L, is associated with ventricular arrhythmias. Hence; present study was planned for assessing the prevalence of hypokalemia in AMI patients. **Subjects and Methods:** The present study was carried out in the department of General Medicine, Swatantra Sainani late Dr. Mangal Singh District Hospital, Dholpur, Rajasthan, India. We aimed of estimating the prevalence of Hypokalemia among Acute Myocardial Infarction Patients reporting in a time period of two years. **Results:** A total of 100 subjects were included in the present study. Among these 100 subjects, 50 were healthy controls, while the remaining 50 were affected with AMI. Mean age of the subjects of the AMI group and non- AMI group was 45.6 and 46.5 years respectively. 50 percent of the patients of the AMI group and 52 percent of the non- AMI group were males while the remaining were females. Mean Potassium levels of the subjects of the AMI group was 3.6 mEq/L whereas mean potassium levels of the subjects of the Non-AMI group was 3.8 mEq/L respectively. Non- significant results were obtained while comparing the mean serum potassium levels among the subjects of AMI and Non-AMI group. In the AMI group, 11 patients had potassium levels of less than 3.5 mEq/L. therefore; overall prevalence rate of hypokalemia among the AMI patients was 22 percent. **Conclusion:** From the above results, it can be concluded that patients with AMI are associated with significant electrolyte disturbances, along with alteration in potassium levels. However; further studies are recommended.

Keywords: Hypokalemia, Myocardial Infarction, Prevalence.

Corresponding Author: Dr. Janardan Singh, Principal Specialist & PMO, General Medicine, Swatantra Sainani late Dr. Mangal Singh District Hospital, Dholpur, Rajasthan, India.

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Introduction

The definition of acute myocardial infarction (AMI) has evolved to accommodate increasingly sensitive markers of myocardial necrosis and imaging methods that allow greater understanding of the pathogenic mechanisms of acute coronary syndrome. As such, the universal definition of myocardial infarction proposes that we classify patients with myocardial infarction based on aetiology.[1,2]

Early and rapid ECG testing should be employed in all patients presenting with chest pain. Women often have atypical symptoms such as abdominal pain or dizziness and may present without chest pain at all. Elderly patients more often have shortness of breath as their presenting symptom for myocardial infarction.[3,4] All of these presentations should prompt ECG testing, as well. In the setting of myocardial ischemia, adrenergic stimulation activates the Na–K ATPase pump, lowering plasma potassium levels. Several small, observational studies have suggested that in the setting of acute coronary syndrome (ACS), hypokalemia, typically defined as potassium levels <3.5 mEq/L, is associated with ventricular arrhythmias.[5-8]

Hence; present study was planned for assessing the prevalence of hypokalemia in AMI patients.

Subjects and Methods

The present study was carried out in the department of General Medicine, Swatantra Sainani late Dr. Mangal Singh District Hospital, Dholpur, Rajasthan, India. We aimed of estimating the prevalence of Hypokalemia among Acute Myocardial Infarction Patients reporting in a time period of two years. For the present investigation, we obtained ethical clearance from the ethical committee of the institution. A total of 50 AMI patients and 50 age- matched healthy controls were included in the present study. Criteria described previously in the literature were used for including the patients in AMI group.[4,5]

Exclusion criteria for excluding the patients from the AMI group was:

- Patients with history of any other systemic illness,
- Patients with any other metabolic disorder,
- patients more than 65 years of age

Blood samples of the subjects in the present study were obtained. All the samples were sent to laboratory for biochemical assessment. Auto-analyzer was used for assessing the blood potassium levels of all the patients. Patients with potassium levels of less than 3.5 mEq/L were considered as hypokalemic.[5-8] 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 100 subjects were included in the present study. Among these 100 subjects, 50 were healthy controls, while the remaining 50 were affected with AMI. Mean age of the subjects of the AMI group and non- AMI group was 45.6 and 46.5 years respectively. 50 percent of the patients of the AMI group and 52 percent of the non- AMI group were males while the remaining were females. Mean Potassium levels of the subjects of the AMI group was 3.6 mEq/L whereas mean potassium levels of the subjects of the Non-AMI group was 3.8 mEq/L respectively. Non- significant results were obtained while comparing the mean serum potassium levels among the subjects of AMI and Non-AMI group. In the AMI group, 11 patients had potassium levels of less than 3.5 mEq/L. therefore; overall prevalence rate of hypokalemia among the AMI patients was 22 percent.

Table 1: Age-wise and gender-wise distribution of subjects

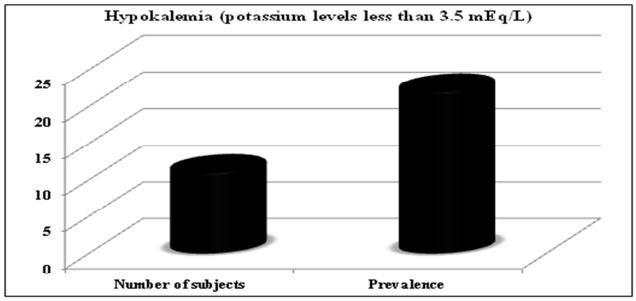
Parameter		AMI group	Non- AMI group
Mean Age (years)		45.6	46.5
Gender	Male	25	26
	Female	25	24

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

Parameter	AMI group	Non- AMI group	P-value
Mean potassium levels (mEq/L)	3.6	3.8	0.52

Table 3: Prevalence of Hypokalemia among subjects of AMI group

Parameter	Number of subjects	Prevalence
Hypokalemia (potassium levels less than 3.5 mEq/L)	11	22



Graph 1: Prevalence of Hypokalemia among subjects of AMI group

Discussion

Several systemic metabolic changes occur in AMI. These changes include increased plasma concentrations of catecholamines, free fatty acids, glucose, glycerol, cortisol and cyclic-AMP. There is decreased triglycerides concentration and an initial fall in plasma insulin concentration, followed by an early return to normal value. Serum electrolytes changes in AMI have not been studied extensively and there is paucity of information in the literature in this regard.[9] Hence; we planned the present study for assessing the prevalence of hypokalemia in AMI patients. In the present study, a total of 100 subjects were included. Among these 100 subjects, 50 were healthy controls, while the remaining 50 were affected with AMI. Mean age of the subjects of the AMI group and non- AMI group was 45.6 and 46.5 years respectively. 50 percent of the patients of the AMI group and 52 percent of the non-AMI group were males while the remaining were females. Goyal A et al determined the relationship between serum potassium levels and in-hospital mortality in AMI patients in the era of β-blocker and reperfusion therapy. Retrospective cohort study using the Cerner Health Facts database, which included 38,689 patients with biomarker-confirmed AMI, admitted to 67 US hospitals between January 1, 2000, and December 31, 2008. All patients had in-hospital serum potassium measurements and were categorized by mean postadmission serum potassium level (<3.0, 3.0-<3.5, 3.5-<4.0, 4.0-<4.5, 4.5-<5.0, 5.0-<5.5, and ≥5.5 mEq/L). Hierarchical logistic regression was used to determine the association between potassium levels and outcomes after adjusting for patient- and hospital-level factors. There was a U-shaped relationship between mean postadmission serum potassium level and in-hospital mortality that persisted after multivariable adjustment. Mortality was twice as great for potassium of 4.5 to less than 5.0 mEq/L, and even greater for higher potassium strata. Similarly, mortality rates were higher for potassium levels of less than 3.5 mEq/L. In contrast, rates of ventricular fibrillation or cardiac arrest were higher only among patients with potassium levels of less than 3.0 mEq/L and at levels of 5.0 mEq/L or greater. Among inpatients with AMI, the lowest mortality was observed in those with postadmission serum potassium levels between 3.5 and <4.5 mEq/L compared with those who had higher or lower potassium levels.[10]

In the present study, mean Potassium levels of the subjects of the AMI group was 3.6 mEq/L whereas mean potassium levels of the subjects of the Non-AMI group was 3.8 mEq/L respectively. Non- significant results were obtained while comparing the mean serum potassium levels among the subjects of AMI and Non-AMI group. In the AMI group, 11 patients had potassium levels of less than 3.5 mEq/L. therefore; overall prevalence rate of hypokalemia among the AMI patients was 22 percent. Patel RB et al evaluated the association between potassium levels, cardiac arrhythmias, and cardiovascular death in patients with non-ST-segment elevation myocardial infarction or unstable angina.

Potassium levels were measured in 6515 patients prior to randomization to receive either ranolazine or a placebo in the MERLIN-TIMI 36 trial. A seven-day continuous electrocardiographic assessment was obtained to determine the incidence of non-sustained ventricular tachycardia (NSVT) and ventricular pauses. The association between potassium levels and cardiovascular death was evaluated using a Cox proportional hazards regression model with multivariable adjustment. NSVT lasting for at least eight consecutive beats occurred more frequently at potassium levels <3.5 mEq/L than at potassium levels ⩾5 mEq/L (10.1 vs. 4.5%, p=0.03 for trend), whereas the inverse pattern was observed for ventricular pauses >3 s, which occurred more frequently at potassium levels ⩾5 mEq/L than at potassium levels <3.5 mEq/L (5.9 vs. 2.0%, p=0.03 for trend). There was a U-shaped relationship between the potassium level at admission and both early and late risk of cardiovascular death. Compared with patients with potassium levels of 3.5 to <4 mEq/L, a potassium level <3.5 mEq/L was associated with an increased risk of cardiovascular death at day 14 (2.4 vs. 0.8%, HRadj 3.1, p=0.02) and at one year (6.4 vs. 3.0%, HRadj 2.2, p=0.01). The risk of cardiovascular death at one year was also significantly increased at potassium levels ⩾4.5 mEq/L and a similar trend was noted at potassium levels ⩾5 mEq/L. The lowest risk of cardiovascular death was observed in patients with admission potassium levels between 3.5 and 4.5 mEq/L. Both lower and higher levels of potassium were associated with tachyarrhythmias and bradyarrhythmias, suggesting a potential mechanistic explanation for the increased risk of cardiovascular death at the extremes of potassium homeostasis.[11]

Conclusion

From the above results, it can be concluded that patients with AMI are associated with significant electrolyte disturbances, along with alteration in potassium levels. However; further studies are recommended.

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