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ORIGINAL ARTICLE

Evaluation of serum potassium levels in acute myocardial infarction patients

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***ABSTRACT*:**
Aim: The present study was planned to evaluate serum potassium levels in acute myocardial infarction patients.
Materials & methods: Assessment of a total of 40 patients with AMI and 40 healthy controls were enrolled. Clinical profile of all the patients was obtained. Ethical approval was taken from institutional ethical committee in written and written consent was obtained from all the patients after explaining in detail the entire research protocol. Patients with acute myocardial infarction and who gave written consent for participating were included in the study. 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. **Results:** AMI patients and control group patients had mean age of 46.5 years and 48.9 years respectively. Mean potassium levels among the patients of the AMI group and the control group was 3.6 mEq/L and 4.28 mEq/L respectively. Significant results were obtained while comparing the mean potassium levels among the patients of the AMI group and control group. **Conclusion:** Potassium plays a significant role in the pathogenesis and severity of disease progression of AMI.
Key words: Potassium, Acute myocardial infarction.

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INTRODUCTION

The term acute coronary syndrome (ACS) refers to any group of clinical symptoms compatible with acute myocardial ischemia and includes unstable angina (UA), non—ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). These high-risk manifestations of coronary atherosclerosis are important causes of the use of emergency medical care and hospitalization. A quick but thorough assessment of the patient's history and findings on physical examination, electrocardiography, radiologic studies, and cardiac biomarker tests permit accurate diagnosis and aid in early risk stratification, which is essential for guiding treatment. High-risk patients with UA/NSTEMI are often treated with an early invasive strategy involving cardiac catheterization and prompt revascularization of viable myocardium at risk. Clinical outcomes can be optimized by revascularization coupled with aggressive medical therapy that includes anti-ischemic, antiplatelet, anticoagulant, and lipid-lowering drugs.[1-3]
Serum electrolytes changes in AMI have not been studied extensively and there is paucity of information in the literature in this regard. Scanty information is available in the literature about prognostic value of serum electrolytes in ischaemic heart disease.[4-6] Hence the present study was planned to evaluate serum potassium levels in acute myocardial infarction patients

MATERIALS & METHODS

In the present study, range of serum potassium levels in patients with diagnosis of AMI was assessed. Assessment of a total of 40 patients with AMI and 40 healthy controls were enrolled. Clinical profile of all the patients was obtained. Ethical approval was taken from institutional ethical committee in written and written consent was obtained from all the patients after explaining in detail the entire research protocol. Patients with acute myocardial infarction and who gave written consent for participating were included in the study. 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 analysed by SPSS software version 17.0.

RESULTS

In the present study, AMI patients and control group patients had mean age of 46.5 years and 48.9 years respectively. Mean potassium levels among the patients of the AMI group and the control group was 3.6 mEq/L and 4.28 mEq/L respectively. Significant results were obtained while comparing the mean potassium levels among the patients of the AMI group and control group.

Table 1: Distribution according to age

Age group	AMI group	Control group
<40	5	8
41- 50	15	14
51- 60	15	14
61- 70	5	4
Total	40	40

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

Group	AMI group	Control group	P- value
Mean Serum potassium levels (mEq/L)	3.6	4.28	0.000 (S)

DISCUSSION

Potassium is an important determinant of myocardial function and hypokalemia, usually defined as <3.5 mEq/L, has frequently been observed in patients with acute myocardial infarction (AMI),1 and is associated with arrhythmia and sudden cardiac death. Since then, there have been substantial changes in the management of AMI, it is therefore necessary to re-evaluate the optimal level of serum potassium with respect to mortality and the incidence of ventricular arrhythmias in patients with AMI.[6- 10] Hence; we planned the present study to evaluate serum potassium levels in acute myocardial infarction patients.

In the present study, AMI patients and control group patients had mean age of 46.5 years and 48.9 years respectively. Mean potassium levels among the patients of the AMI group and the control group was 3.6 mEq/L and 4.28 mEq/L respectively. WaliM V et al studied the correlation of serum sodium and potassium in the severity and outcome of AMI. Hundred people were included in study divided equally in study and control groups. Study group comprised confirmed diagnosis of recent onset of AMI. The blood samples of both the groups were analysed for Serum electrolytes (Na+, K+) by flame-photometry (Bio-Lab Diagnostic kit). There was statistically significant decrease in sodium and potassium levels in across all age groups & in both sexes of study group compared to control group. Significant high level of sodium was observed in AMI patients who are smokers and AMI patients with Diabetes whereas the level was low in AMI patients with hypertension. Potassium levels were low in AMI patients with Diabetes whereas the change was insignificant in association with smoking and hypertension. Decrease in sodium level was due to hypoxia and ischaemia, which increase the permeability of sarcolemma to sodium whereas decrease in potassium level was influenced by the catecholamine levels which are elevated in early acute myocardial infarction.[11]

In the present study, significant results were obtained while comparing the mean potassium levels among the patients of the AMI group and control group. Madias JE et al evaluated the frequency, attributes, and outcome, and speculated on the mechanism of LK in patients with MI. This was a prospective cross-sectional study of 517 consecutive patients with MI admitted to the coronary care unit (CCU). The patients were allocated to a LK and a normokalemic (NK) cohort, based on the emergency department serum potassium measurement. The 41 patients with LK (3.16+/-0.24 mEq/L; 7.9% of total) were comparable on admission in their baseline assessment to the 476 patients with normal serum potassium (4.28+/-0.56 mEq/L), except for lower emergency department magnesium (1.48+/-0.15 mg/dL vs. 1.96+/-0.26 mg/dL; p = 0.0005) and earlier presentation after onset of symptoms (3.0+/-4.1 h vs. 4.4+/- 6.2 h; p = 0.05). There was a poor correlation between serum potassium and magnesium on admission (r = 0.14). Peak creatine kinase (CK) and myocardial isomer of CK were higher in the LK patients (3,870+/-3, 840 IU/L vs. 2,359+/-2,653 IU/L [p = 0.018] and 358+/-312 IU/L vs. 228 +/- 258 IU/L [p = 0.013], respectively). Management of the two cohorts was the same, except for a higher rate of use of magnesium (14.6% vs. 4.6%; p = 0.007), serum potassium supplements (90.2% vs 43. 1%; p = 0.000005), and antiarrhythmic drugs (78.0% vs 50.4%; p = 0. 0007) in the LK patients. No difference was detected between the LK and NK patients in total mortality (24.4% vs. 18.3%; p = 0.34), cardiac mortality (17.1% vs. 15.3%; p = 0.52), atrial fibrillation (14.6% vs 13.9%; p = 0.89), and ventricular tachycardia (22.0% vs. 16.0%; p = 0.32), but ventricular fibrillation (VF) occurred more often (24.4% vs 13.0%; p = 0.04) in the LK patients. However, proportions of VF occurring in the

emergency department, CCU, or wards in the two cohorts were not different, but they were higher during the time interval prior to emergency department admission in LK patients (17.1% vs 2.1%; p = 0.00001). LK is seen in approximately 8% of patients with MI in the emergency department; LK is associated with low emergency department magnesium, and low serum potassium levels in the CCU and throughout hospitalization.[12] Singh RB et al tested whether magnesium and potassium administration can decrease both early and late cardiac event rates in 355 patients with suspected acute myocardial infarction (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. Patients with definite or possible AMI and unstable angina based on World Health Organization criteria were assigned within 24 hours of infarction to different groups. Treatment was administered for 3 days through intravenous infusion with either 8.12 mmol/day Mg (group A, n = 81), 10.49 mmol/day K (group B, n = 77) 10% dextrose solution (group C, n = 87) or a placebo containing 2% dextrose solution (group D, n = 81). After discharge from the hospital all groups were advised to follow a fat-reduced diet. Groups A, B, and C were also advised to take magnesium hydroxide or potassium chloride orally. Comparison of groups A and B with group D over 2 years indicated that treatment with magnesium or potassium was associated with increased ($p < 0.05$) serum magnesium and potassium, and significant reduction in the incidence of cardiac events (22 and 24 vs 41 patients), total mortality (9 and 10 vs 20 deaths), and ventricular ectopics (17 and 21 vs 44), respectively, in the groups. Group C showed no significant benefit. It is possible that magnesium and potassium infusion immediately after AMI and addition of Mg and K salts to the AMI regimen may enhance tissue levels of these cations, leading to significant reduction in complications and mortality after 2 years.[13]

CONCLUSION

From the above results, the authors concluded that Potassium plays a significant role in the pathogenesis and severity of disease progression of AMI.

REFERENCES

1. Théroux P, Taeymans Y, Morissette D, Bosch X, Pelletier GB, Waters DD. A randomized study comparing propranolol and diltiazem in the treatment of unstable angina. J Am Coll Cardiol. 1985;5(3):717-722.
2. Rizik D, Timmis GC, Grines CL, Bakalyar D, Schreiber T. Immediate use of beta blockers, but not calcium blockers, improves prognosis in unstable angina [abstract]. Circulation 1991;84(suppl. II):II-345.
3. Gibson CM, Pride YB, Aylward PE, et al. Association of non-steroidal anti-inflammatory drugs with outcomes in patients with ST-segment elevation myocardial infarction treated with fibrinolytic therapy: an ExTRACT-TIMI 25 analysis. J Thromb Thrombolysis 2009January;27(1):11-17.
4. Eagle KA, Guyton RA, Davidoff R, et al. ACC/AHA 2004 guideline update for coronary artery bypass graft surgery: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Update the 1999 Guidelines for Coronary Artery Bypass Graft Surgery) [published correction appears in Circulation. 2005;111(15):2014] Circulation 2004;110(9):1168-1176.
5. Wiviott SD, Trenk D, Frelinger AL, et al. PRINCIPLE-TIMI 44 Investigators Prasugrel compared with high loading- and maintenance-dose clopidogrel in patients with planned percutaneous coronary intervention: the Prasugrel in Comparison to Clopidogrel for Inhibition of Platelet Activation and Aggregation-Thrombolysis in Myocardial Infarction 44 trial. Circulation 2007December18;116(25):2923-2932.
6. Wiviott SD, Braunwald E, McCabe CH, et al. TRITON-TIMI 38 Investigators Prasugrel versus clopidogrel in patients with acute coronary syndromes. N Engl J Med. 2007November15;357(20):2001-2015.
7. Gottlieb SO, Weisfeldt ML, Ouyang P, et al. Effect of the addition of propranolol to therapy with nifedepine for unstable angina: a randomized, double-blind, placebo-controlled trial. Circulation 1986;73(2):331-337.
8. Pepine CJ, Faich G, Makuch R. Verapamil use in patients with cardiovascular disease: an overview of randomized trials. Clin Cardiol. 1998;21(9):633-641.
9. Gibson RS, Boden WE, Theroux P, et al. Diltiazem and reinfarction in patients with non-Q wave myocardial infarction: results of a double-blind, randomized, multicenter trial. N Engl J Med. 1986;315(7):423-429.
10. Wilcox RG, Hampton JR, Banks DC, et al. Trial of early nifedepine in acute myocardial infarction: the Trent study. Br Med J (Clin Res Ed) 1986;293(6556):1204-1208.
11. WaliM V, Yatiraj S. Study of serum sodium and potassium in acute myocardial infarction. J Clin Diagn Res. 2014;8(11):CC07-CC9.
12. Madias JE, Shah B et al. Admission serum potassium in patients with acute myocardial infarction: its correlates and value as a determinant of in-hospital outcome. Chest. 2000 Oct;118(4):904-13. doi: 10.1378/chest.118.4.904.
13. Singh RB, Singh NK, Niaz MA. Effect of treatment with magnesium and potassium on mortality and reinfarction rate of patients with suspected acute myocardial infarction. Int J Clin Pharmacol Ther. 1996 May;34(5):219-25.