ORIGINAL RESEARCH

Serum potassium levels in patients with acute myocardial infarction

[1]Dr. Rahul Babasaheb Jawale, [2]Dr. Sanjay Venketrao Padalwar, [3]Dr. Ajit Kumar Verma

[1]Assistant Professor, Department of General Medicine, Rama Medical College Hospital and Research Centre, Pilukhawa, Uttar Pradesh, India
[2]Assistant Professor, Department of General Medicine, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India
[3]Associate Professor, Occupational Therapy, Santosh Medical College, Ghaziabad, Uttar Pradesh, India

Corresponding Author
Dr. Sanjay Venketrao Padalwar
Assistant Professor, Department of General Medicine, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India

ABSTRACT
Background: The study was conducted to assess the levels of serum potassium in patients with acute myocardial infarction. **Material and methods**: In this study there were 100 subjects. The serum potassium levels had been measured in the subjects having myocardial infarction and those who did not have the condition. 50 subjects had myocardial infarction and 50 subjects were controls. Serum potassium levels were evaluated. Statistical analysis had been conducted using SPSS software. **Results**: It was observed that serum potassium levels in subjects having AMI were reduced (3.14 mmol/L) as compared to the subjects in control group (4.13 mmol/L). **Conclusion**: It was concluded from the results that serum potassium concentrations among subjects having AMI were reduced as compared to the controls.
Keywords: AMI, controls, serum potassium

INTRODUCTION
Potassium homeostasis is critical to prevent adverse events in patients with cardiovascular disease. 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. However, most prior studies were conducted before the routine use of β-blockers, reperfusion therapy, and early invasive management in eligible patients with AMI. In addition, these studies were small (usually <1000 patients), which precluded a robust assessment of the relationship between potassium levels and mortality. Furthermore, most of these studies focused on the outcome of postinfarction ventricular arrhythmias, which occur much less frequently in the current AMI treatment era. Therefore, there is a lack of current, adequately powered studies that define the optimal range of serum potassium levels with respect to mortality and other important clinical outcomes in patients with AMI.[7- 9]This study was conducted to assess serum potassium levels in subjects with AMI.

MATERIAL AND METHODS
In this study there were 100 subjects. The subjects were informed about the procedure and were asked to give consent. The subjects who were willing to give consent and participate had been included in this study while those who were not willing to give consent and were not willing to participate had been excluded in this study. The serum potassium levels had been measured in the subjects having myocardial infarction and those who did not have the condition. 50 subjects had myocardial infarction and 50 subjects were controls. Blood samples were obtained from all the patients. All the samples were sent to laboratory where auto-analyser was used for evaluation of serum potassium levels. Statistical analysis had been conducted using SPSS software.

RESULTS

Table 1: Group-wise distribution of subjects.

Group	Number of subjects	Percentage
Group 1 (Myocardial Infarction)	50	50%
Group 2 (Control)	50	50%
Total	100	100%

In this study there were 100 subjects out of which 50 subjects had MI and 50 subjects were controls.

Table 2: Gender-wise distribution of subjects.

Gender	Number of subjects in Group 1	Number of subjects in Group 2
Males	38	29
Females	12	21
Total	50	50

In group 1, there were 38 males and 12 females. In group 2, there were 29 males and 21 females.

Table 3: Serum potassium levels in subjects of both groups.

Group	Serum potassium levels (mmol/L)
Group 1 (MI)	3.14
Group 2 (Control)	4.13

In this study, serum potassium levels in subjects having MI were 3.14 mmol/L and in controls, they were 4.13 mmol/L.

DISCUSSION

A decrease in serum potassium (K) level has been suggested to be a fairly common observation in patients with acute coronary syndrome (ACS)[1,11-13], which has been shown to increase the risk of cardiac events, including lethal ventricular arrhythmias.[14] In addition, a decrease in K level generally induces vasoconstriction[15- 16], which leads to further ischemia, thereby producing a vicious cycle. The optimal range of K level in ACS has been recently discussed and reviewed[15], and the importance of potassium homeostasis during ischemic attack was thus clarified. This study was conducted to assess serum potassium levels among subjects having acute MI. In this study, there were 100 subjects out of which 50 subjects were controls and 50 subjects had AMI. In group 1, there were 38 males and 12 females. In group 2, there were 29 males and 21 females. Serum potassium levels in subjects having MI were 3.14 mmol/L and in controls, they were 4.13 mmol/L.A high volume study performed by Goyal et al.[16] interestingly revealed that mean sK level above 4.5 mmol/L is associated with increased mortality. They suggested that K level between 3.5 and 4.5 mmol/L is the optimal range for acute MI patients. This finding was a challenge against the guidelines' recommendation for sK level. Sekiyama H et al[17] The degree of the potassium dip during ischemic attack (as indicated by ΔK, $\Delta K = K$ at discharge $-$ K on admission) was examined in 311 consecutive patients with ACS who required urgent hospitalization in their institution. Serum potassium level during ischemic attack was significantly decreased compared to that during stable phase ($P < 0.001$). Multiple regression analysis revealed that plasma glucose level during attack was the sole factor which was positively correlated with ΔK ($P < 0.01$), while HbA1c level was negatively correlated ($P < 0.05$). The medication profiles and renal function had no impact on ΔK. A longer hospitalization period, higher incidence of myocardial infarction and higher peak creatine kinase level were observed in patients with a larger ΔK. They have clearly demonstrated that there is a transient decrease in serum potassium level during ischemic attack of ACS compared to stable phase. The degree of the potassium dip was tightly correlated with glucose level, which overwhelmed the diabetic condition, and it also indicates the disease severity. The present study therefore promotes awareness of the significance of monitoring potassium level in parallel with glucose level in patients with ACS.[18]

CONCLUSION

It was observed that serum potassium levels in subjects having acute myocardial infarction were less as compared to controls.

REFERENCES

1. Madias JE, Shah B, Chintalapally G, Chalavarya G, Madias NE. Admission serum potassium in patients with acute myocardial infarction: its correlates and value as a determinant of in-hospital outcome. Chest. 2000;118(4):904-91311035655PubMedGoogle ScholarCrossref
2. Nordrehaug JE, Johannessen KA, von der Lippe G. Serum potassium concentration as a risk factor of ventricular arrhythmias early in acute myocardial infarction. Circulation. 1985;71(4):645-6493971535
3. Friedensohn A, Faibel HE, Bairey O, Goldbourt U, Schlesinger Z. Malignant arrhythmias in relation to values of serum potassium in patients with acute myocardial infarction. Int J Cardiol. 1991;32(3):331-3381686433
4. Kafka H, Langevin L, Armstrong PW. Serum magnesium and potassium in acute myocardial infarction: influence on ventricular arrhythmias. Arch Intern Med. 1987;147(3):465-4693827422

5. Hulting J. In-hospital ventricular fibrillation and its relation to serum potassium. Acta Med Scand Suppl. 1981;647:109-1166942634PubMedGoogle Scholar
6. Solomon RJ, Cole AG. Importance of potassium in patients with acute myocardial infarction. Acta Med Scand Suppl. 1981;647:87-936942645PubMedGoogle Scholar
7. Duke M. Thiazide-induced hypokalemia association with acute myocardial infarction and ventricular fibrillation. JAMA. 1978;239(1):43-45579231
8. Antman EM, Anbe DT, Armstrong PW, et al. ACC/AHA guidelines for the management of patients with ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee to Revise the 1999 Guidelines for the Management of Patients With Acute Myocardial Infarction). 2004. http://assets.cardiosource.com/STEMI_2004.pdf. Accessed December 15, 2011
9. Cohn JN, Kowey PR, Whelton PK, Prisant LM. New guidelines for potassium replacement in clinical practice: a contemporary review by the National Council on Potassium in Clinical Practice. Arch Intern Med. 2000;160(16):2429-243610979053
10. Macdonald JE, Struthers AD. What is the optimal serum potassium level in cardiovascular patients? J Am Coll Cardiol. 2004;43(2):155-16114736430
11. Foo K, Sekhri N, Deaner A, Knight C, Suliman A, Ranjadayalan K, Timmis AD: Effect of diabetes on serum potassium concentrations in acute coronary syndromes. Heart. 2003, 89 (1): 31-35. 10.1136/heart.89.1.31.
12. Rodger JC, Simpson E, Rolton HA, Reid W: The hypokalaemia of acute myocardial infarction. Ann Clin Biochem. 1986, 23 (Pt 2): 204-205.
13. Herlitz J, Hjalmarson A, Bengtson A: Occurrence of hypokalemia in suspected acute myocardial infarction and its relation to clinical history and clinical course. Clin Cardiol. 1988, 11 (10): 678-682. 10.1002/clc.4960111005.
14. Salerno DM, Asinger RW, Elsperger J, Ruiz E, Hodges M: Frequency of hypokalemia after successfully resuscitated out-of-hospital cardiac arrest compared with that in transmural acute myocardial infarction. Am J Cardiol. 1987, 59 (1): 84-88.
15. Oberleithner H, Kusche-Vihrog K, Schillers H: Endothelial cells as vascular salt sensors. Kidney Int. 2010, 77 (6): 490-494. 10.1038/ki.2009.490.
16. Goyal A, Spertus JA, Gosch K, Venkitachalam L, Jones PG, Van den Berghe G, Kosiborod M: Serum potassium levels and mortality in acute myocardial infarction. JAMA. 2012, 307 (2): 157-164. 10.1001/jama.2011.1967.
17. Sekiyama, H., Nagoshi, T., Komukai, K. *et al*. Transient decrease in serum potassium level during ischemic attack of acute coronary syndrome: Paradoxical contribution of plasma glucose level and glycohemoglobin. *Cardiovasc Diabetol* **12**, 4 (2013).