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Original Article

Evaluation of Serum Sodium Levels in Acute Myocardial Infarction patients: A Clinical Study

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ABSTRACT:
Background: Modern management of acute myocardial infarction (AMI) is built on a clinical evidence base drawn from many studies undertaken over the past three decades. Various electrolytes have been said to play an important role in the pathogenesis of AMI. Hence; we planned the present study to assess the role of serum sodium levels in AMI patients. **Materials & methods:** The present study included assessment of serum sodium (Na) levels in AMI patients. A total of 30 AMI patients and 30 normal controls were included in the present study. Samples were collected from patients of both the study groups from the anticubital vein and serum Na levels were evaluated using photometry technique. All the results were analyzed by SPSS software. **Results:** Mean serum sodium levels among the patients of AMI group and control group was found to be 128.5 and 135.2 mEq/L respectively. We observed significant result while comparing the mean serum Na levels among patients of both the study groups. **Conclusion:** Sodium definitely plays a significant role in the pathophysiology of AMI.

Key words: Acute myocardial infarction, Sodium.

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INTRODUCTION

Modern management of acute myocardial infarction is built on a clinical evidence base drawn from many studies undertaken over the past three decades. The evolution in clinical practice has substantially reduced mortality and morbidity associated with the condition. Key to this success is the effective integration of antithrombotic therapy combined with timely reperfusion, either primary percutaneous coronary intervention or fibrinolysis for ST-elevation myocardial infarction, and invasive investigation and revascularisation for non-ST-elevation myocardial infarction, underpinned by risk stratification and optimised systems of care.[1- 3] Modern management of acute myocardial infarction (AMI) is built on a clinical evidence base drawn from many studies undertaken over the past three decades. The evolution in clinical practice has substantially reduced mortality and morbidity associated with the condition.[4- 6] Key to this success is the effective integration of antithrombotic therapy combined with timely reperfusion, either primary percutaneous coronary intervention or fibrinolysis for ST-elevation myocardial infarction, and invasive investigation and revascularisation for non-ST-elevation myocardial infarction, underpinned by risk stratification and optimised systems of care. Various electrolytes have been said to play an important role in the pathogenesis of AMI.[7- 9] Hence; we planned the present study to assess the role of serum sodium levels in AMI patients.

MATERIALS & METHODS

The present study was conducted in the department of general medicine of the medical institute and included assessment of serum sodium (Na) levels in AMI patients. Ethical approval was taken from the institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. A total of 30 AMI patients were included in the present study after meeting the inclusion and exclusion criteria. The inclusion criteria for the present study included:

1. Patients with acute myocardial infarction and who gave written consent for participating in the study.
2. Chest pain lasting more than 20 minutes
3. Diagnostic ECG changes with characteristic ECG alterations consisting of (in Absence of LVH and LBBB)

i. ST elevation:
   i. New ST elevation at the J point in two contiguous leads with the cut-points.
   ii. ≥0.1mV in all leads other than leads V2–V3 where the following cut points apply. ≥0.2 mV in men ≥40 years; ≥0.25 mV in men <40 years, or≥ 0.15 mV in women.

ii. ST depression and T wave changes:
   i. New horizontal or down-sloping ST depression ≥ 0.05 mV in two contiguous leads and/or T inversion ≥ 0.1 mV in two contiguous leads with prominent R wave or R/S ratio 1.

Complete demographic details of all the patients were recorded. A total 30 normotensive patients were included in the present study that was without symptoms of AMI. Samples were collected from patients of both the study groups from the anticubital vein and serum Na levels were evaluated using photometry technique. All the results were analyzed by SPSS software. Chi- square test and unpaired t test were used for evaluation of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS

A total of 60 patients were included in the present study; out of which, 30 were AMI patients while the remaining 30 were non-AMI, normotensive controls. Mean age of the patients of AMI group was 42.2 years while that of control group was 41.6 years. Mean serum sodium levels among the patients of AMI group and control group was found to be 128.5 and 135.2 mEq/L respectively. We observed significant result while comparing the mean serum Na levels among patients of both the study groups (P- value < 0.05).

Table 1: Mean serum sodium levels in patients of both the study groups

Parameter	AMI patients	Control group	p- value
Age (years)	42.2	41.6	0.5
Serum Na (mEq/L)	128.5	135.2	0.02*

*: Significant

DISCUSSION

In the present study, we observed significant difference while comparing the mean serum Na levels among AMI patients and controls. Wali MV et al studied the changes in the serum electrolytes with special reference to serum sodium and potassium in cases of AMI and study 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. 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.[10] Rasmussen HS et al determined serum concentrations of magnesium, potassium, calcium, and sodium on admission of 224 patients to the hospital and after 2, 4, and 6 days in hospital; all were admitted to the hospital with suspected acute myocardial infarction (AMI). On admission, the patients were randomly allocated to 48 hours of treatment with magnesium intravenously or placebo. One hundred twenty-three patients had AMI (of whom 53 [43%] were treated with magnesium) and 101 had their suspected AMI disproven (of whom 51 [50%] were treated with magnesium). In a supplementary study, serum and urine levels of magnesium, potassium, calcium, and sodium, together with serum levels of parathyroid hormone, were determined before and after intravenous magnesium treatment in six patients with AMI and six patients with ischemic heart disease but without AMI. In both studies, magnesium therapy was associated with significant alterations in extracellular ion homeostasis. Serum concentrations of potassium decreased during the initial days of hospitalization in the patients treated with placebo, but increased slightly in the patients treated with magnesium infusions. These increments in the serum concentrations of magnesium and potassium correlated significantly. The increase in the serum concentration of potassium after magnesium infusions was due to a reduced renal potassium excretion level (from 71.3 to 49.4 mmol/24 h), indicating the existence of a divalent-monovalent cation exchange mechanism in the nephron. This hypothesis was supported by the observation that renal sodium excretion likewise decreased after magnesium infusions (from 83.2 to 59.2 mmol/24 h). Serum concentration of calcium decreased significantly after magnesium treatment (from 2.35 mmol/L on admission to 2.15 mmol/L after 24 hours in the hospital) in the AMI group, in contrast to the placebo-treated patients, where no significant fluctuations in serum concentration of calcium were detected during the initial six days. This decrease in serum concentration of calcium was due to a marked increase in renal calcium excretion (from 3.43 mmol/24 h before to 6.59 mmol/24 h after magnesium infusion). A correlation between increments in serum magnesium concentration and decrements in serum calcium concentration was detected. No change in serum levels of parathyroid hormone was found before and after magnesium infusions.[11]

Ramasamy R et al evaluated serum Mg+ and other electrolytes as adjuvant markers in the diagnosis of AMI. Study includes sixty patients with AMI and 100 controls. Serum electrolytes were estimated using electrolyte analyzer. Data were compared by using student't' test. ROC was drawn to find out optimum cutoff for diagnosing AMI. Pearson's correlation was done to see the association among the markers. Serum Ca, Mg, K and Na electrolytes were significantly lower ('p'<0.001) in AMI. Ca:Mg, K:Mg, and Na:K ratios were significantly higher when compared to controls ('p'<0.001). There was significant correlation of serum Mg levels with other cardiac markers (Total CK, CK-Mb, Troponin -T) of AMI ('p' <0.05).ROC analysis of Na:Mg (40.9), Ca:Mg (3.43) and K:Mg (2.74) ratios showed optimum cutoffs in diagnosis of AMI. Serum Mg, Ca:mg, K:mg and Na:K ratios could be useful adjuvant markers in diagnosis of AMI.[12]

CONCLUSION

From the above results, the authors conclude that Sodium definitely plays a significant role in the pathophysiology of AMI. However; further studies in future are recommended.

REFERENCES

1. Goyal A, Spertus J A, Gosch K, Venkitachalam L, Jones P G, Berghe G V D, et al. Serum potassium levels and mortality in acute myocardial infarction. JAMA. 2012;307:157-164.
2. Xianghua F, Peng Q, Yanbo W, Shigiang L, Weize F, Yunfa J. The relationship between hypokalemia at the early stage of acute myocardial infarction and malignant ventricular arrhythmia. Heart. 2010;96:196.
3. Madias J E, Shah B, Chintalapally G, Chalavarya G, Madias N E. Admission serum potassium in patients with acute myocardial J Clin Biomed Sci 2012;2:173.
4. EshaMati et al Source of Support: Nil Conflict of Interest: Nil infarction: its correlates and value as a determinant of in hospital outcome. Chest. 2000;118:904-913.
5. Nordrehaug J E. Malignant arrhythmia in relation to serum potassium in acute myocardial infarction. Am J Cardio. 1985;56:20-23.
6. Cohn J N, Kowey PR, Whelton PK, Prisant L M. New Guidelines for Potassium replacement in Clinical Practice, AContemporary Review by the National Council on Potassium in clinical practice. Arch Int Med. 2000;160:16.
7. Mac Donald J E, Struthers A D. What is the optimal serum potassium level in cardiovascular patients. J Amc Cardio. 2004;43:155-161.
8. Burke AP1, Virmani R. Pathophysiology of acute myocardial infarction.Med Clin North Am. 2007 Jul;91(4):553-72; ix.
9. Reed GW1, Rossi JE1, Cannon CP2.Acute myocardial infarction.Lancet. 2017 Jan 14;389(10065):197-210.
10. WaliM V, Yatiraj S. Study of Serum Sodium and Potassium in Acute Myocardial Infarction. Journal of Clinical and Diagnostic Research : JCDR. 2014;8(11):CC07-CC09.
11. Rasmussen HS1, Cintin C, Aurup P, Breum L, McNair P. The effect of intravenous magnesium therapy on serum and urine levels of potassium, calcium, and sodium in patients with ischemic heart disease, with and without acute myocardial infarction. Arch Intern Med. 1988 Aug;148(8):1801-5.
12. Ramasamy R1, Murugaiyan SB, Gopal N, Shalini R. The prospect of serum magnesium and an electrolyte panel as an adjuvant cardiac biomarker in the management of acute myocardial infarction. J Clin Diagn Res. 2013 May;7(5):817-20.

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