

Original Research article

A cross sectional study on hypokalemia in patients with acute myocardial infarction

Abstract

Introduction: A higher incidence of hypokalemia was observed in women, in patients with hypertension, and in those on chronic diuretic treatment. **Objectives of the study:** The main objective of the study is to analyse the hypokalemia in patients with acute myocardial infarction. **Material and methods:** This cross sectional study was conducted in District Head Quarter Teaching Hospital Faisalabad during 2019 to 2020. The data was collected with the permission of ethical committee of hospital. The data was collected from 100 male and female patients with myocardial infarction. We determine the impact of plasma potassium concentration for patient survival following myocardial infarction. **Results:** The data was collected from 100 patients of MI. Mean age of male patients was found to be 64.12 ± 12.34 and female patients was 46.21 ± 10.24 . There was statistically significant decrease in serum sodium and potassium levels in study group among both the ages compared to normal healthy control group. Serum sodium, potassium, chloride, calcium levels were significantly lower in the AMI patients and magnesium levels were slightly raised among cases than controls. **Conclusion:** It is concluded that reduction in sodium level was assessed only in patients with AMI as compared to healthy persons. Estimation of serum electrolyte is of utmost importance for diagnosis and prognosis of AMI.

Introduction

Patients with anterior infarction had a higher incidence of hypokalemia than those with inferior infarction, as did patients with large as compared with small infarcts. No clear difference was observed between patients whose infarction was confirmed and those in whom the diagnosis was not confirmed [1].

Extracellular (serum) potassium concentration is normally maintained within the approximate reference range of 3.5-5.2 mmol/L; this is important for normal cardiac function. Both reduced serum potassium (hypokalemia) and increased serum potassium (hyperkalemia) can, if sufficiently severe, be associated with potentially lethal cardiac arrhythmia [2].

Some recommend a higher target of 4.5-5.5 mmol/L. The study, which was conceived to test the validity of this expert advice, involved retrieval of the medical records of 38,689 patients admitted with acute myocardial infarction (AMI) to 67 US hospitals for the period 2000-2008 [3]. Each of these patients was assigned to one of seven groups, depending on their mean serum potassium concentration for the duration of hospital stay [4].

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) [5].

A recent study sought to determine the impact of plasma potassium concentration for patient survival following myocardial infarction. Current guidelines emphasize the importance of avoiding hypokalemia, advising that patients diagnosed with myocardial infarction should be given potassium supplements, if necessary, to maintain serum potassium in the range of 4.0-5.0 mmol/L [6].

Objectives of the study

The main objective of the study is to analyse the hypokalemia in patients with acute myocardial infarction.

Material and methods

This cross sectional study was conducted in District Head Quarter Teaching Hospital Faisalabad during 2019 to 2020. The data was collected with the permission of ethical committee of hospital. The data was collected from 100 male and female patients with myocardial infarction. We determine the impact of plasma potassium concentration for patient survival following myocardial infarction. Current guidelines emphasize the importance of avoiding hypokalemia, advising that patients diagnosed with myocardial

infarction should be given potassium supplements, if necessary, to maintain serum potassium in the range of 4.0-5.0 mmol/L. Serum potassium was measured in the emergency department and repeatedly thereafter throughout hospitalization, and was used in the analysis, along with a large array of clinical and laboratory variables.

Statistical analysis

The data was collected and analysed using SPSS version 19.0. All the values were expressed in mean and standard deviation.

Results

The data was collected from 100 patients of MI. Mean age of male patients was found to be 64.12 ± 12.34 and female patients was 46.21 ± 10.24 . There was statistically significant decrease in serum sodium and potassium levels in study group among both the ages compared to normal healthy control group. Serum sodium, potassium, chloride, calcium levels were significantly lower in the AMI patients and magnesium levels were slightly raised among cases than controls.

Table 1: Analysis of comparison of electrolytes

Serum (mmol/L)	case	control	p-value
Sodium	82.641 ± 6.412	94.612 ± 5.241	0.001
Potassium	4.234 ± 1.156	4.562 ± 1.214	0.728
Magnesium	6.624 ± 2.562	2.431 ± 1.124	0.001
Chloride	72.421 ± 6.561	78.432 ± 6.112	0.134
Calcium	3.431 ± 0.456	4.428 ± 1.141	0.005

Discussion

Most likely there is also an increase in circulatory catecholamines in patients with an unconfirmed myocardial infarction. Patients with anterior infarction and those with larger infarcts tended to have more hypokalemic episodes than those with inferior and those with smaller infarcts. Such findings raise the possibility that the association between infarct size and the occurrence of severe ventricular arrhythmias, which has previously been shown, to some extent, depend on the more frequent development of hypokalemia in patients with large infarcts [7]. Our results fit with the hypothesis that a higher sympathetic tone increases the risk for development of hypokalemia. On the other hand, a higher initial heart rate did not significantly increase the risk for development of hypokalemia [8].

MI patients were found to have hyponatremia which could be attributed to the fact that non osmotic secretion of vasopressin impairs the water secretion causing dilutional hyponatremia [9]. AVP or vasopressin is known to regulate tone and cardiac contraction and may adversely affect cardiac hemodynamics and myocardial remodelling. Hyponatremia on admission or early development of hyponatremia in patients with acute STElevation myocardial infarction is an independent predictor of 30-day mortality, and prognosis worsens with the severity of hyponatremia [10].

Conclusion

It is concluded that reduction in sodium level was assessed only in patients with AMI as compared to healthy persons. Estimation of serum electrolyte is of utmost importance for diagnosis and prognosis of AMI.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is

absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

References

1. Bertel O, Buhler FR, Baitsch G, Ritz R: Plasma adrenaline and noradrenaline in patients with acute myocardial infarction relationship to ventricular arrhythmias of varying severity. *Chest* 82, 64 (1982)
2. Goldstein DS: Plasma norepinephrine as an indicator of sympathetic neural activity in clinical cardiology. *Am J Cardiol* 48, 1147 (1981)
3. Myoishi M, Kitakaze M. A role of magnesium: magnesium in the therapy for cardiovascular diseases. *Clin Calcium*. 2005;15(2):265-70.
4. Alizadehasl A, Sepasi F, Azarfarin R, Ghaffari S. Hypokalemia, arrhythmias and early outcomes in acute myocardial infarction. *Res J Bio Sci*. 2008;3(9):1130-2.
5. Solomon RJ, Cole AG. Importance of potassium in patients with acute myocardial infarction. *Acta Med Scand*. 1981 Jan 12;209(S647):87-93.
6. Beck OA, Hochrein H: Serumkaliumspiegel und Herzrhythmusstörung bei akutem Myocardinfarkt. *Z Kardiol* 66, 187 (1977)
7. Dyckner T, Helmers C, Lundman T, Wester PO: Initial serum potassium level in relation to early complications and prognosis in patients with acute myocardial infarction. *Acta Med Scand* 197, 207 (1975)
8. Morgan DB: Hypokalaemia and diuretics. *Roy Soc Med Intern Congr Symp Series* 44, 3 (1981)
9. Nordrehaug JE, von der Lippe G: Hypokalaemia and ventricular fibrillation in acute myocardial infarction. *Br Heart J* 50, 525 (1983)

10. Nordrehaug JE, von der Lippe G: Serum potassium concentrations are inversely related to ventricular, but not to atrial, arrhythmias in acute myocardial infarction. *Eur Heart J* 7, 224 (1986)

UNDER PEER REVIEW