Original Research Article

A Prospective Study to Assess the Serum Electrolytes Levels in Acute Myocardial Infarction (AMI) Patients at a Tertiary Care Centre

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Abstract

Background: An acute myocardial infarction (AMI) is a subset of a spectrum of Ischemic Heart Disease (IHD) that includes unstable angina and AMI with or without ST elevation. Hence; the present study was conducted with the aim of assessing the serum Electrolytes Levels in Acute Myocardial Infarction (AMI) Patients at a Tertiary Care Centre.**Materials & Methods:** 50 patients with presence of AMI were enrolled as study group. For the control purpose, 50 normal non-hypertensive and non- diabetic persons with negative history of smoking, and without symptoms of AMI were carefully selected and examined in detail with age and gender matched, who were not obese, non-predisposed and physically active. 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 electrolyte levels. All the results were analyzed by SPSS software version 17.0. **Results:** Mean serum potassium levels among AMI patients and controls were 3.79 mEq/L and 4.49 mEq/L respectively. Mean serum sodium levels among AMI patients and controls were 131.8 mEq/L and 139.4 mEq/L respectively. Mean serum magnesium levels among AMI patients and controls were 0.89 mmol/L and 1.23 mmol/L respectively. While analyzing statistically, it was seen that mean serum electrolyte levels were significantly altered in AMI patients in comparison to healthy controls.**Conclusion:** Serum electrolyte levels are significantly altered in AMI patients.

Keywords: Acute Myocardial Infarction, Electrolyte.

Introduction

At the advent of the 21st century, infectious diseases became relatively less of a concern, while chronic diseases continue to plague the global populace. As opposed to their acute disease counterparts, most chronic diseases are largely related to lifestyle factors, and can be minimized or prevented, for the most part, by lifestyle changes. Chronic diseases have one or more of the following characteristics: they are persistent and leave residual disability; they are caused by non-reversible pathological conditions; and they require special training of the patient on rehabilitation, or may be expected to require prolonged medical supervision, observation or health care. Among the most common chronic diseases that afflict humans worldwide are diabetes, cardiovascular diseases (CVDs), osteoporosis, arthritis, obesity, chronic obstructive pulmonary disease, inflammatory bowel disease, central nervous system degenerative diseases and some cancers. The seriousness of current scenario could be gauged by the fact that most CVD sufferers in India happens to be in their productive age which may potentially impose huge socioeconomic burden and devastating consequences over the coming years.2 IHD is one of the predominant types of CVD. The two leading manifestations of IHD are angina and acute myocardial infarction[1-3].The term myocardial infarction (MI) is thought to reflect death of cardiac myocytes due to prolonged ischaemia. As such, MI is an acute coronary syndrome that can occur during the natural course of coronary atherosclerosis. Progression of atherosclerosis is triggered and enhanced by several factors, which can cause mediating diseases or directly affect the arterial wall. An acute myocardial infarction (AMI) is a subset of a spectrum of Ischemic Heart Disease (IHD) that includes unstable angina and AMI with or without ST elevation. IHD places a massive health burden on humanity. Sodium and potassium have played key roles in the development and maintenance of essential cellular functions throughout more than 2 million years of human evolution[4-7].Hence; the present study was conducted with the aim of assessing the serum Electrolytes Levels in Acute Myocardial Infarction (AMI) Patients at a Tertiary Care Centre.

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Materials & Methods

The present study was conducted in the Department of General Medicine, S. K. Government Medical College, Sikar, Rajasthan, India, with the aim of assessing the serum Electrolytes Levels in Acute Myocardial Infarction (AMI) Patients at a Tertiary Care Centre. 50 patients with presence of AMI were enrolled as study group. For the control purpose, 50 normal non-hypertensive and non-diabetic persons with negative history of smoking, and without symptoms of AMI were carefully selected and examined in detail with age and gender matched, who were not obese, non-predisposed and physically active. All the patients of acute myocardial infarction fulfilling the inclusion and exclusion criteria were included in the present 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. 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 electrolyte levels. All the results were analyzed by SPSS software version 17.0. The data of 50 AMI patients and 50 non-AMI persons (Control) thus collected were analyzed. The mean and standard deviations was calculated and compared. P- value of less than 0.05 was taken as significant.

Results

Mean age of the AMI patients and controls was 45.6 years and 42.7 years respectively. 58 percent of the patients of the AMI group and 62 percent of the patients of the controls were males. Mean serum potassium levels among AMI patients and controls were 3.79 mEq/L and 4.49 mEq/L respectively. Mean serum sodium levels among AMI patients and controls were 131.8 mEq/L and 139.4 mEq/L respectively. Mean serum magnesium levels among AMI patients and controls were 0.89 mmol/L and 1.23 mmol/L respectively. While analyzing statistically, it was seen that mean serum electrolyte levels were significantly altered in AMI patients in comparison to healthy controls.

Table 1: Demographic data

Variable	AMI patients	Controls
Mean age (years)	45.6	42.7
Males (%)	58	62
Females (%)	42	38

Table 2: Comparison of serum electrolyte levels

Serum electrolyte level	AMI patients	Controls	p- value
Mean serum potassium levels (mEq/L)	3.79	4.49	0.00*
Mean serum Sodium levels (mEq/L)	131.8	139.4	0.00*
Mean serum magnesium levels (mmol/L)	0.89	1.29	0.00*

*: Significant

Discussion

The prevalence of myocardial infarction (MI) is more in the middle income world; (WHO report, 2004) and it is well known that males are more commonly affected than females. In the era of evidence based medicine, biochemical markers have become a prime factor in the diagnostic evaluation of patients with symptoms of myocardial infarction, which include myoglobin, troponins and creatine-kinases, ischemia modified albumin (IMA), heart fatty acid-binding protein, hsCRP, brain natriuretic peptide, etc. Magnesium is the second most abundant intracellular cation and it is vital for more than 300 enzymatic reactions which are involved in various metabolic processes in our body, but still, it is often a parameter which is overlooked by the clinicians[6-10]. Hence; the present study was conducted with the aim of assessing the serum Electrolytes Levels in Acute Myocardial Infarction (AMI) Patients at a Tertiary Care Centre.In the present study, mean age of the AMI patients and controls was 45.6 years and 42.7 years respectively. 58 percent of the patients of the AMI group and 62 percent of the patients of the controls were males. Mean serum potassium levels among AMI patients and controls were 3.79 mEq/L and 4.49 mEq/L respectively. Mean serum sodium levels among AMI patients and controls were 131.8 mEq/L and 139.4 mEq/L respectively. Mean serum magnesium levels among AMI patients and controls were 0.89 mmol / L and 1.23 mmol/L respectively. Our results were in concordance with the results obtained by Mizuguchi Y et al and Ramasamy R et al who also reported similar findings[11,12]. Mizuguchi Y et al investigated the prognostic value of serum magnesium level on admission in these patients. They retrospectively analyzed the data of 165 consecutive reperfused AMI patients. Serum magnesium concentration was measured on admission. The primary outcome was in-hospital death. Fifty-four patients (33%) died during hospitalization. Higher serum magnesium level was significantly related to in-hospital death (Fine & Gray's test; $p < 0.001$). In multivariable logistic regression analyses, serum magnesium level on admission was independently associated with in-hospital death (hazard ratio 2.68, 95% confidence interval 1.24-5.80) even after adjustment for covariates. Furthermore, the incidences of cardiogenic shock necessitating an intra-aortic balloon pump ($p = 0.005$) or extracorporeal membrane oxygenation ($p < 0.001$), tracheal intubation ($p < 0.001$) and persistent vegetative state ($p = 0.002$) were significantly higher in patients with higher serum magnesium level than in those with lower serum magnesium level. In reperfused AMI patients, admission serum magnesium level might be a potential surrogate marker for predicting in-hospital death[11].In the present study, while analyzing statistically, it was seen that mean serum electrolyte levels were significantly altered in AMI patients in comparison to healthy controls. Ramasamy R et al evaluated serum Mg+ and other electrolytes as adjuvant markers in the diagnosis of AMI. Case control study was conducted in South Indian male population with AMI within six hours of onset of symptoms. Study includes sixty patients with AMI and 100 controls. Serum electrolytes were estimated using electrolyte analyzer. 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 Serum electrolyte levels are significantly altered in AMI patients.

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