

Original Research Article

Study of Serum Electrolytes and Blood Urea Levels with Cardiac Markers in Acute Myocardial Infarction

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Abstract: Myocardial infarction is now considered part of a spectrum referred to as acute coronary syndrome. This refers to a spectrum of acute myocardial ischaemia that also includes unstable angina and non-ST segment elevation myocardial infarction (NSTEMI). The Materials and Methods in these Study Includes 50 Confirmed cases of acute myocardial infarction along with 50 age and sex matched healthy controls .Blood samples were collected from all participants and analyzed for Cardiac Troponin I (cTnI), CK-MB, Serum sodium, potassium, chloride and urea. Comparison of level of various parameters between two groups was done by calculating p-value. In Results the Serum sodium and potassium level is significant low in AMI patients as compared to control group and blood urea level is found to be high in AMI patients. But, the levels of serum chloride didn't show any significant difference between case and control groups. In Conclusion the cTnI and CK-MB are the ideal markers for the diagnosis of AMI. Hyponatremia and hypokalemia are indicators of acute myocardial infarction.

Keywords:non-ST segment elevation myocardial infarction (NSTEMI),acute myocardial infarction

INTRODUCTION

Cardiovascular disease is one of the leading causes of morbidity and mortality across the world. World Health Organization (WHO) has declared cardiovascular disease as a modern epidemic [1]. Acute Myocardial Infarction is one of the manifestations of coronary heart disease leading to morbidity and mortality. Arrhythmias and hemodynamic abnormalities in left ventricular dysfunction are the major causes of mortality along with acute myocardial infarction. The arrhythmias predisposing factors are: autonomic nervous system dysfunction, electrolyte disorders, left ventricular dysfunction, myocardial ischemia and medications [2]. Coronary heart disease is mainly caused by atherosclerosis and plaque formation on the surface of the coronary arteries[3]. These pathological factors causes narrowing of the coronary arteries which lead to inadequate blood flow to heart and if it severely compromised death is inevitable[4].

Electrolytes play an important role in intermediary metabolism and cellular function, including enzyme activities and electrical gradients⁵.So, the present study was designed to evaluate serum sodium, potassium, chloride and urea Level in AMI patients.

MATERIALS AND METHODS

This study was conducted at SMS medical college and attached hospital, Jaipur, Rajasthan. Study Consist of Total 100 participants and they were divided in to 2 group.

- Group 1: Case group (AMI-Acute myocardial infarction)
- Group 2: Control group

Study group comprised 100 subjects between 40 to 70 years who were visiting hospital OPD, as well as admitted will be considered.

Diagnosis and selection of the 50 cases were made on the basis of recent onset of chest pain, abnormal ECG pattern and by cardiac biochemical markers. The control group included 50 normal healthy subjects visiting hospital for routine check up without any history of chest pain or previous incidence of AMI, hypertension, diabetes, alcoholism and smoking.

Collection of Blood samples: 3 ml venous blood was collected in supine position from all participants and all samples were centrifuged at central

laboratory at 3000 RPM for 10 minutes. Unique ID was given to all samples to hidden identity of participants.

Following biochemical parameters was measured from all collected samples-Troponin I, Creatine kinase-MB (CK-MB), urea, sodium, potassium and chloride

Estimation of serum cardiac Troponin I (cTnI) was done by Electrochemiluminescence immunoassay hormone analyser. Creatine kinase-MB (CK-MB) estimated by Colorimetric method, also serum urea by Urease kinetic method in chemistry analyzer. Serum sodium, potassium and chloride were determined by direct ion selective electrode methods by using Roche electrolyte analyzer.

All obtained data were analyzed statistically by calculating p-value by using online student t-test calculator. P-value less than 0.01 were considered as difference of significance.

RESULTS

Age and sex wise distribution of participant is mentioned in **Table 1,2**. The mean level of CK-MB in case group is 195.2 ± 92 IU/L that is very high in compared to 19.22 ± 5.1 IU/L in control group. Similarly the mean level of Troponin I in case group is 12.36 ± 9.3 ng/ml that is also very high in compared to 0.352 ± 0.4 ng/ml in control group and then difference found among them is found to be highly significant. ($p < 0.01$) (**Table 3**)

Table 1: Showing age wise distribution of participants

Group	Number(n)	Age Group(Yr)	Mean Age(yr)
Case(AMI)	50	40-70	45.5 ± 5
Control	50	35-70	48 ± 6

Table 2: Showing Sex wise distribution of participants

Group	Number(n)	Sex(M:F)
Case(AMI)	50	32:18
Control	50	35:15

Table 3: Comparison of serum level of cardiac markers between case group and control group

Cardiac Marker	Case(AMI)(n=50)	Control(n=50)	p-value
CK-MB(IU/L)	195.2 ± 92	19.22 ± 5.1	$< 0.01(S)$
Troponin I(ng/mL)	12.36 ± 9.3	0.352 ± 0.4	$< 0.01(S)$

S: Significant
NS: Non significant

Table 4: Comparison of serum electrolyte and blood urea level between case group and control group

Parameter	Case(AMI)(n=50)	Control(n=50)	p-value
Blood Urea(Mg/dl)	56.62 ± 15.23	25.56 ± 5.2	$< 0.01(S)$
S.Sodium(Mmol/l)	133.5 ± 3.5	139.5 ± 5.2	$< 0.01(S)$
S.Potassium(Mmol/l)	3.65 ± 0.91	4.35 ± 0.36	$< 0.01(S)$
S.Chloride(Mmol/l)	106.3 ± 3.5	108.6 ± 5.3	$> 0.01(NS)$

S: Significant
NS: Non significant

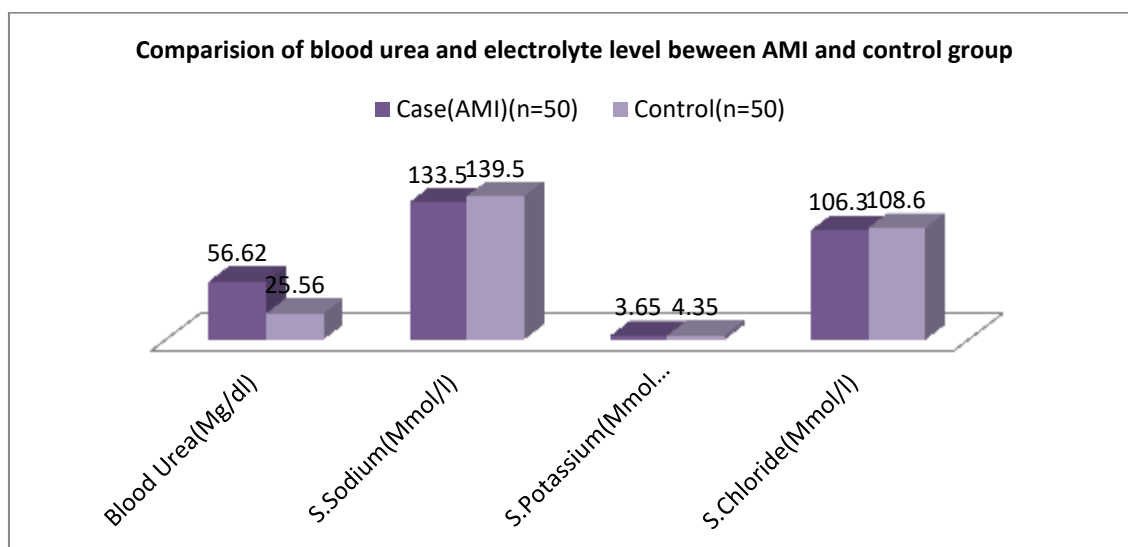


Fig 1: Graphical presentation of serum electrolyte and blood urea level between case group and control group

The electrolytes such as Na^+ , K^+ levels in AMI cases (135.5 ± 3.5 , 3.65 ± 0.91 , $p < 0.001$) shows significant difference when compared with healthy control group (139.5 ± 5.2 , 4.35 ± 0.36 respectively). But, Cl^- levels didn't show any difference in both the groups. Moreover, urea values were significantly higher in AMI cases (56.62 ± 15.23 , $p < 0.001$) compared to healthy control group (25.56 ± 5.2).

DISCUSSION

A heart attack (myocardial infarction) is usually caused by a blood clot, which stops the blood flowing to a part of your heart muscle. You should call for an ambulance immediately if you develop severe chest pain. Treatment with a clot-busting medicine or an emergency procedure to restore the blood flow through the blocked blood vessel is usually done as soon as possible. This is to prevent or minimize any damage to your heart muscle. Acute myocardial infarction occurs when there is an abnormal ischemic alteration of the myocardium due to an inability of the coronary perfusion to meet the myocardial contractile demand[5]. The diagnosis of a myocardial infarction relies heavily on clinical signs, symptoms, electrocardiogram changes, cardiac enzymes and radiological tests[6].

Cardiac troponin (cTn) testing is an essential component of the diagnostic workup and management of acute coronary syndromes (ACS). Although over the past 15 years the diagnostic performance of the previous gold-standard assay, creatine kinase-MB, has not changed appreciably, the ever-increasing sensitivity of cTn assays has had a dramatic impact on the use of cTn testing to diagnose ACS. It is widely accepted that presence of cTnI in blood serum indicates myocardial damage, thus cTnI is considered specific biochemical marker for AMI[7]. CK and CK-MB were also

employed in the diagnosis of AMI along with cTnI. In the present study all these marker levels were elevated significantly in AMI case groups and also rate of occurrence was more in males than females.

In the present study we observed that serum sodium level was significantly decreased ($p < 0.001$) in AMI cases when compared with normal healthy controls. These observations are in consistent with that of Hadeel Rashid Faraj[8].

Urea is the end product of protein metabolism. Rise of serum urea is observed in AMI cases of this study. Only few studies have been done about association of urea with AMI. Some studies have reported that, increasing in the urea predicts poor outcome and high mortality rates in subjects with AMI[9]. Elevated levels of urea indicate renal response to systemic hypo perfusion with respect to reduced cardiac output in decompensated heart failure[10]. Similar type of results are obtained by Heraldoguedis Lobo Filho et al.; where experimental rats have been induced of myocardial infarction by isopreterenol resulted in increased urea level, probably related to low cardiac output state of ventricular dysfunction[11].

CONCLUSION

The cTnI, CK, and CK-MB are the ideal markers for the diagnosis of AMI. Hyponatremia and hypokalemia are indicators of acute myocardial infarction. Serum sodium and potassium levels are prognostic indicators, i.e., rise in sodium levels after initial fall was indicative of clinical improvement. Therefore estimation of sodium and potassium level in acute MI patients can help assess their prognosis.

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