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# A Study of Serum Magnesium Levels in Acute Myocardial Infarction

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**Abstract**

Coronary artery disease is the most common cause of premature deaths. It is characterized pathologically by atheromatous plaque which may stenose the coronary arterial system sufficiently to cause exertional myocardial ischemia. There are reports in the literature over patients with acute myocardial infraction have lower magnesium levels. Supplementation of magnesium salts may reduce the incidence of fatal and on fatal arrhythmias after an infarct and thereby decreased the mortality in AMI. The present study was undertaken to determine whether changes occur in the serum magnesium level in acute myocardial infarction and to plot its time course during the acute illness and if changes occurred,were they related to the occurrence of arrhythmias and its prognostic values. The present study was conducted on 37 patients of acute myocardial infarction admitted to ICCU. Patients presenting with chest pain suggestive of myocardial infarction, who showed E.C.G evidence of acute infarction changes were assessed by detailed history and physical examination . The infarction was confirmed by elevated CPK/SGOT levels. Serum magnesium is estimated within first 24 hours of chest pain 1st day and on 9th day as well. Eight controls were chosen in the age group of35 to 70 years. Simultaneously serum potassium levels were estimated. The individual values of Serum Magnesium and Potassium in controls and in patients with acute myocardial was estimated. statistical analysis was done. Of the thirty seven cases of acute myocardial infarction, ten patients were hypomagnesemic on the first day of A.M.I. In the other twenty seven cases acute myocardial infarction studied, Serum Magnesium concentrations were within normal range. It is evident from the above results, that a statistically significant decrease in mean serum magnesium levels was noted in patient with AMI as compared to control levels.

**Keywords**: Magnesium, Myocardial infarction, AMI, Arrhythmias.

Coronary artery disease is the most common cause of premature deaths. Its cause is unknown. But a number of risk factors have been identified including diabetes, hypertension, hypercholesterolemia, cigarette smoking, correlation of which may protect the development and progression of disease. It is characterized pathologically by atheromatous plaque which may stenose the coronary arterial system sufficiently to cause exertional myocardial ischemia, experienced by the patient as angina. Plaque rupture provides a focus for platelet deposition and thrombosis which my result in unstable angina or myocardial infarction depending on whether the thrombus is subocclusive or occlusing the coronary lumen completely. There are reports in the literature over patients

with acute myocardial infraction have lower magnesium. Magnesium has been known to have an influence in the causation of acute myocardial infarction and also its sequelae like arrhythmias. It plays a major role in the pathogenesis of other cardiovascular diseases as well. Magnesium ions are found to be essential for the maintenance of the normal functional integrity of the myocardium[1]. supplementation of magnesium salts may reduce the incidence of fatal and on fatal arrhythmias after an infarct and thereby decreased the mortality in AMI. In patients with sudden death because of ischemic heart disease, magnesium concentration in the cardiac muscle was found to be decreased [2]. A fall in serum magnesium following acute myocardial infarction has been observed by many workers [3, 4] Hypomagnesemia is an electrolyte disturbance in which there is low level of magnesium in blood [5]. Experimental studies showed that magnesium suppresses the early after-depolarsation and the triggered activity responsible for arrhythmias. This indicates that a fall in serum magnesium in AMI may be associated with ventricular arrhythmias in patients with acute myocardial infarction [6]. The present study was undertaken to determine whether changes occur in the serum magnesium level in acute myocardial infarction.

**Material and methods**

**Selection of Patients:**

The present study was conducted on 37 patients of acute myocardial infarction admitted to ICCU M.G.M hospital,Warangal who fulfilled the following criteria, included in the present study.

1. Patients presenting within 24 hours after the onset chest pain.
2. Patients showing evidence of infarction of either anterior or inferior wall were included.
3. Patients with history of previous infarction, chronic alcohotism and patients on diuretics were excluded.
4. Patients with evidence of serious diseases involving other system were also excluded.
5. Continuous bed ECG monitoring

Patients presenting with chest pain suggestive of myocardial infarction,who showed E.C.G evidence of acute infarction changes were assessed by detailed history and physical examination as outlined in the proforma. Subjects having hypertension, diabetes, history of smoking was noted. Type of infarction was also noted. The infarction was confirmed by elevated CPK/SGOT levels. Serum magnesium is estimated within first 24 hours of chest pain 1$^{st}$ day and on 9$^{th}$ day as well. Patients showing normal magnesium levels on admission were not subjected to repeat examination of magnesium levels on 9$^{th}$ day. Eight controls were chosen in the age group of 35 to 70 year. In the present study, serum magnesium is estimated by colorimetric method using calmagite. . Colorimetric determination of magnesium is done without deproteinization using calmagite. statistical analysis was done.

**Results**

Table 1 shows that out of 37 MI patients,10 patients had low Sr.magnesium on addmission.27 patients had normal Sr.magnesium levels. 100% patients with low magnesium level developed arrhythmias.81% patients with normal magnesium levels developed arrthymias.

Table 1:

| Total Patients with myocardial infarction [37] | Patients with decreased Serum Magnesium levesl on Admission [10] | Patients with normal Serum Magnesium levels on admission [27] |
|---|---|---|
| Patients developed Arrythmias | 10 (100%) | 22 (81%) |

Table 2 and Table 3 shows characteristics of normomagnesic and hypomagnesic patients in relation to history of diabetes, hypertension and smoking history, and also type of MI they developed.

Table 2 . Characteristics of hypomagnesemic patients with acute myocardial infarction.

| Variable | Present Study |
|---|---|
| Males | 8 |
| Females | 2 |
| Male / Female Ratio | 4:1 |
| Hypertension | 6 (60%) |
| Diabetes | 4 (40%) |
| Smoking | 6 (60%) |
| Anterior Wall MI | 6 (60%) |
| Inferior wall MI | 4 (40%) |

Table 3. Characteristics of normomagnesemic patients with acute myocardial infarction.

| Variable | Present Study |
|---|---|
| Males | 18 |
| Females | 9 |
| Male / Female Ratio | 2 :1 |
| Hypertension | 15 (55.5%) |
| Diabetes | 1 4 (51.85%) |
| Smoking | 16 (59.25%) |
| Anterior Wall MI | 16 (59.25%) |
| Inferior wall MI | 11 (40.74%) |

Table 4 shows that 10 patients had low Sr.magnesium level on first day of addmission ,by ninth day the magnesium levels increased .27 patients had normal Sr.magnesium level on addmission.Similar results were observed in other studies[7,8].

Table 5 shows Sr.magnesium levels in 8 control subjects .

Table 4. Mean and standard deviation values of Serum magnesium in patients.

| Patients with low serum magnesium on admission (mg%) 10 patients | Patients with low serum magnesium on admission (mg%) 10 patients | Patients with normal serum magnesium on admission (mg%) 27 patients |
|---|---|---|
| 1st day | 9th day | 1st day |
| 1.07 ± 0.23 | 2.32 ± 1.78 | 2.32 ± 0.32 |

Table 5. Mean and standard deviation values of Serum magnesium in 8 Control subjects.

| |
|---|
| 2.29±0.174 mg% |

**Discussion**

Few studies have demonstrated that Serum Magnesium concentration decreases significantly during A.M.I. The cause of hypomagnesemia during the early phase of infarction is related to the increased stress induced catecholmine release, which induce enhanced lipolysis and sequestration of magnesium with free fatty acids (FFA) and adipocytes. It has been shown that magnesium depletion modifies coronary blood flow, blood clotting, and atherogenesis [9]. Magnesium cofactor in more than 300 enzymes system of the body in human cell. Its possible site of action includes vascular smooth muscle, platelets, and myocardial cells [10]. Magnesium depletion can induce hyperlipidemia and subsequently atherogenic deposits in coronary arteries leading to atherosclerosis[11].Routine use of IV magnesium is recommended within first few hours of acute myocardial infarction to reduce mortality, arrhythmias and pump failure.[12,13].Magnesium treatment reduces ventricular tachycardia and ventricular fibrillation[14]. Although the present study and many other studies have indicated a trend towards disturbed magnesium homeostasis in acute myocardial infarction, particularly in cases of pump failure, serious arrhythmias and mortality, the data seems

to be inconclusive because of smaller number of patients in each study. Trials already conducted on iv magnesium therapy in acute myocardial infarction have shown reduced incidence of cardiogenic shock and arrhythmias, but no effect on mortality, however, the meta-analysis of seven trials showed a 55% reduction in odds of deaths and in the recently completed LIMIT 2 study [15]. There was a 24% reduction ofmortality in patients of acute myocardial infarction treated with iv magnesium.

Intravenous magnesium therapy can therefore be recommended for use in cases of acute myocardial infarction within first few hours of the onset of infarction because of its effect on prognosis, economy.

**Conclusion**

Serum magnesium levels on admission were significantly low in patients of acute myocardial infarction as compared with healthy controls. Hypomagnesemia is often associated with acute myocardial infarction. Prophylactic administration of the intravenous magnesium sulphate may be considered in all cases of Acute Myocardial infarction as an adjuvant to thrombolytic therapy and in patients not suitable for thrombolysis, to prevent cardiac arrhythmias, irrespective of serum magnesium levels.

**References**

[1]. Burch GE, Gibs TD. Importance of magnesium deficiency in cardiovascular disease. American Heart Journal. 1977; 94: 649.

[2]. Burch GE, Gibs TD. Importance of magnesium deficiency in cardiovascular disease. American Heart Journal. 1977; 94: 649.

[3]. Dyckner T. Serum Magnesium in acute myocardial infarction. *Acta Med Scand* 1980; 207 : 59-66.

[4]. Papaceit J, Moral V. Recie J, de Ferrer JM, Riva J. Bayes de Luna A. Severe heart arrhythmias, secondary to magnesium deplition. *Rev Esp Anesthesiol Reanim* 1990; 37 : 28-31.

[5]. Taylor EJ. Hypomagnesemia at Dorland's Medical Dictionary. Philadelphia, PA: Saunders; 2011.

[6]. Keller PK. Aronsom RS. Role of magnesium in cardiac arrhythmias. *Prog Cardiovas Dis* 1990; 32 : 433-448.

[7]. Giesecke D. Weise M. Seidal D. Serum magnesium concentration in myocardinfarct. *Klin Wechenschr 1986;* 64:1003- 1012.

[8]. Kafka H. Langevin L. Armstrong PW. Serum magnesium and potassium in acute myocardial infarction. *Arch Intern Med 1987;* 147: 465-469.

[9]. Prakash C, Arya RK, Singla KP. Study of platelet adhesiveness and serum magnesium levels in cases of acute myocardial infarction. J Assoc Physicians India 1969;17:499-504.

[10]. Altura BM, Altura BT, Carella A, Turlapaty PD. Hypomagnesemia and vasoconstriction: Possible relationship to etiology of sudden death ischemic heart disease and hypertensive vascular diseases. Artery 1981;9:212-31.

[11]. Altura BM, Zhang A, Altura BT. Magnesium hypertensive vascular disease, atherogenesis, subcellar compatmentation of Ca2+ and Mg2+ and vascular contractility. Minor Electrolyte Meab 1993;19:323-36.

[12]. Tee KK, Yusuf S, Colins R. Held PH. Reto R. Effect of intravenous magnesium in suspected acute myocardial infarction : Overview of randomised trials. *8M]* 1991; 303 : 1499-1504.

[13]. Woods KL, Fletcher S, Roffe C. Halder 'Y. Intravenous magnesium sulphate in suspected acute myocardial infarction: result of the second Leicester Intravenous Magnesium Intervention Trial (LIMIT-2). *Lancet* 1992; 339 : 1553-1558.

[14]. Li J, Zhang Q, Zhang M, Egger M. Intravenous magnesium for acute myocardial infarction. Cochrane Database Syst Rev. 2007;(2):CD002755.

[15]. Woods KL, Fletcher S, Roffe C. Halder 'Y. Intravenous magnesium sulphate in suspected acute myocardial infarction: result of the second Leicester Intravenous Magnesium Intervention Trial (LIMIT-2). *Lancet* 1992; 339 : 1553-1558.