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Research Article

EVALUATION OF ARRHYTHMIAS IN LOW VERSUS NORMAL MAGNASSIUM LEVEL IN ACUTE MYOCARDIAL INFARCTION

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Abstract:

Objective: The objective of this study is to compare the occurrence of arrhythmias in the Acute Myocardial Infarction patients with low versus normal serum magnesium level.

Study Design: This observational & comparative study was conducted at department of Cardiology, Liaquat University Hospital, Hyderabad. All the patients with Acute Myocardial Infarction, with post MI arrhythmias either gender were included in the study. The diagnosis of Acute Myocardial Infarction and arrhythmias was based on the History, Electrocardiographic evidence of Myocardial Infarction and Arrhythmias, and significant elevations of cardiac enzymes (biomarkers) especially Troponins. Patients were divided into two groups 'A' and 'B'. In group 'A' patients with normal serum magnesium and in group 'B' patients with low serum magnesium level will be included. Finally arrhythmias were analyzed and compared in both groups.

Results: Total 96 cases were selected. Mean age of patients was 56.78 ± 14.1 years. Male were found in majority 75(78.1%). In this study 87(90.6%) patients were with negative family history. 89(92.7%) patients were present in A group having normal magnesium level while 7(7.3%) patients were in B group having low magnesium level. 94(97.9%) patients had developed arrhythmias while 2(2.1%) patients had no arrhythmias. Mean serum magnesium level was 1.97 ± 0.34 with range of 1-3.20. Normal magnesium level was found in 17 patients having CHB, 13 patients having AF, 27 patients having VT, 14 patients having VF and 3 patients having junctional bradycardia. While low magnesium level was seen in 4 patients having VT, 1 patient having 2nd degree AV block and 1 patient having bigeminy. This is showing no significant difference p value 0.107

Conclusion: We concluded that there was no difference found in the low verses normal magnesium level in the occurrence of arrhythmias in the Acute Myocardial Infarction patients.

Key words: Acute Myocardial Infarction, arrhythmias, serum magnesium level

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INTRODUCTION:

Acute Myocardial Infarction (AMI) is one of the commonest diseases and leading causes of death among Hospitalized patients in industrialized countries and also increasing in the developing countries[1]. It is described as a threat that leads to a life crisis in one's whole life and it is also a high family stress especially for the couples[2]. According to the careful estimates based on scientific studies nearly 100.000 individuals suffered from acute myocardial infarction in calendar year 2002[3]. The relative risk of developing CAD in Pakistani men is highest in early ages[3]. In a recently published study, 16% of AMI patients at the Aga Khan University Hospital (AKUH) between 2000-2002 were found to be younger than 45 years of age and 93% of them were men[4]. Sustained ventricular arrhythmias (VA) complicate 5-10% of all acute MIs. These arrhythmias remain a life-threatening complication of MI, with an in hospital mortality rate of 16-20%, despite advances in reperfusion and pharmacotherapy 4.7% patients were died, 10% patients had Ventricular tachycardia and 7% patients had ventricular fibrillation. Similar findings were observed in another study done by Minicucci MF in which sustained ventricular arrhythmias and heart failure are well-recognized complications after acute myocardial infarction (AMI)[4,5].

Magnesium is the fourth most abundant cation in the body and plays an important physiological role in many of its functions[6]. Magnesium deficiency in the body is associated with different complications for cardiovascular diseases and atherogenesis such as increasing oxidative stress, cytokine synthesis, nitrogen oxides and mediators of inflammation and adhesion molecules on micro-vascular endothelial cells and can affect cardiac electrical activity, myocardial contractility and vascular tone[6].

The frequency of Arrhythmias in Acute Myocardial Infarction is higher in patients with Hypomagnesaemia and is reduced by Magnesium administration.⁵ It was proven that 6.9 - 11% of Hospitalized patients with Acute Myocardial Infarction and 65% of patients in Intensive care units have a lack of Magnesium[7,8]. A possible role of Magnesium in the etiology of Ischemic Heart disease is still not sufficiently clear. Previous studies have demonstrated that increased intake of dietary Magnesium may lower blood triglyceride level and increase high-density lipoprotein (HDL) cholesterol levels.⁷ Magnesium is involved in Post Myocardial Infarction Arrhythmias as Epidemiological studies have shown a correlation between hardness of water and the incidence of Myocardial infarction and of sudden death. Patients with Acute Myocardial infarction also have lower exchangeable Magnesium

content and retain abnormally high amounts of Magnesium after a Magnesium load than control subjects[8]. On the basis of these associations and facts that Magnesium depletion may worsen or precipitate Acute Myocardial infarction, arrhythmias and enhance reperfusion injury, intravenous magnesium therapy has been advocated in the management of Acute Myocardial Infarction. Purpose of this study is to compare the occurrence of arrhythmias in the Acute Myocardial Infarction patients with low versus normal serum magnesium level

MATERIAL & METHODS:

This was a cross sectional &comparative study and was carried out in the department of Cardiology, Liaquat University Hospital, Hyderabad. Study duration was 12 months after approval of Research protocol. All the patients with Acute Myocardial Infarction, with post MI arrhythmias either gender were included in the study. All the patients having history of Alcoholism, malnutrition, diarrhea, history of drugs such as Loop and thiazide Diuretic and Proton pump Inhibitors and patients with hypermagnesemia were excluded. The patients' were selected after taken written and informed consent. Clinical data such as the age, gender, Hypertension, Diabetes, Smoking, and Family History was assessed by clinical Examination including Pulse and Blood Pressure and Laboratory investigations such as ECG findings, Serum Magnesium Level and Cardiac Biomarkers were collected on the first day of Hospitalization and were record on proforma for the study. The diagnosis of Acute Myocardial Infarction and arrhythmias was based on the History, Electrocardiographic evidence of Myocardial Infarction and Arrhythmias, and significant elevations of cardiac enzymes (biomarkers) especially Troponins. All Investigations were sent to Diagnostic and Research Laboratory of Liaquat University Hospital, Hyderabad. According to investigation of serum magnesium patients were divided into two groups 'A' and 'B'. In group 'A' patients with normal serum magnesium and in group 'B' patients with low serum magnesium level was included. Finally arrhythmias were analyzed and compared in both groups. Data was entered and analyzed in statistical Package for social sciences (SPSS) version 20.

RESULTS:

In this study data of patients regarding age and blood pressure was as: Mean age of patients was 56.78 ± 14.1 years with range of 30-80 years. Mean systolic blood pressure of patients was 125.73 ± 25.8 mmHg with range of 70-200 mmHg, while mean

diastolic blood pressure was 79.94 ± 15.8 mmHg with range of 40-120 mmhg. Mean hospital stay of patients was 4.58 ± 0.96 days with range of 2-8 days. According to the gender of patients in this study male were found in majority as: 21(21.9%) patients were female while 75(78.1%) patients were males. In this study 87(90.6%) patients were with negative family history of MI, while 9(9.4%) patients were positive family history. **Table 1.**

In this series according to distribution of MI, majority of patients i.e. 29 (30.2%) had acute anterior wall MI while 23.95% patients had acute inferior MI, 15.62% had EXT ANT WALL MI, 15.62% had IW+RV MI and 9 (9.4%) patients had EXT AWMI. Only 2(2.1%) patients had Acute inferior +RV MI. results showed in **Table 2.**

In this study table 7 is showing arrhythmias. 94(97.9%) patients had developed arrhythmias while 2(2.1%) patients had no arrhythmias. **FIG 1.**

We found patients with Arrhythmias as: Majority of patients i.e. 31.3% had VT. 17.7% patients had CHB,

13.5% had AF, 14.6% patients had VF, following by VARIABLE BLOCK, 2ND DEGREE HEART LOCKS, BIGEMN, HIGH DEGREE AV BLOCK, JUNCTIONAL BRADYCARDIA, SINUS BRADYCARDIA, SVT, 1ST DEGREE AV BLOCK, 2ND DEGREE AV BLOCK with percentage of 1.0%, 2.1%, 1.0%, 2.1%, 1.0%, 3.2%, 6.2%, 2.1% and 3.1% respectively. **Table 3.**

Table 6 is showing groups. 89(92.7%) patients were present in A group having normal magnesium level while 7(7.3%) patients were in B group having low magnesium level. **Table 4**

In this study normal magnesium level was found in 17 patients having CHB, 13 patients having AF, 27 patients having VT, 14 patients having VF and 3 patients having junctional bradycardia. While low magnesium level was seen in 4 patients having VT, 1 patient having 2nd degree AV block and 1 patient having bigemny. This is showing no significant difference p value 0.107. **TABLE 5**

Table 1: Patients distribution according to demographic characteristics n=96

Demographic characteristics	Frequency (%)
Age (Mean \pm SD)	56.78 \pm 14.1 years
BP_SYS (Mean \pm SD)	125.73 \pm 25.8 mmHg
BP_DIAS(Mean \pm SD)	79.94 \pm 15.8 mmHg
Hospital Stay(Mean \pm SD)	4.58 \pm 0.96 days
Gender	
Male	21(21.9%)
Female	75(78.1%)
Family history	
Positive	09(09.4%)
Left	87(90.6%)

Table 2: Patients distribution according Type of myocardial Infarction n=96

Type of MI	Frequency	Percent
Acute anterior wall MI	27	28.12%
EXT ANT WALL MI	15	15.62%
Acute A/S MI	3	3.1%
Acute AVR MI	2	2.1%
Acute inferior MI	23	23.95%
Acute inferior +RV MI	15	15.62%
Acute inferior +POST MI	07	7.29%
Acute inferior +LATERAL MI	03	3.1%
Acute POST WALL MI	01	1.0%

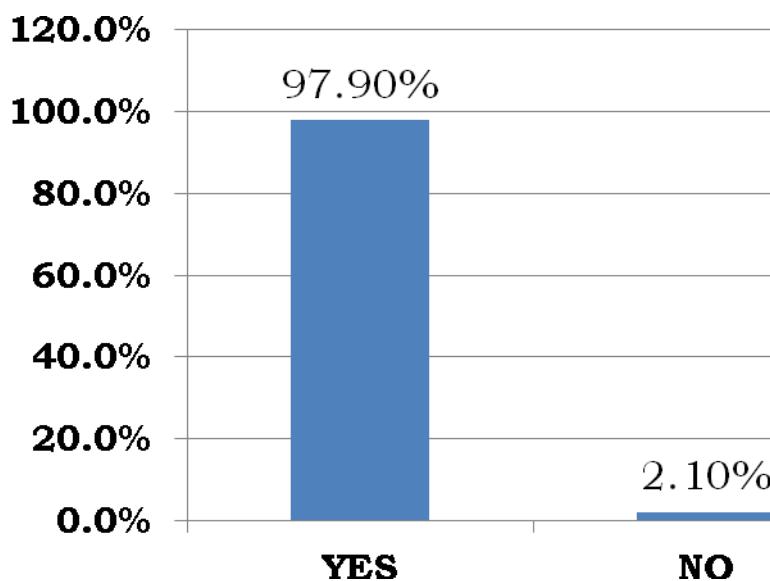


Fig1: Patients distribution according Frequency of arrhythmias n=96

Table 3: Patients distribution according To Arrhythmias and its types n=94

Arrhythmias	Frequency	Percent
1ST DEGREE AV BLOCK	1	1.0%
2ND DEGREE AV BLOCK	2	2.1%
2ND DEGREE HEART BLOCKS	1	1.0%
Atrial Fibrillation	13	13.5%
BIGEMNY	2	2.1%
CHB	15	15.6%
HIGH DEGREE AV BLOCK	1	1.0%
JUNCTIONAL BRADYCARDIA	3	3.2%
SINUS BRADYCARDIA	6	6.2%
SVT	2	2.1%
VARIABLE BLOCK	3	3.1%
VF	13	14.6%
VT	30	31.3%

Table 4: Patients distribution according To magnesium level n=96

MAGNESIUM	Frequency	Percent
A(NORMAL MAGNESIUM)	89	92.7%
B(LOW MAGNESIUM)	07	07.3%

Table 5: Arrhythmias association with magnesium level n=94

	A(normal magnesium) N=89	B(low magnesium) N=07
1ST DEGREE AV BLOCK	1	0
2ND DEGREE AV BLOCK	1	1
2ND DEGREE HEART BLOCKS	1	0
Atrial Fibrillation	13	0
BIGEMINY	1	1
CHB	14	1
HIGH DEGREE AV BLOCK	1	0
JUNCTIONAL BRADYCARDIA	3	0
SINUS BRADYCARDIA	6	0
SVT	2	0
VARIABLE BLOCK	3	0
VF	14	0
VT	27	4
P VALUE	0.107	

DISCUSSION:

Myocardial infarction is one of the most common diseases that most people are grappling with it across the world. Despite many advances in diagnosis and treatment of the disease over the past two decades, myocardial infarction remains a major cause of health problems in the world[9]. According to many studies arrhythmias are the most common complication of acute myocardial infarction, and responsible for 40-50% of mortality due to acute myocardial infarction and the possibility for incidence of arrhythmias after acute myocardial infarction during the first hour is about 15 times more than 12 hours after acute myocardial infarction[10,11]. The disturbance in serum magnesium level i.e. hypomagnesemia has been reported to occur among patients with acute myocardial infarction[12]. Magnesium has been suggested as a possible intervention to be used in AMI since the early 1960s mainly because it was thought to be an antiarrhythmic agent, although no studies have conclusively shown this to be the mechanism of action for magnesium in reducing mortality[13].

Total 96 patients with acute MI were included in this study, patients regarding age were found as mean age of patients was 56.78 ± 14.1 years with range of 30-80 years. In the study of D, rajasekhar[14] reported average of age 54.5 ± 11.5 , and he found majority of the male cases 71% in the study. Masood A et al,¹⁵ had also found male in the majority 75% as compared to female 25%. As well as in this study male were found in majority as: 21(21.9%) patients were female while 75(78.1%) patients were males.

We found majority of patients i.e. 29 (30.2%) had acute anterior wall MI while 23.95% patients had acute inferior MI, 15.62% had EXT ANT WALL MI, 15.62% had IW+RV MI and 9 (9.4%) patients had EXT AWMI. Only 2(2.1%) patients had Acute inferior +RV MI. Masood A et al [15], stated one hundred and two (63.8%) patients had anterior wall, 50 (31.3%) had inferior wall, 6 (3.8%) had posterior wall and 2 (1.3%) had lateral wall myocardial infarction. On other hand In the study of Palwasha Sahibzada et al [16]. Reported that total of 45.1% patients were with STEMI, from them 29% were anterior wall myocardial infarctions and 16% were inferior wall MI, and 29% were diagnosed as ACS. Similar finding also reported by some other studies[17,18].

In this study data of patients regarding age and blood pressure was as: Mean age of patients was 56.78 ± 14.1 years with range of 30-80 years. Mean systolic blood pressure of patients was 125.73 ± 25.8 mmHg with range of 70-200 mmHg, while mean diastolic blood pressure was 79.94 ± 15.8 mmHg with range of 40-120 mmhg. In the study of D,rajasekhar et al[14] reported that Systolic blood pressure 122.4 ± 24.5 and diastolic blood pressure 78.4 ± 15.2 . A comparative study by Ying-Qing et al[19] Li on MI reported that systolic blood pressure in control group 125.56 ± 12.52 and systolic blood pressure in patients with acute MI 129.66 ± 15.35 , while diastolic blood pressure 79.75 ± 6.81 in control cases

and diastolic blood pressure in MI patients 81.57 ± 9.76 [19].

We found 89(92.7%) patients were present having normal magnesium level while only 7(7.3%) patients were in B group having low magnesium level. On other hand it has been observed in various international studies that the serum magnesium Mg⁺⁺ level is not only low at admission in cases of AMI but also continues to fall even for days after the onset of AMI[20]. In our series the mean serum magnesium level was low in both gender and it is consistent with the study published in 2010[21]. Magnesium is an important cofactor for many enzymatic reactions and intracellular ATPase activity and may be important in cellular recovery after an ischemic period. Haigney et al [22]. Recently reported that magnesium levels were significantly reduced in patients with ST elevation during AMI. In this study normal magnesium level was found in 17 patients having CHB, 13 patients having AF, 27 patients having VT, 14 patients having VF and 3 patients having junctional bradycardia. While low magnesium level was seen in 4 patients having VT, 1 patient having 2nd degree AV block and 1 patient having bigemny. This is showing no significant difference p value 0.107.

CONCLUSION:

Although magnesium level is a major factor in the metabolism of cell and low level of magnesium can disturb the metabolism, but in our study no significant difference was found in the occurrence of arrhythmias in the Acute Myocardial Infarction patients with low versus normal serum magnesium level. More big sample size studies are required to conform more accurate findings.

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