International Journal Dental and Medical Sciences Research
Volume 4, Issue 5, Sep-Oct 2022 pp 480-484 www.ijdmsrjournal.com ISSN: 2582-6018

"Serum Magnesium Level in Acute Myocardial Infarction: A Study in A.J. Institute of Medical Sciences, Mangalore"

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Submitted: 10-10-2022 Accepted: 22-10-2022

ABSTRACT: Magnesium has been linked to the development of arrhythmia, a consequence of myocardial infarction, as well as the disease itself. Magnesium enhances the function of the myocardium and prevents calcium buildup and myocardial cell death. It enhances lipid metabolism, peripheral vascular resistance, cardiac output, afterload, and vascular tone. It also lowers cardiac arrhythmias threshold. Magnesium also enhances endothelial function, decreases sensitivity to oxygen-derived free radicals, and prevents platelet aggregation and adhesion.

OBJECTIVE: To understand the connection between individuals with acute myocardial infarction's blood magnesium levels and their occurrence of arrhythmias.

METHOD: By using simple random method, 60 cases of acute myocardial infarction admitted in A.J. Institute of Medical Sciences, Mangalore over a period of 11 months, i.e., between July 2021 to May 2022.

RESULTS: Magnesium levels in patients with and without arrhythmias varied significantly.

CONCLUSION: Patients with low magnesium levels are more likely to develop arrhythmias after an acute myocardial infarction. Therefore, individuals with acute myocardial infarction and low magnesium levels may benefit from magnesium therapy.

KEYWORDS: Magnesium; Myocardial Infarction;Arrhythmias

I.INTRODUCTION:

Hypomagnesaemia is an electrolyte imbalance characterized by a low magnesium content in the blood. [1] Magnesium is a crucial micronutrient for humans and is necessary for maintaining healthy cardiac function. It functions as a cofactor in the body's more than 300 enzyme systems found in human cells. Vascular smooth muscle, platelets, and cardiac cells may all be its sites of action. [2] Magnesium deficiency can cause hyperlipidemia, which in turn can cause atherogenic deposits in the coronary arteries and eventually atherosclerosis. [3]Numerous factors, such as insufficient magnesium intake, persistent diarrhea, malabsorption, ongoing stress, drinking, and medications like diuretics, can cause hypomagnesaemia. [4]

In the therapy of arrhythmia and coronary artery disease, magnesium is crucial. Those who have coronary heart disease (CHD) are deficient in magnesium. In these individuals, oral magnesium and potassium combination treatment improves endothelial function and lowers platelet-dependent thrombosis.

Low magnesium concentration in the cardiac cell is linked to membrane instability, whereas high magnesium concentrations stabilize the membrane and are consequently antiarrhythmic. Magnesium is a powerful vasodilator[5, 6,] and it is necessary for the contraction of muscles. One of the indications for oral magnesium treatment includes CHD. It may be demonstrated that magnesium lengthens exercise time and enhances general wellbeing in these people. After myocardial infarction, those who received intravenous magnesium had a much decreased chance of dying from complications associated with ischemic heart disease. [8, 9]

OBJECTIVES OF THE STUDY

To know the relation between level of serum magnesium and arrhythmias in patients with acute myocardial infarction who are presenting within 12 hours of onset of symptoms.

II.MATERIALS AND METHODS

DATA SOURCE

60 Cases of Acute Myocardial Infarction , admitted to Intensive Coronary Care Unit of A.J Institute of Medical Sciences, Mangalore over 11 months i.e., between July 2021 to May 2022

INCLUSION CRITERIA FOR PATIENTS

Only those patients who exhibited two of the following features were given an acute myocardial infarction diagnosis:

1) Chest discomfort

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2) Acute Myocardial Infarction ECG Characteristics.
3) An increase in cardiac enzymes.
The research only included individuals who arrived at the hospital within 12 hours after the beginning of symptoms.

EXCLUSION CRITERIA FOR PATIENTS
Hypokalemia patients

A comprehensive physical examination, extensive history taking, and basic tests including hemoglobin, total leukocyte count, urine analysis, blood sugar, Blood urea, and Serum creatinine, serum electrolytes, fasting lipid profile, cardiac enzymes and Echocardiography were all performed on a select group of patients. Serum Magnesium level was done on Day-1 and Day-5

III.RESULTS

In this study of 60 cases, 50 were males and 10 were females with male female ratio of 5:1. The maximum incidence of acute myocardial infarction was seen between 6th and 7th decades of life followed by fifth and sixth decades**.**

Age Range (years)	Male	Female	Total
30-40	8	1	9
40-50	10	4	14
50-60	12	3	15
60-70	16	2	18
70-80	4	-	4

TABLE1: Ageandsexdistributionofthestudygroup

Risk factors	No. of cases	%
Smoking	43	71
Family history of HTN/DM/CVA/IHD	17	28
Obesity	10	16
Hypertension	32	53
Diabetes	21	35
Dyslipidemia	15	25

TABLE2:RISKFACTORS

Table 2 shows, according to the study, individuals with acute myocardial infarction most frequently had smoking as a risk factor. Smoking cigarettes raises the risk of thrombosis, plaque instability, and myocardial infarction as well as accelerates coronary atherosclerosis in people of all ages and genders. Additionally, it worsens angina by raising the myocardial oxygen requirements and decreasing the oxygen supply.In this investigation, it was shown that hypertension was the second biggest risk factor (53%) for the occurrence of acute myocardial infarction. Out of 60 patients in the current study, 21 patients (35%) were found to have diabetes, and 15 patients (25%) to have dyslipidemia.

Time of presentation	No. of cases	%
0-3 hrs.	24	40
3-6 hrs.	36	60

Table 3: Time of presentation

Table 3 shows that in the current study, 24 instances (40%) and 36 cases (60%) of the cases presented to the hospital between 0 and 3 hours and 3 to 6hours after the beginning of chest discomfort, respectively.

Serum Magnesium in patients with arrhythmias (n=30)	Day 1	%	Mean magnesium levels on day 1	Day 5	%	Mean magnesium levels on day 5
<1.6	13	21.6	1.52±0.30	6	10	1.90±0.32

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1.6-2.5	17	28.3		24	40	
>2.5	-	-		-	-	

Table 4: Serum Magnesium levels in patients with arrhythmias (n=30)

Table 4 shows that, 30 of the 60 patients in the current research experienced severe ventricular premature contractions, ventricular tachycardia, or ventricular fibrillation throughout the course of their five days in the hospital. Day 1 mean serum magnesium levels in patients with arrhythmias was 1.52±0.30. Day 5 mean serum magnesium levels in patients with arrhythmias was 1.90±0.32

Serum Magnesium in patients without arrhythmias (n=30)	Day 1	%	Mean magnesium levels on day 1	Day 5	%	Mean magnesium levels on day 5
<1.6	8	13.3	2.13±0.50	-	-	2.52±0.48
1.6-2.5	16	26.6		20	33.3	
>2.5	6	10		10	16.6	

Table 5: Serum Magnesium levels in patients without arrhythmias (n=30)

Table 5 shows that, 30 of the 60 patients in the current research did not experience arrhythmias throughout the course of their five days in the hospital. Day 1 mean serum magnesium levels in patients without arrhythmias was 2.13±0.50. Day 5 mean serum magnesium levels in patients without arrhythmias was 2.52±0.48

	Day 1	Day 5
Mean serum magnesium levels in 60 cases	1.74±0.32	2.29±0.44
Mean serum magnesium in patients with arrhythmias	1.52±0.30	1.90±0.32
Mean serum magnesium in patients without arrhythmias	2.13±0.50	2.52±0.48

Table 6: Comparison of Mean serum Magnesium levels in all groups.

Above table 6 shows that this cross-sectional investigation of 60 patients, the mean blood magnesium levels on days 1 and 5 were 1.74±0.32 and 2.29±0.44, respectively. On day 1, individuals with arrhythmias had a mean blood magnesium level of 1.52±0.26, while those without arrhythmias had a mean level of 2.13±0.40 (p 0.001). Patients with and without arrhythmias had significantly different magnesium levels. On day 5, individuals with arrhythmias had a mean blood magnesium level of 1.90±0.32, while those without arrhythmias had a mean level of 2.52±0.48.

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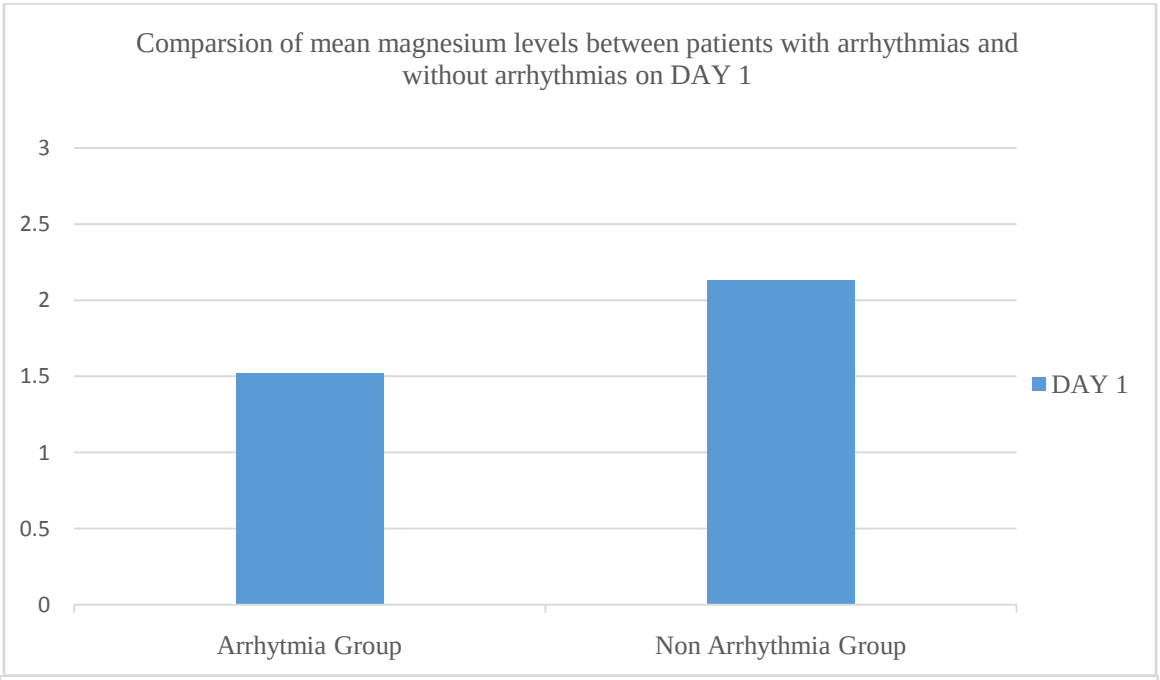

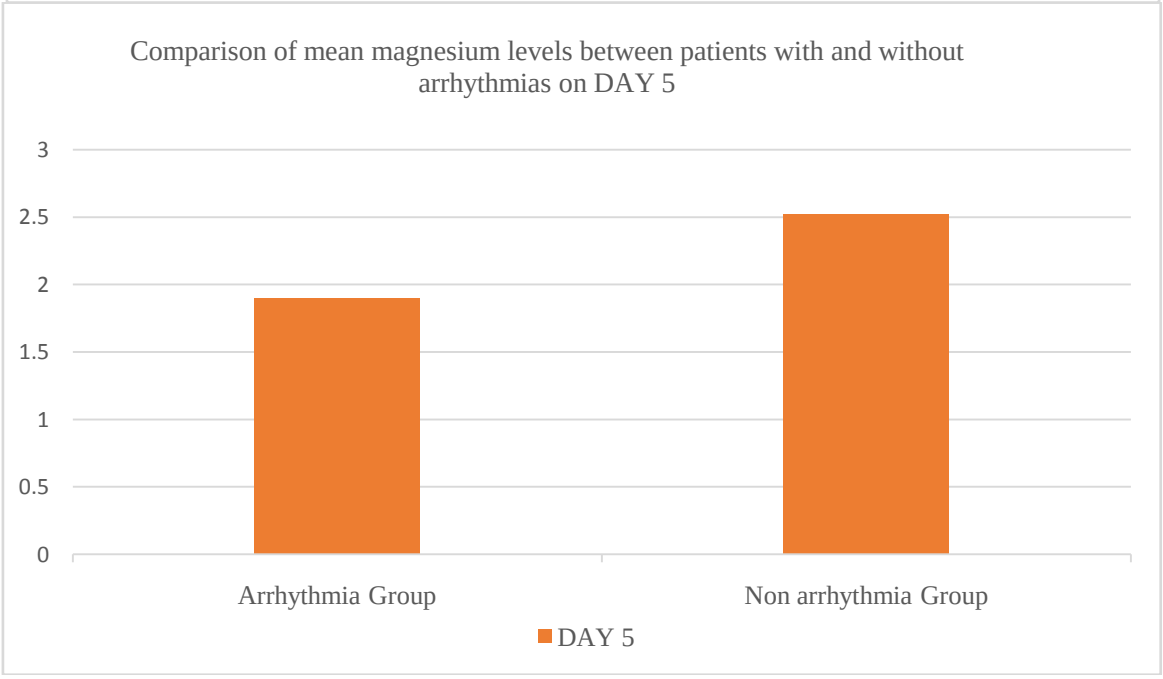

IV.DISCUSSION

During the past ten years, magnesium ion has become a leading cardiovascular cation. It has been linked to the development of complications such arrhythmias and acute myocardial infarction. Magnesium is necessary for ATP activation, which keeps the sodium-potassium pump functioning. Additionally, due to its calcium-blocking properties, magnesium has been linked to arrhythmias following acute myocardial infarction

The male-to-female ratio in the study group of 60 patients was 5:1, with 50 men and 10 women. The sixth and seventh decades had the highest rates of acute myocardial infarction. In the current investigation, which involved 60 patients, the average blood magnesium level on day 1 was 1.74±0.32 and the average level on day 5 was 2.29±0.44. In the present study, the serum magnesium level on day-1 was significant lower in patients with arrhythmias than those without arrhythmia ($p<0.001$). There was an increase in serum magnesium from Day-1 to Day-5 in both those with arrhythmias and those without arrhythmias.

Abraham et al.[10] examined the magnesium levels of 65 patients who had been diagnosed with acute myocardial infarction at the time of admission. In contrast to the control group and patients with non-cardiac chest pain (mean 1.91 mg/dl), patients with AMI or acute coronary insufficiency had serum magnesium concentrations that were low (mean 1.70 mg/dl, p0.001) or 1.61 mg/dl, p0.01, respectively.

In the CCU, Dyckner T et al. [11] treated 905 patients over the course of 11 and a half years, 342 of whom had an acute myocardial infarction, and 563 others who had other diagnoses. Both the acute myocardial infarction and non-AMI groups had significantly lower serum magnesium levels than the reference group. In the hypomagnesaemia individuals with acute myocardial infarction, the incidence of severe ventricular premature beats, ventricular tachycardia, and ventricular fibrillation was considerably greater upon admission.

V.CONCLUSION

This study was carried out in 60 patients of acute myocardial infarction who are admitted to the ICCU of A.J Institute of Medical Sciences, Mangalore over 11 months i.e., between July 2021 to May 2022

The male to female ratio in the study group was 5:1 and the maximum incidence of acute myocardial infarction was seen in 6th and 7th decade. Smoking was the most prevalent risk factor in the research, followed by hypertension and diabetes.60 participants in the study group had an average blood magnesium level of 1.74±0.32 on day 1 and 2.29±0.44 on day 5. 30 individuals with arrhythmias in the study group have mean blood magnesium levels of 1.52±0.30on day 1 and 1.90±0.32 on day 5. 30 individuals without arrhythmia in the research group had mean blood magnesium levels of 2.13±0.50 on day 1 and 2.52±0.48 on day 5.Patients with and without arrhythmias had significantly different magnesium levels

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