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ORIGINAL ARTICLE

Compare the Mean Magnesium Level among Diabetic and Non-Diabetic Patients Presenting with Myocardial Infarction in a Tertiary Care Hospital

IRFAN BHATTI[1], WASIF BAIG[2], SALMAN AZHAR[3], MUHAMMAD AAMIR RAFIQUE[4], TALHA MUNIR[5], VARDA BALOUCH[6]
[1]*Senior Registrar Cardiology, Punjab Institute of Cardiology, Lahore*
[2]*Assistant Professor Nephrology, Madina Teaching Hospital, Faisalabad*
[3]*Assistant Professor Medicine, Madina Teaching Hospital, Faisalabad*
[4]*Associate Professor Pharmacology, Punjab Institute of Cardiology, Lahore*
[5]*Senior Registrar Medicine, DHQ hospital, Faisalabad*
[6]*Assistant Professor Anesthesiology, Pakistan Ordinance Factories Hospital, Wah Cantt*
Corresponding author: Irfan Bhatti, Email: drirfanbhatti@hotmail.com, Cell: +92 321 6451169

ABSTRACT

Objective: To compare the mean magnesium level among diabetic and non-diabetic patients presenting with myocardial infarction in a tertiary care hospital.

Study Design: Descriptive study

Place and Duration: Conducted at Emergency department, Punjab Institute of Cardiology, Lahore during the period from 5th June 2018 to 4th December 2018.

Methodology: The non-probability purposive sampling technique was used in this study. Informed consent was obtained from all patients and study protocol was explained. Under aseptic conditions, venous blood samples were obtained from cases at the time of presentation in emergency department. Samples were sent to laboratory of hospital to assess magnesium level. Serum magnesium level was measured by using standard chemical analyzer. Reports were read to note serum magnesium level (as per operational definition). Data was collected by the researcher himself. Both groups were compared using independent sample t test to compare mean serum magnesium level in both groups. A p value <0.05 was taken as significant.

Results: The mean age of the patients was noted as 45.56±8.78 years, 70% patients were males whereas 30% patients were females. In this study the DM was observed in 60% patients whereas it was not observed in 40% patients.The mean value of serum magnesium level of the patients was 1.60±0.53 mg/dl. Mean serum magnesium value in diabetic group was 1.36±0.56 mg/dl whereas the mean serum magnesium value in non-diabetic group was 1.96±0.21 mg/dl. Statistically there is highly significant difference was found between the values of serum magnesium values and study groups i.e. p-value=0.000.

Conclusion: Thus according to the findings of this study we have come to know that the incidence of DM is high in MI patients. Moreover, low magnesium levels have been observed in diabetic patients.

Keywords: Serum Magnesium level, Myocardial Infarction, MI, Diabetes Mellitus, DM, HBA1C

INTRODUCTION

Worldwide, diabetes and myocardial infarction (MI) are on the rise (1, 2), with a prevalence of 16.68 percent among males and 19.37 percent among females in Pakistan (3), which is significantly lower than the global prevalence of 7.7 percent estimated to be reached by 2030. In comparison to people without diabetes, people who have diabetes mellitus are at an increased risk for cardiovascular disease by a factor of 2 to 3. (4)It has been demonstrated that electrolyte concentrations in the bloodstream fluctuate in response to changes in plasma glucose. Diabetes mellitus is related with abnormalities in the levels of several electrolytes (DM). In addition to its role in cellular metabolism, magnesium is the second most abundant intracellular cation. Sixth, it has been discovered that magnesium insufficiency has an inverse relationship with glycemic control. Increased urine losses, as well as lower serum and intracellular magnesium levels, are observed in both Type 1 and Type 2 diabetics. (7)

Patients with diabetes benefit from oral magnesium supplementation, which lowers fasting plasma glucose levels (5). Mild electrolyte abnormalities, such as low Mg2+ levels, can predict mortality in type 2 diabetes, which is associated with increased vulnerability to ventricular arrhythmias.(8)

Patients with diabetes had mean serum magnesium levels of 0.88 0.08 mmol/L, while non-diabetics had mean serum magnesium levels of 0.91 0.07 mmol/L, a statistically significant mean difference (p value 0.001) between the two groups, according to a study conducted in China.(5)

The mean serum magnesium level in diabetic patients was 1.67 0.47 mg/dl, while the mean serum magnesium level in non-diabetic patients was 1.75 0.47 mg/dl, resulting in a statistically insignificant mean difference (p value =0.572) in the study. Patients with MI were found to have Diabetes Mellitus in 51 percent of cases, according to the study. (9)

Diabetes patients who receive chronic magnesium supplements have been shown to have improved islet beta cell response, and hypomagnesaemia has been shown to be associated with insulin resistance in diabetic patients. However, we do not routinely measure magnesium in our electrolyte measurements because it is not considered important. In addition, we discovered ambiguity in previous studies. We may be able to formulate guidelines for periodic determination of magnesium levels and appropriate magnesium replacement in diabetic patients with MI based on the findings of this study. This study

would aid in the reduction of mortality and morbidity associated with lower magnesium levels in patients with diabetes mellitus who are at an increased risk of magnesium-related complications, as well as in the prevention of such complications.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted at Emergency department, Punjab Institute of Cardiology, Lahore during the period from 5th June 2018 to 4th December 2018. Myocardial infarction was diagnosed in a total of 200 patients, of both sexes, who were included in the study. The patients' ages ranged from 20 to 60. There were exclusions for patients with end stage renal disease (creatinine clearance 15 mL), diagnosed cases of Chronic Obstructive Pulmonary Disease (COPD) through pulmonary function testing, body mass index > 35 kg/m2, and smokers due to the possibility that recent drug intake could have changed the serum magnesium level.

All patients were given a thorough explanation of the study's procedures and informed consent was obtained. In order to collect the data, we used a pre-made questionnaire (called a "proforma") that included questions about demographics like gender, age, and who the respondents knew. Diabetes was checked in the medical history and medical record. Venous blood samples were obtained from patients in the emergency department under aseptic conditions. To determine the magnesium content, the samples were sent to the hospital's laboratory. A standard chemical analyzer was used to determine the concentration of magnesium in the blood. Serum magnesium levels were noted in reports that were read (as per operational definition). The researcher collected all of the data himself.

SPSS version 17 was used to enter and analyse the collected data. As with categorical variables such as gender and diabetes, the mean was calculated with the standard deviation for quantitative factors such as age and serum magnesium level. In order to compare the mean serum magnesium levels in both groups, an independent sample t test was used. A p-value of 0.05 or less was considered significant. Data was stratified for age, gender, glycemic control and duration of disease. T-test was applied post stratification with p-valeu≤0.05 considered as significant.

RESULTS

In this study total 200 cases were enrolled. The mean age of the patients was noted as 45.56±8.78 years with minimum and maximum ages of 30 & 60 years respectively. **Table#1**

Table 1: Descriptive statistics of age (years)

Age (years)	n	200
	Mean	45.56
	SD	8.78
	Minimum	30.00
	Maximum	60.00

The study results showed that the 70% patients were males whereas 30% patients were females. **Fig#1**

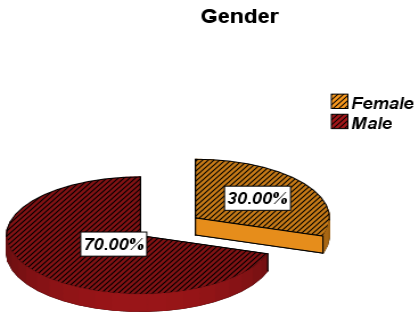

Figure 1: Distribution about Gender

In this study,DM was observed in 60% patients whereas it was not observed in 40% patients. **Fig#2**

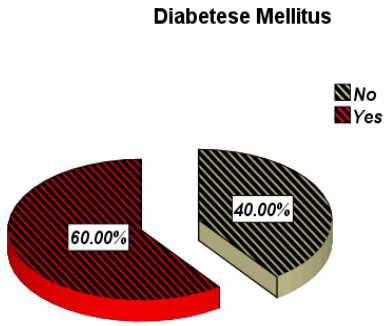

Figure 2: Frequency of Diabetes Mellitus among all the patients

In this study the mean duration of DM was 3.39±3.80 years with range of duration of DM 0 - 10 years respectively. The study results showed that the mean HBA1C value was 9.63±3.70 with minimum and maximum values of 4 & 17 respectively.

In this study the mean serum magnesium value in diabetic group was 1.36±0.56 mg/dl whereas the mean serum magnesium value in non-diabetic group was 1.96±0.21 mg/dl. Statistically there is highly significant difference was found between the values of serum magnesium values and study groups i.e. p-value=0.000 **Table#2**

Table 2: Descriptive statistics of Serum magnesium level in accordance with DM

		Diabetes Mellitus	
		Yes	No
Serum Magnesium (mg/dl)	n	120	80
	Mean	1.36	1.96
	SD	0.56	0.21

P value=0.000

In female groups, the mean serum magnesium level in diabetics was 1.29±0.56 mg/dl while its mean value in non-diabetics was 1.89±0.23 mg/dl. Statistically there is highly significant different was found between the serum

magnesium levels and study groups i.e. p-value =0.000. In male cases, the mean serum magnesium level in diabetics was 1.39±0.56 mg/dl while its mean value in non-diabetics was 1.99±0.18 mg/dl. Statistically there is highly significant different was found between the serum magnesium level and study groups i.e. p-value =0.000 **Table#3**

Table 3: Comparison of Serum magnesium level in both groups stratified by gender of patient

		Female		Male	
		DM+	DM-	DM+	DM-
Serum Magnesium level (mg/dl)	n	34	26	86	54
	Mean	1.29	1.89	1.39	1.99
	SD	0.56	0.23	0.56	0.18
P-value		0.000 (Significant)		0.000 (Significant)	

In patients having age <40 years, the mean serum magnesium level in diabetics was 1.60±0.45 mg/dl while in non-diabetics was 2.08±0.10 mg/dl. Statistically there is highly significant different was found between the serum magnesium level and study groups of the patients having age <40 years i.e. p-value =0.000**.** In patients having age ≥40 years, the mean serum magnesium level in diabetics was 1.32±0.57 mg/dl while in non-diabetics was 1.72±0.13 mg/dl. Statistically there is highly significant different was found between the serum magnesium level and study groups of the patients having age ≥40 years i.e. p-value =0.000 **Table#4**

Table 4: Comparison of Serum magnesium level in both groups stratified by age of patient

		Age<40years		Age≥40years	
		DM+	DM-	DM+	DM-
Serum Magnesium (mg/dl)	n	19	52	101	28
	Mean	1.60	2.08	1.32	1.72
	SD	0.45	0.10	0.57	0.13
P-value		0.000 (Significant)		0.000 (Significant)	

DISCUSSION

Approximately 10% to 20% of patients with a history of coronary artery disease (CAD) have diabetes. In order to lower the high mortality rate among diabetics who suffer a MI, significant efforts must be made [10-12].

Patients with diabetes mellitus are more likely to suffer from IHD-related complications and deaths, according to a number of epidemiological studies, including the Framingham Study. Because of this, diabetes mellitus (DM) is linked to an increased risk of AMI [15, 16].

In our study, 60 percent of patients with DM were found, while only 40 percent of patients with MI were. Different studies that support our findings are outlined here.

According to a study by Nasir Ahmed et al, 31.6% of people with ACS had diabetes mellitus, and 62 percent of those with diabetes had poor glycemic control [17].

Diabetes mellitus affects 10–20% of patients with MI who are hospitalised, and about 40% of those patients have glucose levels that are out of whack [18].

Diabetes was seen in 37 percent of patients with ACS in a research in Japan [19]. According to Maria and colleagues, 33.1 percent of patients with ACS had diabetes [20].

Diabetes was identified in 27 percent of individuals with ACS, according to Okosieme OE et al. In their study, Palwasha et al. reported that 37.34 percent of diabetics had ACS. ACS patients were found to have a total of 32% diabetes, with 4.48 % of them being newly diagnosed diabetics.

Other research in Larkana found that 30.5 percent of ACS patients had diabetes, with 6 percent of those newly diagnosed [24]. Ishihara M et al observed that 7% of newly diagnosed diabetics had ACS in their study.

The participants in our study had an average serum magnesium concentration of 1.600.53 mg/dl. In our study, the diabetic group had a mean serum magnesium level of 1.36 mg/dl, while the non-diabetic group had a mean serum magnesium level of 1.96 mg/dl. Significant statistical differences were identified between serum magnesium value and study group results in this research. e.g., a p-value of 0.0000000

Researchers in China found a statistically significant difference in the mean serum magnesium levels between diabetics and non-diabetics (p value 0.001). When compared to non-diabetic patients, diabetes patients had a mean serum magnesium level of 1.75 0.47 mg/dl while non-diabetic patients had a mean of 1.67 0.47 mg/dl. Patients with MI were found to have diabetes at a rate of 51%.

Even after adjusting for covariates, glucose stabilisation after admission was related with greater patient survival in a study of over 8000 patients with ACS hospitalised in the United States.

According to our findings [27], admission glucose levels >180 mg/dL were associated with an increased risk of high-risk ventricular tachyarrhythmia only in patients without diabetes in a Spanish study looking at the impact of glucose levels on admission and hospital mortality in patients with AMI [27].

Male patients were shown to have a higher risk of developing MI compared to female patients in our study. 70% of patients in our study were male, while 30% were female.

In the study conducted by Nasir Ahmed et al., there were 161 men (64.4%) and 89 women (34.6%). According to the Cardio 2000 survey in Greece, (89)CAD is more prevalent in men than women. In England and Karachi, men are more likely than women to suffer from IHD [29].

CONCLUSION

There is a significant prevalence of diabetes mellitus (DM) in people with coronary artery disease. Furthermore, diabetics have been found to have lower magnesium levels. When doing routine tests in the future, we'll be recommending that magnesium levels be checked. Patients with diabetes mellitus (DM) who have a higher risk of magnesium-related problems may benefit from this strategy.

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