

ORIGINAL ARTICLE

Levels of Serum Magnesium among Recently Diagnosed Glucose Intolerance Patients and its Comparison with Serum Magnesium Level of Sex and Age Controlled Healthy Subjects

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ABSTRACT

Background: Hypomagnesaemia is related with diabetes mellitus (DM) and its complications and insulin resistance. On the other hand, the patients of Diabetes mellitus have decreased levels of magnesium. This analysis was planned to assess levels of serum magnesium in patients with newly diagnosed impaired glucose intolerance and the severity of intolerance e.g., DM or impaired glucose tolerance, impaired fasting glucose and compare the serum levels of magnesium with sex and age matched healthy individuals.

Methods: This case-control study was carried out in the Outpatient department of Diabetes Hospital Peshawar and CMH Multan Institute of Medical Science Multan for six months duration from February 2020 to July 2020. New patients of glucose intolerance (IGT 2, DM 54) were matched with same number of sex and age matched healthy subjects (n=56). All participants in the study done with the level of serum magnesium and comparisons were made between the case and the healthy subjects.

Results: This study evaluated 56 patients (studied group) and 56 healthy volunteers of similar gender and age (control group) with glucose intolerance. There was no substantial difference between the control group in terms of sex, body mass index ($p = 0.39$) and age ($p = 0.88$). The level of serum magnesium was according to standard in 30 patients and 39 healthy subjects, and decrease in 26 patients and 17 normal subjects. The mean concentration of serum magnesium was lower in the experimental group (0.69 ± 0.16 m. Mol / L) than in the control group (0.84 ± 0.17 m. Mol / L), though the variance was not substantial ($p = 0.37$).

Conclusions: The levels of Serum magnesium were lesser in individuals with IGT and DM compared to healthy volunteers of the same sex and age and levels of serum magnesium were related to blood glucose levels.

Key words: Serum magnesium, Diabetes mellitus, Glucose intolerance, Impaired glucose tolerance, Impaired fasting glucose.

INTRODUCTION

Diabetes mellitus (DM) is a universal community health issue. 34.7 billion People worldwide have diabetes, which will be two-fold in the following twenty-years and 150% more in under developed countries¹⁻². 90% of all diabetics have type II diabetes mellitus³⁻⁴. Typically, these individuals had pre-diabetes [impaired glucose tolerance and impaired fasting glucose]. The resistance to Insulin is the major enteropathogenic factors in the development of T2DM⁵⁻⁶. Low levels of magnesium (mg) have been reported in diabetic individuals, with South Asian people in particular being more at risk. Moreover, insulin resistance in more communal in hypomagnesaemia, and thus with diabetes mellitus⁷⁻⁸. Hypomagnesaemia is also related with the development of complications of diabetes mellitus. Abnormal blood sugar levels cause hypomagnesaemia and osmotic diuresis, thus vicious cycle of diabetes mellitus and hypomagnesaemia initiated⁹. Supplements of Mg helps achieve good glycemic control and can avoid or delay complications. When glucose intolerant patients are tested and have decrease levels of magnesium, replacement with Mg helps them attain improved results¹⁰. This analysis was planned to assess levels of serum magnesium in patients with newly diagnosed impaired glucose intolerance and the

severity of intolerance e.g DM or IGT, impaired fasting glucose and compare the serum levels of magnesium with sex and age matched healthy individuals.

METHODS

This case-control study was carried out in the Outpatient department of Diabetes Hospital Peshawar and CMH Multan Institute of Medical Science Multan for six months duration from February 2020 to July 2020. New patients of glucose intolerance (IGT 2, DM 54) were matched with same number of sex and age matched healthy subjects (n=56). All participants in the study done with the level of serum magnesium and comparisons were made between the case and the healthy subjects. Patients treated with type 1 diabetes, gestational diabetes (GDM) and other diabetes types, using diuretics or laxatives, having vomiting or diarrhea, detected with parathyroid disorders, malabsorption syndrome, and electrolyte imbalance were not included. The approval from the Ethical Review Commission was taken prior to study initiation. Patients had a high level of glucose intolerance according to the candidate criteria, which were collected continuously and consciously after the last Oral Glucose Tolerance Test (OGTT) in the previous three months. Patients received

detailed information about the purpose of the study and serum Mg level was verified after obtaining written consent. The serumMg levels have been tested by the Hospital laboratory. Other important laboratory and clinical statistics were obtained from patient histories as an exercise of daily routine. For healthy volunteers, the same age and gender were engaged as controls. Data were scrutinized using the SPSS version 20.0 and suitable statistical analyzes were accomplished. The outcomes are accessible in the appropriate figures and tables.

RESULTS

This study evaluated 56 patients (studied group) and 56 healthy volunteers of similar gender and age (control group) with glucose intolerance. The basic features are presented in Table I. There was no substantial difference between the control group in terms of sex, body mass index ($p = 0.39$) and age ($p = 0.88$). The level of serum magnesium was according to standard in 30 patients and 39 healthy subjects, and decrease in 26 patients and 17 normal subjects. The mean concentration of serum magnesium was lower in the experimental group (0.69 ± 0.16 m. Mol / L) than in the control group (0.84 ± 0.17 m. Mol / L), though the variance was not substantial ($p = 0.37$). The levels of serum magnesium were associated negatively with), 2-hour post glucose ($r = -0.560$), HbA1c ($r = -0.544$) and fasting blood glucose ($r = -0.532$).

The Clinical Features of the patients are given in Table-II
Serum Magnesium Level of Newly Detected Patients with Glucose Intolerance and Its Comparison with Serum Magnesium Level of Age and Sex Matched Healthy Volunteers

Characteristics	Cases (n=56)	Controls (n=56)	p value
Age in years	42.10 \pm 12.11	43.26 \pm 11.23	0.88
Male:Female	1:2	1.5:2	---
BMI (kg/m ²)	26.55 \pm 2.02	24.56 \pm 2.70	0.39
Systolic BP (mm Hg)	131.20 \pm 15.10	120.90 \pm 11.90	0.002
Diastolic BP (mm Hg)	82.20 \pm 6.33	77.88 \pm 10.11	0.003
DM:IGT	50:1.5	---	---
2-h BG (m.mol/L)	13.44 \pm 7.32	---	---
FBG (m.mol/L)	9.11 \pm 1.85	---	---
HbA1c (%)	7.90 \pm .85	---	---
RBG (m.mol/L)	---	6.42 \pm 0.40	---
Ca (mg/dL)	8.80 \pm 0.29	8.41 \pm 1.30	0.003
Mg (m.mol/L)	0.69 \pm 0.16	0.84 \pm 0.17	0.37
S. Creatinine (mg/dL)	0.90 \pm 0.151	0.78 \pm .089	0.001
ALT (U/L)	53.50 \pm 11.58	40.70 \pm 14.96	0.002

The Demographic Features are given in Table-I

Studied group		Control group	
Males	19	Males	16
Females	37	Females	40
Total	56	Total	56
Age range			
20-40	22	20-40	24
40-60	34	40-60	32

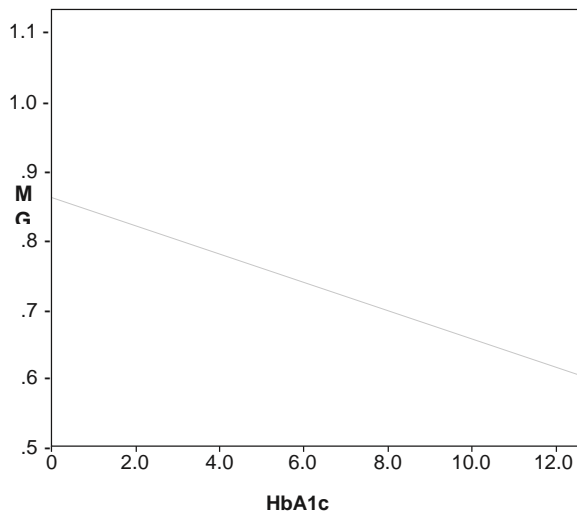


Figure 1. Association between serum Mg and HbA1c level amid patients

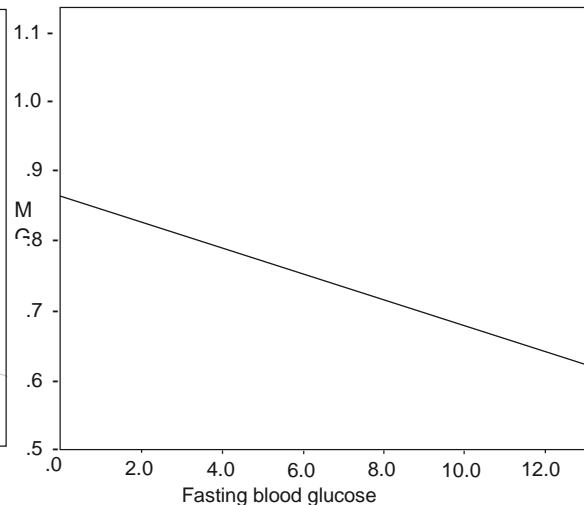


Figure 2. Association between serum Mg and FBG level amid patients.

DISCUSSION

Mg is the 2nd most important cell cation in the humanoid. It is an essential component of many enzymes and perform as a cofactor in above 300 enzymatic reactions¹¹. Evidence suggests that decrease levels of Mg are associated with resistance of insulin and thus contribute to the progression of diabetes¹². Mg supplementation can prevent the occurrence of diabetes. Among diabetic patients: Hypomagnesemia is related with neuropathy and additional associated complications of diabetes¹³. In patients of diabetes, renal Mg secretion is increased as a result of glucose-induced osmotic diuresis and possibly as a result of insulin resistance-induced causing reduced of tubular Mg absorption¹⁴⁻¹⁵. Recent studies have shown that Mg levels are low among people with recently detected glucose and Mg tolerance are reversed with glycemic control. Nearly all comparable results were seen in the study by Noferz et. Al in Canada¹⁶. Serum levels of Mg have been negatively associated with HbA1c in several analysis, and the results are consistent. Improvement of hypomagnesaemia has an optimistic effect on glycemic control, therefore dietary supplements can help diabetic patients, even if they are debatable¹⁷. Newer drugs launched for control of DM like sodium glucose transporter 2 (SGLT2) inhibitors, upsurge levels of serum Mg in patients of diabetes mellitus. Many of the researches associated with diabetes and serum Mg have been diagnosed among diabetic patients with diabetes¹⁸⁻¹⁹. 50% of patients with type-II diabetes have not been diagnosed, and 1/3rd to 50% of people with type II-diabetes have at least one complication at the diagnosis. Evidence has shown that correcting hypomagnesaemia helps in control of diabetes and postponed complications, while hypomagnesaemia is detected and treated early in the disease and naturally improves the patient's overall treatment outcomes²⁰⁻²¹. The main benefit of our study was the assessment of Mg levels in individuals with early glucose intolerance and in this case the control regimen. However, these studies had some restrictions. This was a single-center analysis with limited quantity of study applicants. Patients with IFG were not encompassed in this study²²⁻²³. A wider, multicenter study would provide a more meaningful response with more study participants.

CONCLUSION

Although there was no significant variance in serum Mg levels between recently perceived glucose intolerance with serum Mg levels of sex and age matched healthy volunteers in this analysis, serum Mg levels were found decreased in glucose intolerance patients (IGT and DM). Among glucose intolerance patients, serum Mg concentration was negatively associated with glycemic control.

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