

Frequency of Hypomagnesemia in Patients with Diabetes Mellitus at Civil Hospital Karachi

Hypomagnesemia
in Diabetes
Mellitus

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ABSTRACT

Objective: To determine frequency of hypomagnesemia in diabetic patients presenting at Civil Hospital Karachi.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at a Diabetic Clinic in National Institute of Diabetes and Endocrinology (NIDE), Karachi from January to June 2016.

Materials and Methods: All patients > 12 years of age of either sex, diagnosed cases of diabetes mellitus (either Type I or Type II) of > 5 years duration and have given consent for participation in the study were included. Patients with acute pancreatitis and have history of alcoholism (such conditions results in reallocation of the magnesium from extracellular to intracellular space), occurrences of diarrhea, regurgitating and nasogastric suction, ostomies and gastrointestinal fistulas (conditions which result gastrointestinal magnesium loss) and patients receiving diuretics, chemotherapeutic agents (cisplatin), antimicrobials (amphotericin B, aminoglycosides, pentamidine, capreomycin, vancomycin, and foscarnet), immunosuppressants (tacrolimus and cyclosporine), and proton-pump inhibitors, (as all these drugs results in renal loss of magnesium) were excluded.

Results: The average age of selected patients with diabetes mellitus was 46.81 ± 6.8 years. Of 350 patients, 203 (58%) were female and 147 (42%) were male; 176 (50.3%) patients had diabetes for ≥ 7 years; 269 (76.9%) patients had type II diabetes and 275 (78.6%) had uncontrolled diabetes. The mean serum magnesium level was 1.48 ± 0.36 mg/dl and the frequency of hypomagnesemia was 227 (64.9%) cases.

Conclusion: It is concluded from this study that the frequency of hypomagnesemia was 64.9% among study population.

Key Words: Hypomagnesemia, Diabetes, Type I diabetes, Type II diabetes

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INTRODUCTION

This disorder leaves an indicative influence on the standard and prospects of life, health and the entire well-being of an individual.¹ The incidence of diabetes is increasing all over the world. The global prevalence is expected to rise to 300 million, an increase of approximately 120% from 1995 to 2025.² In the urban and rural areas Pakistan, a study was done on 5433 people reported that the proportion of people suffer from type two diabetes were 19%.³

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After potassium (K^+), Magnesium is second most common intracellular ion and according to the ratings the eleventh most typical ion in human body. Magnesium is amongst the eleventh most prolific element by mass found in the human body and its ions are vigorous element of cell. The major role of magnesium is to manipulate the essential biological polyphosphate compounds⁴. Patients with diabetes mellitus are prone to hypomagnesemia⁵. Hypomagnesemia in diabetes may result from poor oral intake, poor gastrointestinal absorption, enhanced renal magnesium excretion and certain metabolic disturbances.⁵ The prevalence of hypomagnesemia in diabetes mellitus is 65%⁶. The constant hypomagnesemia precipitates to elevate the level of serum glucose and diminishes the degree of magnesium which is positively linked with serum glucose concentration and the amount of glucosuria⁷.

Moderated intracellular Mg concentrations cause a substandard tyrosine-kinase activity, post-receptorial deficiency in insulin action, and deteriorating insulin defiance in diabetic patients. There are number of diseases including poor glycemic control, hypertension, coronary artery disease, diabetic retinopathy, nephropathy, neuropathy and lastly foot ulcers are associated with hypomagnesemia^{5,8,9}.

On this topic, there is very limited data available locally; hence considering all the appropriate discourse and context, the current study is set in a tertiary care hospital of Karachi. This study mainly focuses on the disruption of the level serum magnesium (hypomagnesemia) present in patients suffering with diabetes mellitus. Secondly, magnesium supplementation may be advised to prevent the complications caused by magnesium deficiency in diabetes mellitus.

MATERIALS AND METHODS

A cross-sectional study conducted from January to March 2016 in Karachi. Study was conducted at a diabetic clinic in National Institute of Diabetes and Endocrinology (NIDE), Karachi.

All patients were evaluated for their serum magnesium status by taking 3 cc venous blood sample in a disposable syringe and sent to laboratory for analysis. Inclusion Criteria were All diabetic patients > 12 years of age of either sex, diagnosed cases of diabetes mellitus (Either type I or type II) of > 5 years duration and patients who agreed to give consent for participation in the study. Exclusion criteria were patients with acute pancreatitis or having history of alcoholism (as such conditions result in redistribution of magnesium from extracellular to intracellular space), patients with history of diarrhea, vomiting and nasogastric suction, gastrointestinal fistulas and ostomies (as such conditions result in gastrointestinal magnesium loss) and patients on diuretics (loop diuretics, osmotic diuretics, and chronic use of thiazide), chemotherapeutic agents (cisplatin), antimicrobials (amphotericin B, aminoglycosides, pentamidine, capreomycin, vancomycin, and foscarnet), immunosuppressants (tacrolimus and cyclosporine), and proton-pump inhibitors, as all these drugs result in renal loss of magnesium.

RESULTS

A total number of 350 patients were enrolled in this study during study period. The mean age of enrolled participants is 46.81 ± 6.8 years and 55.4% patients are below 45 years of age.

Of 350 patients, 203 (58%) were female and 147 (42%) were male with female to male ratio of 1.38:1. 176 (50.3%) patients had diabetes for ≥ 7 years in 269 (76.9%) patients had type II diabetes and 275 (78.6%) had uncontrolled diabetes.

The mean serum magnesium level was 1.48 ± 0.36 mg/dl and the frequency of hypomagnesemia was 227 (64.9%) cases.

Among the patients with type II diabetes, 183 (68%) had hypomagnesemia compared to 44 (54.3%) cases among those with type I diabetes ($p=0.017$) (Table 1). Among the patients with uncontrolled diabetes, 187 (68%) had hypomagnesemia compared to 40 (53.3%) cases among those with controlled diabetes ($p=0.014$) (Table 2).

Table No.1: Hypomagnesemia according type of diabetes (n=350)

		Type of diabetes		P-value
		Type II DM	Type I DM	
Hypomagnesemia	Yes	183	44	0.017
		68%	54.3%	
	No	86	37	
		32%	45.7%	
Total		269	81	
		100%	100%	

Table No. 2: Hypomagnesemia according status of diabetes (n=350)

		Status of diabetes		P-value
		Uncontrolled	Controlled	
Hypomagnesemia	Yes	187	40	0.014
		68%	53.3%	
	No	88	35	
		32%	46.7%	
Total		275	75	
		100%	100%	

DISCUSSION

It is reported that hypomagnesemia likely to occur in diabetic patients with both type 1 and type 2 as compared to non-diabetic patients. Although several studies have been done to support the evidence of complications in diabetic patients with hypomagnesemia, but the evidence fails to get attention among physicians. The important negative correlations have been shown between magnesium and fasting plasma glucose, HbA1c, HOMA-IR.^{10,11}

The various causes of low magnesium in diabetics include diets low in magnesium¹², osmotic diuresis causing high renal excretion of magnesium, insensitivity to insulin affecting intracellular magnesium transport and thereby causing increased loss of the extracellular magnesium¹³, extensive use of loop and thiazide diuretics promoting magnesium wasting, diabetic autonomic neuropathies¹⁴, and reduced tubular reabsorption due to insulin resistance¹⁵. In the present study hypomagnesemia was found in 64.9% of diabetics. The reported prevalence of hypomagnesemia in this study is quite high as compared to global estimates where studies have reported incidence rates of 13.5–47.7% in diabetic subjects¹⁶. The high incidence of hypomagnesemia in this study could perhaps be attributed to inclusion criteria with high sensitivity in order to include more patients and drinking water in some regions of Pakistan has lower content of calcium and magnesium.

Low intracellular magnesium results in defective tyrosine-kinase activity and worsening of insulin resistance¹⁷. Low cellular magnesium results in altered activities of various enzymes involved in transport and oxidation of glucose and release of insulin. Mg is a cofactor for adenylatecyclase enzymes¹⁸. Long term deficiency of magnesium has also been associated with elevated levels of TNF-alpha and contribute to post-receptor insulin resistance¹⁹.

In this study, the mean duration of diabetes in the patients with hypomagnesemia was 7.08 years. We also found that patients with more than 7 years of DM have significant hypomagnesemia ($p < 0.01$). In contrast to the findings of this study, in another study it was found that the mean diabetic duration was 8.85 years in hypomagnesemic patients and concluded that serum magnesium level has no direct relationship with diabetic duration if the diabetes is well controlled¹⁴. Available studies incorporating the gender difference factor, reported a higher incidence of hypomagnesemia in women as compared to men. at a ratio of 2 to 1^{7,20}. Further, a high ionized levels of Mg reported in men with diabetes. Similarly we found statistically high proportion of hypomagnesemia in female patients ($p < 0.001$). The findings of this study also correlate with a study from India²¹. In a descriptive case series, patients with T2DM had higher frequency of hypomagnesemia with is comparable to this study ($p < 0.017$). Hypomagnesemia is also found in patients with poor glycemia control (0.014).

CONCLUSION

Regional administration of corticosteroid injection as conservative management of carpal tunnel syndrome provides statistically significant mean decrease in distal motor latency on nerve conduction in four weeks after injection.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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