



HYPOMAGNEAEMIA IN DIABETES MELLITUS CAUSE OR EFFECT?

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ABSTRACT

Introduction: Hypomagnesaemia has been seen to occur with increased frequency in type 2 diabetes mellitus patients; it is frequently overlooked and undertreated.

Materials and Methods: A total of 60 patients with type 2 Diabetes Mellitus were enrolled from the hospital medicine department. 60 age and sex matched apparently healthy individuals with normal plasma glucose and with no symptoms suggestive of Diabetes mellitus were taken as controls.

Objectives: The present study was conducted with an objective to evaluate the serum magnesium and fasting blood glucose in type 2 Diabetes mellitus cases and compare them with controls.

Results: There is significant difference between levels of serum magnesium levels among diabetics and controls. The mean serum magnesium levels in cases and controls are 1.67 mg/dl and 2.03 mg/dl respectively ($p < 0.001$).

Conclusion: The serum magnesium levels were significantly lower in diabetes mellitus type 2 as compared to healthy sex and age match controls.

KEYWORDS : Diabetes mellitus, Insulin, Hypomagnesemia

Introduction

Diabetes mellitus is a highly prevalent disease worldwide. Diabetes and its complications are a significant cause of mortality, morbidity and increased economical burden to country's health sector. Type 2 diabetes mellitus (DM2) is often accompanied by alteration of Mg status. An increased prevalence of Mg deficits have been identified in DM2 patients, especially in those with poorly controlled glycemic profiles, with longer duration of the disease and with the presence of micro- and macrovascular chronic complications(1-5). Magnesium is the fourth most abundant cation in the human body and the second most abundant intracellular cation(6). It plays an important role in the carbohydrate metabolism. It serves as a cofactor for all enzymatic reactions that require kinases(7). It is also an essential enzyme activator for neuromuscular excitability and cell permeability, a regulator of ion channels and mitochondrial function, a critical element in cellular proliferation and apoptosis, and an important factor in both cellular and humoral function(8).

The treatment of the patients of type 2 diabetes mellitus requires a multidisciplinary approach whereby every potential complicating factor must be closely monitored and treated. Although hypomagnesaemia has been reported to occur with increased frequency in patients with type 2 diabetes mellitus, it is frequently overlooked and undertreated (9).

The present study was conducted with an objective to evaluate the serum magnesium and fasting blood glucose in type 2 Diabetes mellitus cases and compare them with controls.

Materials and Methods

The study was approved by the Ethics committee; a written informed consent was obtained from all participants in this study. A total of 60 patients with type 2 diabetes mellitus were recruited from the institute's medicine department. The diagnosis of type 2 diabetes mellitus was confirmed by biochemical investigations as per WHO criteria(10). sixty age and sex matched apparently healthy individuals with normal plasma glucose and with no symptoms suggestive of DM were taken as controls.

Patients with acute or chronic diarrheal/ malabsorption states, with thyroid or adrenal dysfunction, history of alcohol intake, history of vitamin or mineral supplements in the recent past, recent metabolic acidosis, pregnancy, lactation, with serum creatinine > 1.5 mg/dl

and on drugs known to affect magnesium levels were excluded from the study (11). Both cases and controls were subjected to estimation of biochemical parameters. Fasting plasma glucose was estimated by using commercially available kit in automated analyzer. Magnesium was estimated by a kit that uses cal magite dye method(12). The reference serum magnesium level by this method is 1.6-2.5 mg/dl.

Statistical Analysis

Statistical analysis of data was performed using SPSS (Version 15.0). Student t test has been used to find the significance of proportion of serum magnesium levels between cases and controls.

Results

A Comparative study consisting of 60 Diabetic Mellitus patients and 60 controls was undertaken to investigate the change pattern of serum magnesium in DM cases when compared to controls. The mean age of the diabetics was 55 ± 12 years whereas it was 55.58 ± 12 years respectively. Both among the cases and controls the sex distribution was same i.e. 62% and 38% males and females respectively. The maximum number of patients was in the age group of 40-50 i.e. 42%. The mean FBS levels among cases and controls were 230.1 mg/dl and 99.42 mg/dl respectively. There is significant difference between levels of serum magnesium levels among diabetics and controls. The mean serum magnesium levels in cases and controls are 1.67 mg/dl and 2.03 mg/dl respectively ($p < 0.001$).

Table 1: Effect of DM on serum magnesium levels

Serum magnesium	cases	control
Range(mg/dL)	1.0-2.50	1.50-2.60
mean \pm SD	1.67 \pm 0.37	2.03 \pm 0.25

Students t=5.649; p<0.001

Discussion

Of all the endocrine and metabolic disorders associated with magnesium deficiency, diabetes mellitus is the most common. Many studies have shown that plasma levels are lower in patients with type 1 and type 2 diabetes mellitus compared with non diabetic control subjects.

Inverse correlations between magnesium and fasting plasma

glucose, HbA1C, HOMA-IR have been observed. Factors implicated in hypo-magnesemia in diabetics include diets low in magnesium(13),osmotic diuresis causing high renal excretion of magnesium, insensitivity to insulin affecting intracellular magnesium transport and thereby causing increased loss of the extracellular magnesium(14) rampant use of loop and thiazides diuretics promoting magnesium wasting(15,16) diabetic autonomic neuropathies and reduced tubular reabsorption due to insulin resistance(17). Hypomagnesemia may be a contributing factor for the long term complications particularly ischemic heart disease ,retinopathy (18,19) foot ulcer(20)and peripheral neuropathy(21).

In our study there was significant decrease in serum magnesium level in type 2 DM as compared to controls. Similar such decreased in serum magnesium level in diabetic patients as compared to controls has been reported in other studies (22,23).

Conclusion

Hypomagnesemia, defined herein as having low serum magnesium concentrations, is common among patients with type 2 diabetes. Contributory mechanisms most likely are multi factorial. Because available data suggest that adverse outcomes are associated with hypomagnesemia, it is prudent that routine surveillance for hypomagnesemia is done and the condition be treated whenever possible. A magnesium rich diet consisting of whole grains legumes, fruits and vegetables such as spinach, okra, dry apricots may be recommended. Further studies on the role of magnesium supplementation in type 2 DM in the Indian population are recommended.

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