

Effect of Magnesium as an Adjuvant in the Treatment of T2 DM Patients

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Abstract

Diabetes has taken the shape of a pandemic putting a financial burden on the patients as well as on the nation. Insulin resistance, T₂DM, and many other health diseases like hypertension, coronary artery disease (CAD), cerebrovascular accident (CVA), migraine, carcinoma, and bone-related problems have been associated with low levels of magnesium. Magnesium is an important ion responsible for glucose metabolism. Notably, adults in many countries do not consume recommended dietary allowance (RDA). All these health problems need to be addressed at the primary preventive level. Dietary modifications are effective preventive measures to control other health problems and T₂DM. Many studies that show the essential role performed in previous years, strongly recommended that Magnesium could play a significant role in the reduction of the risk of developing T₂DM. RDA for magnesium is 340 - 350 mg/day for adult men and 310 mg/day for adult women. Promoting magnesium-rich food consumption can translate into a considerable benefit in preventing T₂DM. Dietary magnesium supplementation- as a cost-effective alternative may help in reforming nutritional health care all over the world.

Keywords: Diabetes, Insulin Resistance, Magnesium, RDA

Introduction

The incidence and prevalence of diabetes have increased worldwide at a very rapid rate. The associated factors with diabetes are improper diet and an unhealthy lifestyle. Genetic predisposition also places an important role [1]. Magnesium is an important cation involved in the glycolytic pathway and many other enzymatic reactions. In Diabetes either there is insulin sensitivity or enhanced insulin resistance due to magnesium deficiency [2]. Fasting plasma magnesium is positively associated with the rate of glucose disposal [3,4].

Higher-magnesium diets reduce the risk of diabetes because magnesium plays an important role in the metabolism of glucose [5,6]. Hypomagnesemia, a disorder that frequently precedes diabetes, may exacerbate insulin resistance, or it may be a result of insulin resistance [7]. Diabetes leads to increased urinary loss of magnesium, and the resulting inadequacy of magnesium can impair the secretion and action of insulin, thereby worsening the control of diabetes [8]. Magnesium either taken orally or intravenously causes improvement in insulin response and glucose disposal. Insulin resistance in such patients also is reduced [9].

Discussion

An Indian study concluded that 44 percent of diabetes patients had hypomagnesemia, which was substantially associated with low glycaemic control and diabetic retinopathy [10].

| Title Of Study | Study Population | Administration Of: | Result/Conclusion | References |
|---|--|---|---|--------------------------------|
| Association of serum magnesium with type 2 diabetes mellitus and diabetic retinopathy | Type 2 diabetes patients | Cross-sectional observational study | Mg deficiency may increase the risk of diabetic retinopathy and poor glycaemic control. | Kumar, <i>et al.</i> , 2019 |
| The Effects of Oral Magnesium Supplementation on Glycemic Response among Type 2 Diabetes Patients | Type 2 diabetes patients | 250 mg/day of elemental Mg supplements | Oral Mg supplementation reduces insulin resistance and improves the glycaemic control | Wafaa <i>et al.</i> , 2018 |
| The effect of magnesium supplementation on blood pressure in individuals with insulin resistance, prediabetes, or noncommunicable chronic diseases: a meta-analysis of randomized controlled trials | BP, noncommunicable chronic diseases (type 2 diabetes etc) | 365 to 450 mg/d of elemental Mg supplements | Magnesium supplementation significantly lowers BP in individuals with insulin resistance, prediabetes | Dibaba <i>et al.</i> , 2017 |
| Higher Magnesium Intake Reduces Risk of Impaired Glucose and Insulin Metabolism and Progression from Prediabetes to Diabetes in Middle-Aged Americans | Type 2 diabetes patients | Food frequency questionnaire | Magnesium supplementation may lower the risk of diabetes progression in high-risk individuals like those with IR or prediabetes. | Hruby, 2014 |
| Oral magnesium supplementation in type II diabetic patients | Type 2 diabetes patients | 300 mg elemental magnesium | Magnesium imparts beneficial effects on blood glucose, lipid profile, and blood pressure in patients with type II diabetes. | Solati <i>et al.</i> , 2014 |
| Dietary calcium and magnesium intakes and the risk of type 2 diabetes: the Shanghai Women's Health Study | Type 2 diabetes patients | Detailed survey-dietary intake, other lifestyle factors | Calcium and magnesium intakes may protect against the development of T ₂ DM. | Villegas, <i>et al.</i> , 2009 |
| Oral Magnesium Supplementation Improves Insulin Sensitivity and Metabolic Control in Type 2 Diabetic Subjects | Type 2 diabetes patients | Oral supplementation with MgCl ₂ solution | Restores serum Mg levels, improves insulin sensitivity and metabolic control in type 2 diabetic patients with decreased serum magnesium levels. | Moran and Romero, 2003 |

Table 1: Summary of the Relationship Between Magnesium and Diabetes.

Wafaa, *et al.* (2018) concluded that the daily administration of magnesium tablets (250 mg) of elemental magnesium showed a substantial increase in the percentage of HbA1c, HOMA-IR and a slight reduction in fasting blood sugar. Furthermore, the use of magnesium supplements decreased insulin resistance and improved measures of glycaemic control in the diabetic patient [11].

Dibaba, *et al.* (2017) observed the beneficial effect of magnesium supplementation in the regulation of blood pressure, insulin resistance, and cardiovascular diseases [12].

A longitudinal study conducted among diabetic patients of the USA showed an association of higher magnesium intake with a lower risk of 32% diabetes incidence [13].

A research study by Solati, *et al.* (2014) concluded that not only supplementation with magnesium can help manage diabetes, but also the effective dosage and period of supplementation, and consideration should be given to patients who need supplementation. Therefore, for patients with diabetes, magnesium is also recommended as an affordable, simple to use, natural adjuvant therapy [14].

Data from a previous study performed by Villegas, *et al.* (2009) also showed a beneficial effect of calcium and magnesium intake in T₂DM patients. Grain fiber-rich in calcium and magnesium reduced the diabetes risk by almost 20% [15].

Rodriguez-Moran, *et al.* (2003) stated the benefits of oral magnesium supplementation as an adjuvant therapy to minimize the fasting glucose, HbA1c, and HOMA-IR index in T₂DM patients [16].

Conclusion

Based on several studies reviewed it was observed that promoting consumption of whole grains, nuts, and green leafy vegetables rich in magnesium, plays an important role in preventing T₂DM, as a cost-effective alternative. Healthcare providers (doctor, registered dietitian, pharmacist, etc.) may talk about the health benefits of dietary Magnesium supplementation with the community. Recommendation of dietary magnesium should be done immediately after diagnosing their patients, to reduce the complications of T₂DM.

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