

Low Serum Magnesium Level is one of the contributing factor in development of Type-I Diabetes Mellitus

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Abstract: Magnesium deficiency has been proposed as a novel factor implicated in the pathogenesis of diabetic complications. Hypomagnesaemia can be both a consequence and a cause of diabetic complications. The aim of our study was to know the relationship between serum magnesium levels in type-I diabetes mellitus as compared to the control subjects Eighty (80) cases from which 40 cases of type-I diabetic patients and 40 non diabetic patients were taken as controls. All the patients were evaluated in detail and serum magnesium levels were estimated using Atomic Absorption spectrophotometer. The mean serum Magnesium levels were decreased in type-I diabetes as compared to the control subjects. There was significant reduction in serum magnesium levels in type-I diabetics compared to the controls. So hypomagnesaemia and uncontrolled glycemic index one of the risk factor for development of retinopathy.

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1. Introduction

The chronic hyperglycemia that results may eventually lead to dysfunction, especially the heart, kidneys, blood vessels, nerves and eyes (1). The prevalence of diabetes is on the rise. Besides multiplying the risks of coronary heart disease, diabetes enhances the incidence of cerebrovascular strokes. Moreover it is the leading cause of acquired blindness and accounts for over 25% of cases with end stage renal failure as well as 50% of non-traumatic lower limb amputations. Hypomagnesemia is a common feature in patients with type-I diabetes. Magnesium is a necessary cofactor for several enzymes that play an important role in glucose metabolism. Some short-term metabolic studies suggest that magnesium supplementation has a beneficial effect on insulin action and glucose metabolism (2). Hypomagnesaemia has long been known to be associated with diabetes mellitus. In diabetics there is a direct relationship between serum magnesium level and cellular glucose disposal that is independent of insulin secretion. This change in glucose disposal has been shown to be related to increased sensitivity of the tissues to insulin in the presence of adequate magnesium levels (3). Magnesium deficiency has been found to be associated with diabetic micro vascular disease. Low serum magnesium level correlated positively with the velocity of regaining basal vascular tone after hyperaemia. Hypomagnesaemia has been demonstrated in patients with diabetic retinopathy, with lower magnesium levels predicting a greater risk

of severe diabetic retinopathy (4). Magnesium deficiency has been found to be associated with diabetic micro vascular disease. Low serum magnesium level correlated positively with the velocity of regaining basal vascular tone after hyperaemia. Hypomagnesaemia has been demonstrated in patients with diabetic retinopathy, with lower magnesium levels predicting a greater risk of severe diabetic retinopathy (5) Magnesium depletion has been associated with multiple cardiovascular implications: arrhythmogenesis, vasospasm, and hypertension and platelet activity.(6)

In this study evaluation of serum magnesium was carried out in patients of type-I diabetes and a correlation of these values with the Controls.

2. Materials and Methods

Sample collection: Forty patients of type-I diabetes admitted or visited to Liaquat University Hospital were included in the study and also 40 non diabetic patients visited due to other problems without diabetes during the same period were included under the control group. Five (5) ml of blood collected from each patient included in study by venipuncture using plastic disposable syringes under aseptic measures. **Analytic method** Serum magnesium level was analyzed by polarized Zeeman atomic absorption spectrophotometer HLA-4S hollow cathode lamp Hitachi series no.2000 magnesium kit by Hitachi at 285.2nm wavelength.

Principle: Magnesium is determined by AAS after diluting the specimen 1:50 with a standard solution of lanthanum hydrochloride to eliminate

interference from anions including phosphate and protein and metal oxides. The dilution also reduces viscosity ensuring that absorption rate for aqueous calibrators and specimens are comparable. The specimen is aspirated into an air acetylene flame in which the ground state magnesium ions absorb light from a magnesium hollow lamp (285.2nm). Absorption at 285.2 nm is directly proportional to the ground state magnesium atoms in the flame (7). The statistical software SPSS version 16 were used for data analysis, student t-test and Chi-square test were used to find out the significant proportions of serum magnesium and levels between patients and controls. Microsoft word and excel have been used to generate the graphs and tables etc.

3. Results and Discussion:

The present study was carried out on 80 subjects. The cases were divided into two groups, 40 were normal persons which is control group 40 cases of Type I Diabetes Mellitus. The present study analyses the correlation between serum magnesium levels in type-1 diabetes these results were compared with the controls.

Table No: 1 Serum magnesium levels in type-I Diabetes

Magnesium levels	Type-I Diabetes	Controls
Mean± SD	1.93±1.06	2.11±1.13

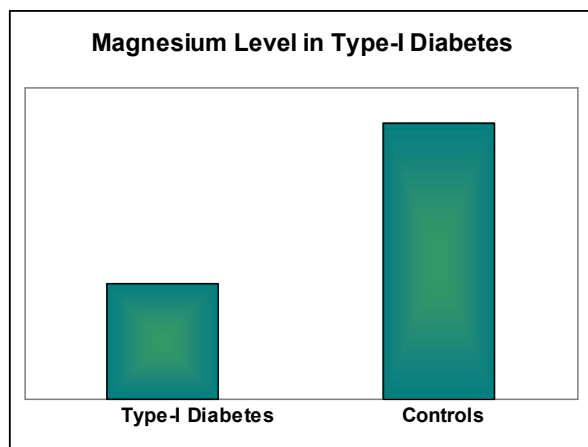


Figure No: 1 Serum magnesium levels in type-I Diabetes as compared to the controls

This current study significantly shows that serum magnesium level decrease in diabetic and more decrease in diabetic retinopathy. Our findings correlate with the study done by: Ishrat kareem et. al. (2004), have shown the presence of hypomagnesemia in diabetic retinopathy (8) Zélia Maria da Silva

Corréal et al (2003), also have shown that low magnesium level is one of the risk factor of diabetic retinopathy.(10) Cristiane Hermes Sales et al (2006) have shown that low magnesium level cause the macro vascular and micro vascular complication in diabetes. (11) The exact cause of hypomagnesaemia in diabetes mellitus is not known. Poor dietary intake, impaired absorption of magnesium, increased urinary loss due to hyperglycemia and osmotic diuresis may be the contributory factors. Magnesium is necessary for several enzymes that play an important role in glucose metabolism. (9) Not only has hypomagnesaemia been associated with diabetes, but also numerous studies have reported an inverse relationship between serum Mg levels (12-16) Although many authors have suggested that diabetes may induce hypomagnesemia, others have reported that higher Mg intake may confer a lower risk for diabetes (17, 18). Hence change in magnesium states with respect to improvement or worsening of diabetic state in the long run was not studied. This study focuses on evaluate magnesium levels in type-I diabetics at a given point but not on therapeutically correcting hypomagnesaemia in the future course of the disease and its outcome.

4. Conclusion

Serum magnesium levels were lower in type-I diabetic patients as compared to controls. Hypomagnesemia is a factor in type-I diabetes mellitus patients leading to various complications.

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