Serum Magnesium Levels in Type-I and Type-II Diabetes

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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 magnesium levels in type-I and type-II diabetes as compared to the control subjects, 40 cases of type-I and 40 cases of type-II diabetes mellitus were taken for the study after satisfying the inclusion and exclusion criteria 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 both type of diabetes as compared to the control subjects. There was significant reduction in serum magnesium levels in type-I and type-II diabetics compared to the controls. So hypomagnesaemia and uncontrolled glycemic index one of the risk factor for development of retinopathy.

Keywords
Magnesium, Type- I and Type-II Diabetes, Atomic Absorption Spectrometer.

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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 and II diabetes. Although diabetes can induce hypomagnesaemia, magnesium deficiency has also been proposed as a risk factor for type-II 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 hyperemia. Hypomagnesaemia has been demonstrated in patients with diabetic retinopathy, with lower serum 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 hyperemia. Hypomagnesaemia has been demonstrated in patients with diabetic retinopathy, with lower serum 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 and type-II diabetes and a correlation of these values with the Controls.

Materials and Methods
Sample collection
Forty patients of type-I and forty patients of type- II diabetes admitted or visited to Liaquat University Hospital were included in the study. Also 40 non diabetic patients admitted 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.

Results and discussion
The present study were divided into two groups, 40 were normal persons which is control group 40 cases of Type I Diabetes Mellitus, 40 cases of Type II Diabetes. The present study analyses the correlation between serum magnesium levels in type-I and type -II diabetes these results were compared with the controls.

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

<table>
<thead>
<tr>
<th>Serum Magnesium</th>
<th>Type-I Diabetes</th>
<th>Type-II Diabetes</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean± SD</td>
<td>1.93±1.06</td>
<td>1.83±0.25</td>
<td>2.11±1.13</td>
</tr>
</tbody>
</table>

There is significant difference between levels of serum magnesium levels among type-I and type-II diabetics and controls. The results show that there is significant decline in serum magnesium in diabetic patients as compared to the controls that indicate hypomagnesaemia is one of predisposing risk factor for development of retinopathy.
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) and Phoung-chi T et al (2007), have shown that hypomagnesaemia occur in diabetes espically type II (9)Zélia Maria da Silva Corrêa1 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 absorpti

Conclusion
Serum magnesium levels were lower in type-I and type-II diabetic patients as compared to controls.

Hypomagnesemia is a factor in type-I and type-II diabetes mellitus patients leading to various complications.

Authors’ Statements
The authors declare no conflict of interest.

References