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Magnesium's Impact on Insulin Resistance and Glycemic Control in Type 2 Diabetes

Abstract:

The escalating global health burden of Type 2 diabetes mellitus (T2DM) underscores the importance of understanding contributing factors and effective management strategies. Given the established crucial role of magnesium (Mg) in various physiological processes and the observed prevalence of hypomagnesemia in T2DM patients, a study was conducted involving 300 individuals with diabetes and 100 non-diabetic controls aged 31 to 55 years. This research aimed to ascertain the occurrence of low magnesium levels in T2DM and explore its relationship with both blood sugar control and the development of complications within rural and urban populations. Fasting blood glucose, post-prandial blood glucose, and magnesium levels were measured using an automated analyzer, while HbA1c was assessed via a Bio-Rad D10. Insulin levels were determined using chemiluminescence, and insulin resistance was estimated using the HOMA-IR index. The findings revealed significantly lower magnesium levels in the diabetic group (1.34 ± 0.29) compared to the control group (2.17 ± 1.87 , $p < 0.0001$).

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Furthermore, within the diabetic cohort, those with hypomagnesemia exhibited significantly higher levels of fasting blood glucose (267.67 ± 89.78 mg/dL vs. 167.87 ± 76.87 mg/dL, $p < 0.0001$), post-prandial blood glucose (376.87 ± 112.87 mg/dL vs. 287.90 ± 99.98 mg/dL, $p < 0.0001$), HbA1c (9.54 ± 2.6 % vs. 7.23 ± 1.8 %, $p < 0.0001$), Insulin (17.21 ± 8.98 IU/mL vs. 14.87 ± 5.98 IU/mL, $p = 0.039$), and HOMA-IR (7.32 ± 3.67 vs. 6.13 ± 0.99 , $p = 0.012$) compared to those with normal magnesium levels. Correlation analysis demonstrated a significant negative association between magnesium levels and fasting blood glucose ($r = -0.465$; $p < 0.0001$), post-prandial blood glucose ($r = -0.596$; $p < 0.0001$), HbA1c ($r = -0.765$; $p < 0.0001$), insulin ($r = -0.454$; $p < 0.0001$), and HOMA-IR ($r = -0.325$; $p < 0.0001$). In conclusion, this study underscores the importance of monitoring serum magnesium levels in individuals with T2DM as a crucial step towards managing hypomagnesemia, potentially reducing the risk of associated complications, and ultimately improving patient care.

Keywords: Hypomagnesemia, T2DM, Glycemic Control, HOMA-IR, Glucose Metabolism

Biography:

My academic foundation rests upon an MBBS from Subharti Medical College, Meerut, and an MD in Biochemistry from Uttar Pradesh University of Medical Sciences, Saifai, Etawah. My dedication to research is reflected in my publications across esteemed national and international journals. My expertise extends beyond core biochemistry, encompassing certifications in Diabetes mellitus (CCEBDM) and Hypertension (CCPMH) from the Public Health Foundation of India, New Delhi. A pivotal Experimental Biotechnology course from NPTEL has further enriched my scientific perspective.