



Association of Serum Magnesium with Gestational Diabetes Mellitus Indices

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KEYWORDS:

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ABSTRACT:

Introduction: Gestational diabetes mellitus (GDM) and presentational diabetes mellitus (PGDM) are serious health issues that have an impact on mother and new born outcomes. Metabolic abnormalities, including possible disruptions in vital minerals like magnesium, are more common in moms with diabetes. In order to shed light on the nutritional effects of maternal diabetes.

Objectives: This study compares serum magnesium levels and their correlation with GDM indices in pregnant women.

Methods: A cross-sectional study was carried out in the department of Obstetrics and Gynecology, Bangalore, India from February 2023 to March 2025. A total of 180 pregnant women, were 120 pregnant women with gestational diabetes mellitus and 60 age and gender matched healthy pregnant women considered as controls. Biochemical and magnesium levels in the serum were assessed. The Pearson correlation test was used to determine the relationship between magnesium and GDM indices.

Results: According to the study, GDM pregnant women had greater rates of hypomagnesaemia than normal pregnant women respectively P value is 0.001**. Serum magnesium levels were substantially less associated in GDM indices (P=0.001**).

Conclusions: The hypomagnesaemia significantly associated with pregnant women with GDM than normal pregnant women. Monitoring of serum magnesium in pregnant women might useful for to prevent in GDM pregnant women and complications.

1. Introduction

Gestational Diabetes Mellitus (GDM) and pregestational diabetes mellitus (PGDM) are serious health issues. These disorders have significant effects on the newborn in addition to the health of the mother (1-2). The significance of micronutrients like calcium and magnesium, which are essential for numerous physiological processes like neuromuscular activity, bone growth, and enzyme reactions, is one of the main topics of focus in neonatal health (3-4). Magnesium insufficiency has been connected to a number of metabolic diseases, and it is important to look into the condition of GDM (5). Magnesium is essential for fetal growth, bone construction and cardiovascular health, while magnesium is needed for enzyme activity and

neuromuscular modulation (6). Hypomagnesaemia is defined as serum magnesium levels below 0.65 mmol/L. If both deficits are present in babies, they may result in problems like cardiovascular problems, seizures, and neuromuscular irritability in future (7-8).

Pregnancy-related diabetes affects both the mother's and the fetus's metabolism, which may have an impact on the fetus's ability to get vital nutrients like calcium and magnesium. In GDM, insulin resistance causes blood glucose levels to rise during pregnancy, but in PGDM, the mother had diabetes prior to becoming pregnant (9-10). Both types of diabetes can affect a baby's nutritional condition and cause imbalances in essential minerals. Magnesium and calcium deficits could have major consequences, such as an increased risk of neurological



and metabolic abnormalities in babies, because these minerals are essential for fetal development (11-12). However, little is known about the precise connection between maternal diabetes and neonates' serum calcium and magnesium levels. By emphasizing the need for improved prenatal care and micronutrient monitoring to lower neonatal problems, examining these associations may offer important insights into enhancing maternal and neonatal healthcare in areas where diabetes is common. This study assed to determine serum magnesium for gestational diabetes mellitus indices.

2. Objectives

This study compares serum magnesium levels and their correlation with GDM indices in pregnant women.

3. Methods

A cross-sectional study was carried out in the department of Obstetrics and Gynecology, Bangalore, India from February 2023 to March 2025. The out patients of department of Obstetrics and Gynecology, Akash Institute of Medical Sciences and Research around 180 pregnant women, were 120 pregnant women with gestational diabetes mellitus (60 pregnant women weeks 24-29 considered as group 2 and 60 pregnant women weeks 28-34 considered as group 2) and 60 age and gender matched healthy pregnant women considered as controls (group 1) according to inclusion and exclusion criteria.

Inclusion criteria: All pregnant women in the age group of 18–38 years, permanent residents of the city in 24–34 weeks of gestation, who underwent GDM screening according to american diabetic association (ADA) 2023 criteria (13), were included in the study. The controls were age and BMI matched with cases for ± 2 years.

Exclusion criteria: The women have history of preexisting medical condition such as T1DM and T2DM, preeclampsia, hypertension, polycystic ovary syndrome, and women on treatment with drugs such as metformin, antihypertensives, and antidepressants were excluded from the study.

5 mL of fasting blood sample were collected from all the included subjects, 1 mL transferred into fluoride tube, 1 mL transferred into EDTA tube and remaining 3 mL transferred into plain tube and separated by centrifugation. The separated samples immediately sent

to biochemistry laboratory and measured biochemical and serum magnesium parameters.

Statistical Analysis

The mean and standard deviation of study variables were calculated and compared using an independent analysis of variance. The association between the serum levels of magnesium and GDM indices was also examined using the Pearson correlation test. Every statistical test was deemed significant when the p-value was less than 0.05. Statistical analysis done by using SPSS (Statistical Package for Social Science) for Windows, version 20.

3. Results

Table 1: Comparison of Anthropometric, Demographic and Biochemical measurement between the study subjects

Table 1 illustrates the comparison of anthropometric, demographic and biochemical measurement between the study subjects. The age, weeks of gestation, BMI were significant between the study subjects ($P=0.001^{**}$). The FBS, PPBS, HbA1c, and dyslipidemia significant and drastically increased in both groups of GDM cases than normal pregnant women ($P=0.001^{**}$). The serum magnesium significant and drastically decreased in both groups of GDM when compared to controls ($P=0.001^{**}$).

Table 2: Correlation of serum magnesium and other parameters of the study

Table 2 demonstrates the correlation of serum magnesium with other study variables in study subjects. There was significant and negative correlation with weeks of gestation, BMI. Blood sugars, HbA1c, total cholesterol, triglyceride's, VLDL, LDL and positively correlated with HDL ($P=0.001^{**}$).

Figure 1: Serum Glycated hemoglobin and magnesium levels between GDM cases and controls

Figure 1 shows the box plots for glycated hemoglobin and serum magnesium levels between the study subjects. There were a significant and increased levels of glycated hemoglobin n both groups of GDM cases than controls. Additionally, serum magnesium levels significant and drastically reduced in both groups of GDM cases than controls.



4. Discussion

GDM pregnant women shown significant and drastically decreased serum magnesium and calcium levels compared to normal pregnant women. One of the main conclusions of our research was that GDM pregnant women had considerably greater levels of hypomagnesaemia (73.8%) than normal pregnant women (26.2%). The maternal glycosuria brought on by inadequate glycemic management and serum Mg²⁺ insufficiency causes fetal magnesium insufficiency. This suggests that mothers' long-term diabetes, which can impact placental function and fetal nutrition transfer, may be the cause of the greater risk of hypomagnesaemia in the GDM group (14-16).

Overall, our study's substantial correlation between GDM and hypomagnesaemia highlights the significance of closely monitoring serum magnesium levels in gestational diabetic pregnant women and normal pregnant women. Magnesium is essential for preserving calcium homeostasis, hypomagnesaemia has been demonstrated to affect calcium metabolism. Hypocalcemia can result from a magnesium deficit that hinders the release of parathyroid hormone (PTH), which is crucial for controlling calcium levels (17-18). This biochemical relationship is further supported in our work by the co-occurrence of hypocalcemia and hypomagnesaemia in GDM cases (19). This aligns with research that highlights the role of magnesium in insulin regulation and glucose metabolism. Based study findings decreased serum magnesium pregnant women leads to diabetic complications.

5. Conclusion

The difficulties of managing diabetes during pregnancy is shown by the higher frequency of hypomagnesaemia in the GDM than normal pregnant women. These results imply that in order to maximize newborn outcomes, customized therapies based on the type of maternal diabetes are required.

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Table 1: Comparison of Anthropometric, Demographic and Biochemical measurement between the study subjects

Parameters	Controls		GDM 1		GDM 2		P-value
	Mean ± SD		Mean ± SD		Mean ± SD		
Age (Years)	27.98 ± 2.05		25.70 ± 2.02		27.40 ± 2.08		0.001**
Weeks of Gestation (Years)	23.82 ± 1.65		27.05 ± 1.43		32.67 ± 1.72		0.001**
BMI (kg/m ²)	22.54 ± 1.94		22.21 ± 2.10		32.93 ± 3.06		0.001**
FBS (mg/dL)	85.05 ± 8.45		131.53 ± 1.98		155.35 ± 1.43		0.001**



PPBS (mg/ dL)	27 7. 85	± 4 8. 9	27 7. 25	± 4 8. 3	28 4. 18	± 5 3. 2	0.0 01 **
HbA 1C (%)	5. 20	± 0. 6 3	6. 78	± 0. 5 2	8. 20	± 1. 0 6	0.0 01 **
Total Chol ester ol (mg/ dL)	16 1. 85	± 1 3. 9	17 4. 07	± 1 0. 7	27 4. 18	± 1 9. 3	0.0 01 **
Triac ylgly cerid es (mg/ dL)	11 6. 05	± 1 6. 8	13 3. 98	± 1 5. 4	19 8. 07	± 2 0. 5	0.0 01 **
HDL (mg/ dL)	48 .0 7	± 4. 9 0	37 .2 5	± 4. 2 1	31 .0 6	± 3. 2 5	0.0 01 **

VLD L (mg/ dL)	24 .5 1	± 3. 1 5	25 .9 7	± 4. 0 6	41 .3 2	± 4. 0 2	0.0 01 **
LDL (mg/ dL)	88 .1 6	± 1 0. 1	11 0. 13	± 1 0. 7	20 6. 25	± 1 6. 1	0.0 01 **
Seru m Magn esium (mg/ dL)	2. 60	± 0. 1 3	1. 71	± 0. 5 2	0. 95	± 0. 1 9	0.0 01 **

Table 2: Correlation of serum magnesium and other parameters of the study

Serum Magnesium (mg/dL)		
Parameters	r- Value	P-Value
Weeks of Gestation	-0.853	0.001**
BMI (kg/m ²)	-0.711	0.001**
FBS (mg/dL)	-0.904	0.001**
PPBS (mg/dL)	-0.053	0.001**



HbA1C (%)	-0.843	0.001**
Total Cholesterol (mg/dL)	-0.817	0.001**
Triacylglycerides (mg/dL)	-0.806	0.001**
HDL (mg/dL)	0.810	0.001**
VLDL (mg/dL)	-0.742	0.001**
LDL (mg/dL)	-0.858	0.001**

Figure 1: Serum Glycated hemoglobin and magnesium levels between GDM cases and controls

