

## SERUM MAGNESIUM LEVEL IN GESTATIONAL DIABETES MELLITUS IN A TERTIARY CARE HOSPITAL OF BANGLADESH

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### ABSTRACT

Gestational diabetes mellitus (GDM) is characterized by glucose intolerance during pregnancy. GDM is associated with an increased incidence of congenital abnormalities usually aggravated by maternal magnesium deficiency. Magnesium is one of the essential trace elements for normal embryogenesis and foetal growth and its deficiency increases mortality and morbidity rate of mothers, embryos and neonates. The present study was undertaken to evaluate the association of serum magnesium with GDM in second and third trimester of pregnancy. This case-control study was conducted in Mymensingh Medical College Hospital during the period from July 2013 to June 2014 to evaluate the association of serum magnesium with GDM in Bangladeshi women. A total of 172 subjects were recruited in this study; among them eighty six women with GDM were selected as case (Group-I) and eighty six healthy pregnant women were taken as control (Group-II). The cases again were subdivided as Group Ia and Ib at second and third trimester respectively. Controls also were subdivided as Group IIa and IIb at second and third trimester respectively. Student's unpaired 't' test was used to compare the data between groups. For analytical purpose 95% confidence limit ( $p < 0.05$ ) was taken as level of significance. Serum magnesium level was significantly decreased in cases compared to that of controls. It was significantly lowered ( $p < 0.001$ ) in cases Gr-Ia ( $1.3884 \pm 0.255$  mg/dl) than controls Gr-IIa ( $1.6651 \pm 0.304$  mg/dl) at second trimester. The result was also significantly ( $p < 0.001$ ) lowered when compared between cases Gr-Ib ( $0.9349 \pm 0.145$  mg/dl) and controls Gr-IIb ( $1.6674 \pm 0.308$  mg/dl) at third trimester. The study shows that serum magnesium level is decreased in pregnancy with GDM. So estimation of serum magnesium level may be done in every GDM cases to reduce the incidence of magnesium related complications by timely intervention.

**Key Words:** Diabetes Mellitus, GDM, Magnesium

### Introduction

Gestational diabetes mellitus is defined as carbohydrate intolerance resulting in hyperglycemia with first onset or detection during pregnancy<sup>1,2</sup>. Approximately 1-14 % of all pregnancies are complicated by GDM<sup>3</sup>. The incidence of GDM in Bangladesh is 6.7%

among all Bangladeshi pregnant mothers<sup>4</sup>. Frequency of congenital malformation in infants of diabetic mothers is estimated to be 6-10%<sup>5</sup>. Gestational diabetes is associated with excessive nutrient losses due to glycosuria<sup>6</sup>. Different researchers demonstrated that micro- and macro-

nutrients are essential for the development of fetus<sup>7</sup>. Magnesium is the fourth most abundant cation in human body, which is related to the carbohydrate and fat metabolism<sup>8</sup>. Magnesium plays important role in obstetrics with its relationship to both fetal and maternal wellbeing. Magnesium is one of the important minerals which is required for cell multiplication in a growing fetus and is an essential element of life chemistry in keeping a balanced neuromuscular system<sup>9</sup>. The low concentration of magnesium in serum exposes the subject to a risk of pregnancy complications - hypertension, preeclampsia, IUGR (Intra uterine growth retardation), preterm labour, low birth weight baby and SIDS (sudden infant death syndrome)<sup>10</sup>. The reason for reduction of magnesium concentration is not clear. An increase in the renal clearance during pregnancy may contribute to the reduction in serum magnesium concentration in GDM, since the kidney is the main regulator of the body magnesium concentration<sup>11</sup>. Pregnant women tend to have low magnesium level than non pregnant because of increased demand for mother and growing fetus and increase renal excretion of magnesium which is about 25% more than nonpregnant women due to increased GFR in second and third trimester<sup>12</sup>. The magnesium deficiency in pregnancy leads to life threatening complications for mother as well as their babies that can be prevented by timely detection and proper management of magnesium deficiency. Pregnant women generally have lower plasma magnesium levels compared to nonpregnant women. Bardicef *et al.* found that women with GDM have lower levels of plasma magnesium<sup>13</sup>.

### Materials and Methods

This case-control study was carried out from July 2013 to June 2014 in the Department of Biochemistry, Mymensingh Medical College. A

total of 172 subjects were selected by purposive sampling technique from the Outpatient Department of Obstetrics and Gynaecology as well as from Department of Endocrinology, Mymensingh Medical College Hospital. Clinically diagnosed GDM (n=86) was in the case group and it was done on the basis of OGTT by WHO criteria 2013. The case group was subgrouped into Gr-Ia (43) and Gr-Ib (43) at second and third trimesters respectively. The normoglycemic pregnant women at second and third trimesters were taken as control group (n=86) and subgrouped as Gr-IIa (n=43) and Gr-IIb (n=43) at second and third trimester respectively. Pregnant women with previous history of diabetes, hypertension, and other endocrine disorders were excluded from this study. The study protocol was approved by the institutional review committee. Data was collected through a preformed data collection sheet (questionnaire). The variables were age, education, occupation, socioeconomic status, residential address, dietary habit, height, weight, family history of diabetes, previous pregnancy history, and previous history of gestational diabetes mellitus. Written informed consent was obtained from all the participants of the study groups prior to their enrollment into this study. Blood samples taken from pregnant women during OGTT were used for this study. Serum glucose was determined by enzymatic method with GOD-PAP, serum magnesium was determined by colorimetric method using the test kit. The results were analysed statistically and values were expressed as mean ( $\pm$ SD). Student's 't' test was done to see the level of significance.  $p < 0.05$  was considered significant.

### Result

This study showed that the mean ( $\pm$ SD) of age (in years) of cases and controls were  $28.6 \pm 3.23$  and  $27.3 \pm 3.13$  respectively which showed no significant difference ( $p = 0.778$ ). BMI between cases and controls also showed no significant differences. The mean ( $\pm$ SD) of serum magnesium (mg/dl) were  $1.162 \pm 0.3.7$  and  $1.666 \pm 0.3.4$  in

cases and controls respectively which showed that cases have low level of serum magnesium ( $p < 0.001$ ). Significantly decreased mean serum magnesium level was also found in Gr Ia than that of Gr IIa ( $1.3884 \pm 0.255$  mg/dl vs  $1.665 \pm 0.304$  mg/dl;  $p < 0.001$ ). Same significant difference was noted between GIb and GIIb ( $0.9349 \pm 0.145$  mg/dl vs  $1.667 \pm 0.308$  mg/dl;  $p < 0.001$ ).

**Table-I:** Clinical and Biochemical Characteristics (Mean $\pm$ SD) of the study subjects.

Variables	Cases	Controls	P value
Age	28.6 $\pm$ 3.23	27.3 $\pm$ 3.13	0.778
BMI	26.4 $\pm$ 1.49	26.3 $\pm$ 1.27	0.774
Magnesium (mg/dl)	1.162 $\pm$ 0.307	1.666 $\pm$ 0.304	0.001

*Student's t test was done to see the level of significance.  $p < 0.05$  was considered significant.*

**Table-II:** Comparison of serum magnesium levels (Mean $\pm$ SD) among different subgroups.

Variables	Group	Trimester	Serum Magnesium (mg/dl)	P value
GDM	Case (Gr-Ia)	Second trimester	1.3884 $\pm$ 0.255	0.001
Normal pregnancy	Control (Gr- IIa)	Second trimester	1.665 $\pm$ 0.304	
GDM	Case(Gr- Ib)	Third trimester	0.9349 $\pm$ 0.145	0.001
Normal pregnancy	Control (Gr-IIb)	Third trimester	1.6674 $\pm$ 0.308	

*Student's t test was done to see the level of significance.  $p < 0.05$  was considered significant.*

## Discussion

In this study, we estimated serum magnesium levels in GDM subjects (cases) and healthy pregnant women (controls). Serum magnesium concentration of the GDM patients was significantly ( $P < 0.001$ ) lower when compared with that of control. Our study findings is supported by the studies of Bardicef *et al.*<sup>13</sup>, Takaya *et al.*<sup>12</sup> and Yinsong Wang *et al.*<sup>14</sup>. They explained that the decrease in serum magnesium might be due to magnesium depletion caused by

osmotic diuresis and by indirect hormonal effects. The low serum magnesium levels seen in the diabetic population may be a consequence of insulin resistance and dietary magnesium intake. Intestinal hypo absorption may also be a factor for the low serum magnesium levels. In contrast Tasdemir *et al.*<sup>15</sup> found that there is no statistically significant difference in serum magnesium concentrations between healthy pregnant women and pregnant women with GDM.

In conclusion, significant alteration in serum magnesium level was observed in GDM patients. Therefore it might be recommended that estimation of this biochemical parameter in GDM patients should be carried out for earlier detection and management of the complications of GDM due to depletion of serum magnesium.

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