

# Influences of One Elevated Glucose Tolerance Test Value on Pregnancy Outcome

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## Abstract

**Introduction:** Patients with abnormal glucose challenge test (GCT) and normal oral glucose tolerance test (OGTT) are also at increased risk for complications, such as macrosomia and pre-eclampsia.

**Objective:** To evaluate the clinical outcomes of pregnancies with one elevated glucose tolerance test value.

**Methods:** In an observational study conducted over duration of 2 years between June 1, 2003 to June 30, 2005, in women with abnormal GCT and normal or one elevated OGTT value and the outcome of pregnancy.

**Results:** Pregnancies with one elevated OGTT value exhibited adverse maternal and perinatal outcomes. These findings suggest that minimal alterations in maternal carbohydrate metabolism may have a significant impact on the fetus and the patients with minimal alterations also require strict glycemic control to decrease the frequency of abnormal outcomes.

## INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as glucose intolerance of variable severity with onset or first recognition during pregnancy. Gestational diabetes mellitus (GDM) is present in 0.6–15% of pregnant women. Prompt identification and treatment of these women is important for both mother and infant health. Therefore, screening for diabetes mellitus is performed during pregnancy. As the incidence of Diabetes Mellitus is high among the Asians, universal screening is undertaken during pregnancies<sup>2, 3</sup>. Diagnosis of GDM is based on National Diabetes Data Group (NDDG) criteria that any two of the four threshold values in a GTT should be abnormal.

But, various studies have been shown that even one abnormal GTT value is associated with adverse maternal and perinatal outcome such as: macrosomia, congenital abnormalities, pre-eclampsia, operative deliveries and adverse fetal outcome like hyperbilirubinemia, hypoglycemia, RDS and perinatal mortality<sup>4, 5, 6, 7</sup>.

In this study that we have attempted to determine the pregnancy outcomes of those patients with a single elevated 100g OGTT and also to ascertain which one of the elevated

four test value is related to adverse pregnancy outcome.

## MATERIALS AND METHODS

In an observational study conducted over duration of 2 years between June 1, 2003 to June 30, 2005, we performed a 50gms glucose challenge test in 2094 pregnant women at 24–28 weeks of gestation. Women with plasma glucose level of  $\geq 140$ mg/dl subsequently underwent 100g of oral glucose tolerance test (OGTT). Known cases of diabetes mellitus and women with two or more abnormal values of OGTT were excluded from the study. Women with one elevated OGTT value were divided into 4 groups, NE – all four normal OGTT values, Group I – with 1<sup>st</sup> hour value of OGTT elevated, Group II with the 2<sup>nd</sup> hour value of OGTT elevated and Group III with the 3<sup>rd</sup> hour elevated OGTT value. The maternal records were reviewed for the incidence of pre-eclampsia, cesarean delivery due to CPD, failure to progress or fetal distress. Also the neonatal records were reviewed for incidence of (SGA) small for gestational age, and large for gestational age babies, low APGAR scores hypoglycemia, respiratory distress syndrome and perinatal death and the incidence was comparatively analyzed between the NE group and Group I, II and III.

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Criteria for pre-eclampsia were defined as the presence of hypertension and proteinuria with or without edema. SGA was defined as birth weight < 10<sup>th</sup> percentile of gestational age weight. LGA was defined as birth weight > 90<sup>th</sup> percentile. The presence of neonatal hypoglycemia was defined as <35mg/dl glucose in venous blood. The criteria for diagnosing RDS was based on the presence of manifestations occurring within several hours of birth such as tachypnoea, grunting, intercostal retractions, nasal flaring or cyanosis, reticular granularity or air bronchograms on chest x-ray and ABG analysis were included. Poor maternal outcome was defined as the presence of pre-eclampsia or when a cesarean delivery was performed for CPD, failure to progress fetal distress.

Poor neonatal outcome was defined as a presence of any one of the following like APGAR <7 at 5min, hypoglycemia, RDS, SGA and perinatal death.

Maternal and neonatal outcomes were compared between the NE group and Group I, II and III. Using Statistical Package for Social Sciences (SPSS) Software under Windows 98 all data was entered and results were computed using Chi square test.

### RESULTS

We performed a 50 g glucose challenge test (GCT) in 2,094 pregnant women at 24-28 weeks of gestation. In 304 (13.8%) with plasma glucose level of more than 140mg/dl, a 100gms of oral glucose tolerance test was performed. Of the 304 women who underwent OGTT, 15 patients were lost during follow up, and 68 were excluded because of GDM, hence the study cohort had 221 women. Of the 221 women with abnormal GCT, 148 (67%) had all four normal OGTT values and 73 (33%) had only one OGTT value elevated. Table I shows distribution of 221 women according to age, gravidity and BMI.

#### Figure 1

Table 1: Demographic obstetrical characteristics.

Characteristics	NE n = 148	Group I n = 44	Group II n = 19	Group III n = 10
Age (years)	27.8 ± 4.2	27.7 ± 4.0	27.5 ± 4.9	29.0 ± 6.8
Gravida	2.6 ± 1.4	2.7 ± 1.5	2.6 ± 1.72	2.8 ± 1.64
BMI (Kg/m <sup>2</sup> )	23.2 ± 2.4	22.8 ± 2.6	23.9 ± 2.6	22.6 ± 3.0

There were no significant differences in the age, gravida, and BMI among all the four groups. Incidence of pre-eclampsia (11.4%) and cesarean section (36.4%) were observed to be high in Group I. Thus the poor maternal outcome was observed in 47.8% of the Group I, 11.5% in NE Group, 10.6% in Group II and 10% in Group III. Group I

when compared with the other three groups, the p value was <0.001 which was statistically significant in terms of poor maternal outcome (Table II).

#### Figure 2

Table 2: Maternal outcomes.

Maternal outcome	NE n = 148	Group I* n = 44	Group II n = 19	Group III n = 10
Pre-eclampsia	9 (6.1%)	5 (11.4%)	1 (5.3%)	1 (10%)
Cesarean section:				
Due to CPD	4 (2.7%)	4 (9.1%)	0 (0.0)	0 (0.0)
Due to fetal distress	4 (2.7%)	12 (27.3%)	1 (5.3%)	0 (0.0)
Total	17 (11.5%)	21 (47.7%)	2 (10.6%)	1 (10%)

\* p<0.001 when compared with NE, group II and III.

Table III shows perinatal outcome among the four groups. Group I had increased incidence of preterm delivery (50%), large for gestational age (13.6%), small for gestational age (11.4%), cord blood pH<7.2 (27.3) and respiratory distress syndrome (2.3%) when compared to the other three groups. The overall poor perinatal outcome was high (41%) in Group I when compared to 4.1% in NE group and 5.3% in Group II.

Group I had a statistically significant (p<0.001) poor perinatal outcome when compared to other three groups.

#### Figure 3

Table 3: Perinatal outcomes.

Perinatal outcome	NE n = 148	Group 1* n = 44	Group 2 n = 19	Group 3 n = 10
Preterm delivery	26 (17.5%)	22 (50%)	1 (5.2%)	1 (10%)
Birth weight	2932 ± 367	3044 ± 500	2903 ± 421	2932 ± 419
LGA	6 (4.1%)	6 (13.6%)	2 (10.5%)	1 (10%)
APGAR < 5 at 1 min	0	0	0	0
Cord blood pH <7.2	4 (2.7%)	12 (27.3%)	1 (5.3%)	0
Hypoglycemia	0	0	0	0
SGA	2 (1.4%)	5 (11.4%)	0	0
RDS	0	1 (2.3%)	0	0
Perinatal death	0	0	0	0
Poor perinatal outcome	6 (4.1%)	18 (41%)	1 (5.3%)	0

\* p<0.001 when compared with NE, group II and III.

### DISCUSSION

Gestational diabetes mellitus is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy<sup>2</sup>. It can have some adverse effect on pregnant women, fetuses and newborns if there were no proper diagnosis and management<sup>8</sup>. From the study that we undertook, we were able to determine that a single elevated 100 g OGTT value especially at 1 hour after glucose intake resulted in poor maternal and perinatal outcomes which was in agreement with that of Kim et al<sup>9</sup>. Lidsay et al<sup>10</sup> reported higher incidence of pre-eclampsia (7.9%) compared with normal patients of (3.3%). In this study, it has been noted that there was an increased

incidence of poor maternal outcome in Group I when compared to the other three groups and this was statistically significant.

It has been reported that there is an increased incidence of fetal macrosomia in these women when compared to normal pregnancies<sup>11, 12</sup>. It was observed in this study that LGA was observed in groups I, II and III when compared to all four normal values but, this was not statistically significant.

Poor maternal outcomes (NE group, Group I, Group II, Group III: 11.5%, 47.8%, 10.6%, 10%) with pre-eclampsia, cesarean delivery for cephalopelvic disproportion, failure to progress, or fetal distress, was highest in Group I,<sup>4, 13, 14</sup>

When there is only one elevated OGTT value according to NDDG criteria and if patient is not treated, the incidence of neonatal hypoglycemia, hyperbilirubinemia and erythroblastosis in increased resulting in poor perinatal outcome when compared with normal patients,<sup>15, 16, 17, 18</sup>

In our study, the poor perinatal outcome was observed more in the Group I (one elevated value of OGTT at 1 hour after glucose intake). Though poor perinatal outcome was not observed in Group II and Group III (i.e. the one elevated value at 2 hour and 3 hour respectively after glucose intake), Group I had significantly high poor perinatal outcome.

These findings suggest that minimal alterations in maternal carbohydrate metabolism may have a significant impact on the fetus and the patients with minimal alterations also require strict glycemic control to decrease the frequency of abnormal outcomes.

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