**Plasma lipids relationship with results of Oral Glucose Challenge Test in pregnancy**

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**Abstract**

**Objective:** This study aimed to evaluate the correlation between plasma lipid levels at first trimester of pregnancy and results of Oral Glucose Challenge Test (OGCT).

**Materials and methods:** In a cross-sectional study, two hundred eligible primigravida women without history of Diabetes Mellitus referring to Vali-e-Asr Hospital were evaluated. Plasma levels of triglyceride and cholesterol were measured at first trimester of pregnancy and Oral Glucose Challenge Test was done for all women at 24th - 28th gestational week. Pre-pregnancy BMI, and plasma levels of triglyceride and cholesterol at first trimester of pregnancy were compared with the results of OGCT. Results were analyzed using SPSS version 14. p-values ≤ 0.05 was considered statistically significant.

**Results:** In 45 (22.5%) of the women OGCT was positive. Pre pregnancy BMI and the rate of positive result for OGCT were both correlated with the plasma levels of triglyceride and cholesterol at first trimester of pregnancy.

**Conclusion:** Plasma lipid levels in first trimester can predict the result of OGCT at 24-28 weeks of pregnancy.

**Key words:** Oral Glucose Challenge Test, Plasma Triglyceride, Body Mass Index

**Introduction**

Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance with onset or first diagnosis during pregnancy. Unrecognized glucose intolerance may have antedated or begun concomitantly with the pregnancy (1). GDM complicates 1 to 14% of pregnancies, depending on the population studied (2). Clinical recognition of GDM is important because therapy, including medical nutrition therapy, insulin when necessary, and antepartum fetal surveillance, can reduce the well-described GDM associated perinatal morbidity and mortality (3, 4). Commonly identified risk factors for GDM including advanced maternal age, high parity, and family history of diabetes, overweight status and obesity have been used for screening purposes (5, 6). However, the extent to which these factors contribute to the etiology of
the disease is largely unknown. Some researchers attributed the increased risk of later developing type 2 diabetes mellitus and hypertension in women with history of GDM to their poorer profile on variables associated with insulin resistance and other features of the metabolic syndrome (7). Detailed metabolic studies were carried out to demonstrate that women with GDM have multiple defects in insulin action together with impaired compensation for insulin resistance. They revealed that defects in the regulation of glucose clearance, glucose production, and FFA concentrations, together with defects in pancreatic B- cell function, precede the development of type 2 diabetes in women with GDM. Insulin resistance and type 2 diabetes are associated with a clustering of interrelated plasma lipid and lipoprotein abnormalities, which include reduced high-density lipoprotein (HDL) cholesterol, a predominance of low- density lipoprotein (LDL) particles, and elevated triglyceride (TG) concentrations (8). This dyslipidemic profile has also been noted in pregnancies complicated by GDM in various case control studies (9-14). However, not all results from these studies were consistent.(15-17).

This study was conducted to evaluate the relationship between maternal plasma level of triglyceride and cholesterol concentrations measured in first trimester and subsequent risk of positive results of OGCT.

Materials and methods

All primigravida women aging between 20 and 35 years old with a singleton pregnancy who admitted to prenatal department of Vali-e-Asr University Hospital over the study period (2003 - 2004) were included in this cross sectional descriptive analytic study .The exceptions were women with pre-existing diabetes and those admitted to the hospital after the 13th week of gestation. The study was approved by the ethics committee of Tehran University of Medical Sciences. 210 Eligible women with obtained obstetric history, family history, height, and weight before pregnancy were checked for their plasma lipid concentrations (triglyceride and cholesterol) addition to routine prenatal laboratory workup. Gestational age was determined by ultrasound examination. Blood samples were taken in the non-fasting state as we felt it inconvenient to ask pregnant women to fast and all samples were taken in the morning within 3 hours of breakfast to minimize variability in plasma lipids. Regardless of the results of plasma lipid concentrations (triglyceride and cholesterol) all patients were made aware and were asked to return for OGCT between 24th and 28th week of gestation. Women who experienced spontaneous or induced abortion (n=2) and who moved elsewhere for prenatal care before 24- 28 weeks of gestation were excluded (n=8). Finally 200 remaining women were given a standard 50gr glucose challenge test between 24th and 28th gestational week, and venous plasma blood glucose was taken 1 hour later. The challenge was performed irrespective to fasting state. A value of plasma venous glucose of 140 mg/dl or more has been recommended as a threshold to indicate the need for a full diagnostic GTT (Glucose Tolerance Test). Diagnosis of GDM was based on the results of the 100 gram oral GTT. Data were logged into computer database and analyzed using SPSS version 14 for windows. All data presented as mean± standard deviation and minimum and maximum range. Pearson correlation was used to evaluate the relations of first trimester plasma level of lipid concentrations (triglyceride and cholesterol) and results of OGCT between 24th and 28th weeks of gestation,
and variables of interest. P-values ≤0.05 was considered statistically significant.

Results

The BMI and levels of serum lipids and results of OGCT are shown in table 1. The correlation between Pre-pregnancy BMI and first trimester plasma levels of triglyceride was positive and significant (p<0.001, r = 0.312). Pre-pregnancy BMI and plasma levels of cholesterol showed a positive relation which was significant (p< 0.05, r = 0.149). BMI and the results of OGCT had also a non significant but positive relation (r = 0.117) respectively. The relationship between first trimester plasma triglyceride level and the results of OGCT was positive and statistically significant (p<0 .05, r=0 .190). Evident correlation between the first trimester plasma level of cholesterol and results of OGCT was not seen ( NS, r =0 .043).

Table1: BMI and laboratory characteristics of studied women

<table>
<thead>
<tr>
<th></th>
<th>BMI(kg/m2)</th>
<th>OGCT (mg/dL)</th>
<th>CHOL (mg/dL)</th>
<th>TG (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean± SD</td>
<td>25.05± .27</td>
<td>128.83± 2.33</td>
<td>173.45± 2.98</td>
<td>139.54± 4.11</td>
</tr>
<tr>
<td>Minimum</td>
<td>16.41</td>
<td>48</td>
<td>68</td>
<td>47.00</td>
</tr>
<tr>
<td>Maximum</td>
<td>35.34</td>
<td>275.00</td>
<td>323.00</td>
<td>353.00</td>
</tr>
</tbody>
</table>

Discussion

Because obesity is associated with insulin resistance and increases the risk of GDM, we examined the association of pre-pregnancy BMI and the results of GCT. The present study demonstrates a positive association between the mother's pre-pregnancy BMI and the results of first trimester plasma triglyceride level. Also a positive correlation between the results of first trimester plasma triglyceride level with the results of OGCT was observed.

Results from some case control studies have generally been consistent with our findings. Clark et al. in their study reported that gestational diabetes mellitus patients, compared with controls had statistically significant higher fasting (median: 2.2 mmol/l versus 1.9 mmol/l, p–value<0.01) and 2h post- prandial triglyceride concentrations (median:2.5 mmol/l versus 2.0 mmol/l, p-value <0.01)(11). Toescu et al. showed that women with gestational diabetes mellitus had significantly increased triacylglycerides in second trimester compared with normal pregnancy (2.27 ± 0.22 compared with 1.47 ± 12, p<0.01), suggesting that the expected hypertriglyceridaemia occurs earlier in pregnancy in this group(18). Nolan et al. noted a strong positive correlation between morning non-fasting triglyceride concentrations with glucose intolerance (r=0.23, p<0.001) (19).

The findings of present study are not consistent with reports from some other investigations (10). Bartha et al. for example, reported that maternal total cholesterol and triglyceride concentrations were similar in GDM and normal pregnancy. Montelongo et al in their study also reported no differences between women with GDM and controls in first, second or third trimester triglyceride and cholesterol concentrations (20). The result obtained in his study is in controversy with the present study which can be interpreted to the difference in sample sizes.
Some potential limitations are noticeable in present study. A single measurement (whether fasting or not) may result in some misclassification of maternal lipid profiles during pregnancy. Longitudinal studies with serial measurements of maternal lipid are needed to elucidate patterns of lipid changes during pregnancy in gestational diabetes mellitus group and control group. Second plasma lipid concentrations were measured using non-fasting samples. However, Schaefer et al. have reported high correlations between fasting and postprandial plasma lipoproteins concentrations (21). Third, to detect association between triglyceride concentrations and results of OGCT the groups should be matched for BMIs, because of the potential influence of BMI on lipid profile. In the present study, BMI was not matched between the groups.

In previous study we have found no relation between the measurement of first trimester fasting plasma glucose levels and OGCT results in a medium risk population of women for Gestational Diabetes (unpublished data). Prospective studies are suggested to be designed in order to evaluate the effect of intervening plasma lipid levels in first trimester on the status of glucose tolerance during pregnancy which may be demonstrated by OGCT at 24-28 weeks.

In conclusion, this study suggests that pre-pregnancy BMI is correlated with first trimester plasma triglyceride concentration. Furthermore, first trimester plasma triglyceride level is correlated with results of OGCT. So pre-conception period is considered to be the golden time to target women who have a high BMI with intercessions (lifestyle and pharmacological interventions) in order to decrease both their plasma triglycerides and risk of gestational diabetes mellitus.

References


