The time of the diagnosis of gestational diabetes and perinatal complications

DALLIA BALIUTAVICIENE¹, JURATE BUINAUSKIENE², VLADIMIRAS PETRENKO³, RIMANTAS ZALINKEVICIUS⁴

Abstract

Aim: To assess whether the diagnosis of gestational diabetes mellitus (GDM) till the 32nd week of gestation and appropriate treatment can reduce perinatal complications. Methods: A retrospective study was performed of 496 women with GDM, diagnosed by an oral glucose tolerance test according to the WHO recommendations. Data from the group of 372 women diagnosed with GDM and treated until the 32nd week of gestation was compared with results of 124 women when GDM was diagnosed and treated later. Results: Analysis of our data showed that the weight of the newborns and the incidence of neonatal macrosomia, hypoglycemia and hypobilirubinemia were statistically lower in the group where GDM was diagnosed till the 32nd week. Conclusions: In order to include more women with glucose intolerance the routine timing of GDM diagnosis should be prolonged until the 32nd week of gestation.

Key words: gestational diabetes mellitus, time of diagnosis, perinatal outcome

Introduction

Gestational diabetes mellitus (GDM) is the most common medical complication and metabolic disorder in pregnancy occurring in 1-14% of all pregnancies depending on the population studied and the criteria used for diagnosis [1, 2]. This rate appears to be increasing worldwide [3, 4].

Pregnancy is a diabetogenic condition characterized by progressive insulin resistance and a compensatory increase in insulin secretion. This insulin resistance is a result of the secretion of placental hormones, that begins near mid-pregnancy and progresses through the third trimester of pregnancy [5].

Women with GDM have a greater severity of insulin resistance and impaired compensatory increase in insulin secretion.

GDM is associated with an increased risk of some perinatal complications the most common being fetal macrosomia as a consequence of fetal hyperinsulinism caused by mother’s hyperglycemia.

Other neonatal morbidities that potentially occur more frequently in infants of women with GDM include hypoglycemia, hyperbilirubinemia, hypocalcemia, respiratory distress syndrome, birth trauma [6-8].

The diagnosis of GDM is based on the results of oral glucose tolerance test (OGTT) which is recommended to perform at 24 to 28 weeks of pregnancy [9-13].

Disagreement extends to the methods used for screening but the recommended time of screening remains the same. However this timing is not based on any evidence that it is the optimal time to identify women who will benefit most from treatment [14].

It is clear that as glucose intolerance increases during pregnancy earlier diagnostic testing lets us find fewer women with GDM, but lets treat them for a longer time while later diagnostic lets find a larger number of women but treat them for a shorter time. Therefore the time for diagnosing GDM must be as late as possible for diagnosing more cases of GDM but not too late to affect the growing of the fetus.

The aim of this study was to assess whether the diagnosis of the GDM later in pregnancy – at 26-32 week of gestation and appropriate treatment can reduce the perinatal complications.

Material and methods

A retrospective study was performed of 496 women with GDM and singleton pregnancy, who gave birth between 1999-2003 in the Hospital of Kaunas Medical University.

GDM was diagnosed by an oral 75-g glucose tolerance test (OGTT) according to the WHO recommendations when the 2-h value was ≥7.8 mmol/l. After the diagnosis of GDM all women were treated by diet (1600-1800 kcal/day) rich in proteins and poor in refined sugars. Fasting and postprandial (1.5-2h after meal) capillary blood glucose values were investigated 4 times a day 3-6 days.

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If normoglycemia was not achieved (fasting < 5.3, post-prandial < 6.7 mmol/l, according the Fourth and Fifth International Workshop – Conference on GDM) [9, 11] insulin treatment was started and patients followed their blood glucose values by self-monitoring. 435 of women with diagnosed GDM (87.7%) were treated by diet only, 61 (12.3%) needed insulin therapy.

Data were collected retrospectively from obstetric and birth records.

Macrosomia was defined as a birth weight over the 90 percentile.

Hypoglycemia was defined as a blood glucose value < 2.6 mmol/l during the first 48 h of life.

Hyperbilirubinemia was diagnosed when bilirubin level exceeded the physiological level in absence of hemolysis.

Fetal well-being was assessed by fetal movement count and by weekly non-stress test. Fetal growth was followed by clinical examinations and echographic controls.

Data management was done via Microsoft Acces, and statistical analyses were done using the SPSS statistical package (Version 12.0; Chicago, IL). Statistical tests included the chi²-test for categorical variables. The difference between two independent samples was calculated using Mann-Whitney U-test.

\[ P < 0.05 \] on two sided tests was considered statistically significant.

**Results**

In order to estimate whether the time of the diagnosis and beginning of treatment of GDM has any influence on perinatal outcomes all our investigated 496 women with GDM were separated into two groups.

The I group were 372 women, when GDM was diagnosed and treated until the 32nd week of gestation, the IInd group –124 women, when GDM was diagnosed and treated at 33 weeks and later.

The maternal characteristics and obstetrical complications in both investigated groups are summarized in Table 1.

**Table 1. The main characteristics and obstetrical complications in women with GDM**

<table>
<thead>
<tr>
<th>Time of diagnosis</th>
<th>Maternal age (years)</th>
<th>Maternal complications (%)</th>
<th>Time of delivery (weeks)</th>
<th>Weight gain (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Till 32 weeks ((n = 372))</td>
<td>29.4 ± 5.8</td>
<td>93 (25)</td>
<td>38.7 ± 2.5</td>
<td>11.9 ± 5.2</td>
</tr>
<tr>
<td>After 32 weeks ((n = 124))</td>
<td>30.9 ± 6.6</td>
<td>31 (24.9)</td>
<td>39.1 ± 1.4</td>
<td>13.6 ± 5.6</td>
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<td>NS</td>
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</tr>
<tr>
<td>Maternal complications (%)</td>
<td>Hypertension</td>
<td>13 (3.5)</td>
<td>38 (8.9)</td>
<td>120 (32.3)</td>
</tr>
<tr>
<td>Maternal complications (%)</td>
<td>Pyelonephritis</td>
<td>33 (8.9)</td>
<td>28 (22.6)</td>
<td>42 (33.9)</td>
</tr>
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<td>Maternal complications (%)</td>
<td>Hydramnios</td>
<td>29 (7.8)</td>
<td>7 (5.6)</td>
<td>28 (22.6)</td>
</tr>
<tr>
<td>Maternal complications (%)</td>
<td>Cesarean section</td>
<td>28 (22.6)</td>
<td>42 (33.9)</td>
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</tr>
<tr>
<td>Data are means ± SD or n (%)</td>
<td>3525.9 ± 671.8</td>
<td>3828 ± 587.7</td>
<td>&lt; 0.0001</td>
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<td>Time of diagnosis</td>
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<td>Time of diagnosis</td>
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<td>19 (15.3)</td>
<td>&lt; 0.03</td>
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<tr>
<td>Time of diagnosis</td>
<td>Hyperbilirubinemia</td>
<td>62 (16.7)</td>
<td>24 (19.3)</td>
<td>&lt; 0.04</td>
</tr>
<tr>
<td>Time of diagnosis</td>
<td>Respiratory distress syndrome</td>
<td>2 (0.5)</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Time of diagnosis</td>
<td>Birth trauma</td>
<td>17 (4.6)</td>
<td>5 (4.0)</td>
<td>NS</td>
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</tbody>
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**Table 2. The main characteristics, neonatal complications and the time of diagnosis**

<table>
<thead>
<tr>
<th>Time of diagnosis</th>
<th>The mean weight (g)</th>
<th>Macrosomia</th>
<th>Diabetic fetopathy</th>
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The mean age and the time of delivery in both groups were similar, only the weight gain was statistically higher in women where GDM was diagnosed after the 32 week of gestation. Other maternal complications and the rate of cesarean section also were similar in both groups except hydramnios which was more often in women where GDM was diagnosed later (Table 1). The neonatal complications are presented in Table 2. The mean weight of the newborns in the group where the diagnosis of GDM was made earlier (3525.9 ± 671.8 g) was statistically lower as in the group were GDM was diagnosed later (3828.8 ± 587.7 g) (p < 0.00001). Not only the incidence of macrosomia was lower in this group, but also the rate of newborns with the typically outlook of diabetic fetopathy was 3 times lower in the group were GDM was diagnosed earlier (7.8% vs. 21.8%). The incidence of hypoglycemia and hyperbilirubinemia also appeared less frequent when GDM was diagnosed and treated till the 32 week (Table 2).

Discussion

Screening procedures and diagnostic criteria for GDM vary in different countries, but the time recommended performing the screening or diagnosis remains the same – 24 to 28 week of gestation [9, 11]. However this time is not based on any evidence. In practice not always the diagnosis is carried out at that time. Not so rarely this is made later in pregnancy and then the question remains whether it is not to late to influence growth of the fetus and other complications.

We have shown that treatment of GDM diagnosed not till 28 but till 32 weeks of gestation reduces the rate of perinatal morbidity, especial the main complication – excessive fetal growth.

There were some reasons why we chose not the 28 but the 32 week as a limit for the GDM diagnosis. As pregnancy progresses, the increased levels of estriol, prolactin, placental lactogen, cortisol and progesteron lead to insulin resistance in peripheral tissues [7, 15]. According to Jovanovic-Peterson and Peterson the diabetogenic potency of estradiol, placental lactogen and cortisol reaches the peak effect at the 26th week of gestation. But progesteron having also a strong anti-insulin effect reaches the peak of its activity at the 32nd week [16]. The same authors found that screening at the interval between the 27th and the 31st weeks had the highest percentage of positive screens and abnormal glucose tolerance tests as compared with the intervals at 9-20 and 33-36 weeks of gestation [17].

On the other hand the response of the fetus has also significance for his excessive growth. Stimulation of the fetal pancreatic beta-cells can occur as early as at 11-15 weeks of gestation [18], but the major impact seems to be from 28-32 weeks onward, most likely because the fetal capacity to store triglycerides in the adipose tissue matures at that time [19].

It is interesting to note, that despite the decreased rate of macrosomia the rate of cesarean delivery was not reduced. This phenomenon has been mentioned in many papers [20-22]. Sermer et al. from Toronto Tri-Hospital GDM Project suggest that the diagnosis of GDM shifts obstetric practice style towards cesarean delivery [21]. Kelly et al. calls this as a “diagnosis effect” – labeling a patient with GDM increases the likelihood that she will have a cesarean section [22].

Conclusions

We suppose that the routine timing of GDM diagnosis till the 28 week will not include many women with glucose intolerance and must be prolonged till the 32 week of gestation. Our proposed time of diagnosis – till the 32 week will not be too late for treatment and influence on the growth of the fetus. Treatment of GDM does decrease the incidence of macrosomia, but till now does not decrease the rate of cesarean section.

References

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