REVIEW

The diagnosis of gestational diabetes mellitus: new paradigms or status quo?

The International Association of Diabetes & Pregnancy Study Groups (IADPSG) Consensus Panel Writing Group and the Hyperglycemia & Adverse Pregnancy Outcome (HAPO) Study Steering Committee

The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study showed significant perinatal risks at levels of maternal hyperglycemia below values that are diagnostic for diabetes. A Consensus Panel of the International Association of Diabetes and Pregnancy Study Groups (IADPSG) reviewed HAPO Study results and other work that examined associations of maternal glycermia with perinatal and long-term outcomes in offspring and published recommendations for diagnosis and classification of hyperglycemia in pregnancy in 2010. Subsequently, some commentaries and debate challenged the IADPSG recommendations. In this review, we provide details regarding some points that were considered by the IADPSG Consensus Panel but not published and address the following issues: 1) what should be the frequency of gestational diabetes mellitus (GDM); 2) were appropriate outcomes and odds ratios used to define diagnostic thresholds for GDM; 3) to improve perinatal outcome, should the focus be on GDM, obesity, or both; 4) should results of randomized controlled trials of treatment of mild GDM influence recommendations for diagnostic thresholds; and, 5) other issues related to diagnosis of GDM. Other groups are independently considering strategies for the diagnosis of GDM. However, after careful consideration of these issues, we affirm our support for the recommendations of the IADPSG Consensus Panel.

Keywords: Gestational diabetes mellitus diagnosis, obesity, perinatal outcomes

Introduction

The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) Study demonstrated strong, continuous associations of maternal glucose levels below those diagnostic of diabetes with birth weight, cord serum C-peptide levels and newborn percent body fat, each >90th percentile. Significant associations were observed with primary cesarean section (CS), clinically defined neonatal hypoglycemia, preeclampsia and other measured outcomes, although these tended to be weaker. Since there were no obvious thresholds at which risks increased more sharply [1,2], the International Association of Diabetes and Pregnancy Study Groups (IADPSG) sponsored a Workshop-Conference on Gestational Diabetes Diagnosis and Classification attended by more than 225 conferees from 40 countries. Published and unpublished HAPO results and other work on associations of maternal glycermia with perinatal and long-term outcomes in offspring were reviewed. A Consensus Panel of more than 50 individuals representing the member organizations of IADPSG and other groups carried out further review and analysis of HAPO results, held a second face-to-face meeting of panel members, then published recommendations for the diagnosis and classification of hyperglycemia in pregnancy [3].

During the time that HAPO was carried out and primary results published, two randomized controlled trials (RCTs) on treatment of “mild” gestational diabetes mellitus (GDM) were completed [4,5]. In both trials, standard treatment of GDM reduced average birth weight and frequencies of babies large for gestational age (LGA) and preeclampsia. In the Maternal Fetal Medicine Units Network (MFMU) trial [5], the rate of cesarean delivery was lower in the intervention group and in the Australian Carbohydrate Intolerance Study in Pregnant Women (ACHOIS) trial [4] rates were not increased in the intervention group.

The IADPSG recommendations received favorable comments from some authors [6], were endorsed by some organizations [7,8], not adopted by others [9] or adopted but with modifications in the detection algorithm:


There have also been commentaries and debate about the IADPSG recommendations [10–12]. Results of the RCTs and potential benefits and cost-effectiveness of diagnosis and treatment of GDM have been inconsistently interpreted [13–15].

In this review, we consider several issues often raised and provide information about some points considered by the IADPSG Consensus Panel but not previously published. Finally, we note that other groups are independently considering strategies for diagnosis of GDM.

What should be the frequency of GDM?

Concern has been expressed in a number of publications [9–12] that adopting IADPSG recommendations will result in more GDM than resources can accommodate. However, concerns seem to be relative rather than specific since it is not indicated what is an acceptable rate of GDM. Reported frequencies of GDM vary widely, in part because standardized methods of detection and diagnosis are not applied. Variation could in part reflect differences in risk of type 2 diabetes in the background populations. The Danish Inter99 study [16] found higher rates of diabetes and impaired glucose regulation than previously reported in northern
European populations. In Australia, diabetes prevalence more than doubled between 1981 and 2000 [17]. NHANES data from 2005–2008 indicate that US women age 18–44 have known diabetes 2.8%; undiagnosed diabetes 1.7%; prediabetes (impaired fasting glucose, impaired glucose tolerance) 26.4%, for a total of 30.9% with disorders of glucose metabolism (Catherine Cowie, NIDDK, personal communication). Increases in frequencies of pre-existing diabetes in pregnancy and of GDM have also been documented [18–21]. With this as background, why should it be unacceptable to find GDM in about 18% of pregnancies?

When rates of GDM were calculated in individual HAPO collaborating centers using IADPSG criteria, rates differed substantially, range 9–26% [22]. HAPO Study participants represent consenting research study volunteers and frequencies of GDM that were found in specific centers may not be representative of national or regional population based data. Four studies in which all participants were tested with a 75-g oral glucose tolerance test (OGTT) (fasting 1-h, 2-h samples) have reported prevalence of GDM. Participants were enrolled during 2003–2010, a timeframe that overlaps enrollment of HAPO Study participants. The frequency of GDM by IADPSG criteria was 12.4% in the multicenter Atlantic DIP cohort in Ireland [23]. Participants were predominately of European origin (93%). GDM frequency was 17.1% in the HAPO Study center in Belfast (also predominately European participants) and 24.3% in the mixed racial/ethnic populations of the Manchester HAPO Study center’s participants. The report by Black et al. [24] from the Kaiser Permanente Southern California Medical Care Program in Bellflower, CA found GDM in 23.7% of the cohort that was >74% Hispanic compared to 25.5% in HAPO Study participants that were recruited at the same institution [22]. In the United Arab Emirates, a country with one of the highest rates of diabetes and impaired glucose metabolism in the world [25], investigators found a 37.2% prevalence of GDM [26]. Moses et al. [27] found the rate of GDM to be 13.0% in predominately Caucasian (89.4%) pregnant women in the Wollongong area of New South Wales, Australia. This rate is comparable to the rate of 15.3 and 12.4% in HAPO Study centers in Newcastle and Brisbane, Australia, respectively [22]. For additional details of these four studies see Supplementary Table S1.

**Were appropriate outcomes and odds ratios used to define the diagnostic thresholds for GDM?**

In the identification of diagnostic thresholds, the IADPSG Consensus Panel put primary emphasis on strength of associations between maternal glycaemia and frequency of outcomes rather than on the frequency of GDM. The Panel used outcomes that are pathophysiological components of diabetic fetopathy (birth weight, cord serum C-peptide concentration, percent newborn body fat >90th percentile) and prespecified odds ratios (OR) for the outcomes (relative to odds at cohort mean glucose values) to define diagnostic thresholds [3]. Based on the HAPO Study prespecified analysis plans, glucose values at OR of 1.5 or greater were considered for diagnostic thresholds.

Concern has been expressed that other more “clinically relevant” outcomes should be used [9,13]. Esakoff et al. [28] found that macrosomia is associated with adverse perinatal outcomes with or without GDM. In the HAPO Study, the risk of Cesarean delivery was more than 75% higher (OR: 2.0) when infant birth weight was >90th percentile. When birth weight, percent newborn body fat or cord C-peptide values were >90th percentile, rates of clinical neonatal hypoglycemia were significantly higher [29]. Furthermore, when the IADPSG-recommended diagnostic thresholds (based on OR of 1.75) are applied ([3] and Table I), the frequency of each HAPO Study outcome is significantly greater in those with one or more glucose values at or above thresholds than in those with all values less than threshold. For example, preeclampsia, birth weight, C-peptide and percent newborn body fat >90th percentile are all twice as common in those with one or more glucose values at or above thresholds as in those with all values less than threshold. Preterm delivery, shoulder dystocia/birth injury and Cesarean delivery are approximately 40% more frequent when one or more glucose values were at or above thresholds.

**Threshold values for fasting plasma glucose (FPG), and 1- and 2-h 75-g OGTT glucose values (in mmol/L) are 5.0, 9.3, and 7.9 for an OR of 1.5; 5.1, 10.0, and 8.5 for an OR of 1.75 and 5.3, 10.6, and 9.0 for an OR of 2.0.** Corresponding proportions of the blinded HAPO cohort that would be considered to have GDM are 25.4, 16.1, and 8.8% respectively. Note that to obtain the total GDM frequency women who meet IADPSG criteria among those unblinded for a glucose value outside predefined ranges must be added to those with GDM in blinded participants [1,22]. With thresholds based on OR 1.75 the overall rate of GDM is 17.8% in blinded plus unblinded women.

The rationale for using OR of 1.75 (relative to odds with glucose values at the study cohort means) to define threshold values has been questioned [10–12]. Table I, shows the frequency of each outcome when all glucose values are < threshold (non-GDM), the frequency with one or more values ≥ threshold (GDM) and the risk ratios for outcomes for each of the three possible threshold OR. In general, the ratios are similar because at higher OR thresholds, more cases with risks of the outcome that are nearly as high as in the group meeting threshold are no longer identified as GDM.

Numbers of potentially preventable outcomes in HAPO with thresholds of 1.75 and 2.0 have been extrapolated [10] but the estimates are not entirely accurate. By applying the outcome frequencies in Table I potentially preventable outcomes can be calculated in a straightforward manner for GDM defined by glucose threshold values corresponding to OR: 1.5, 1.75, or 2.0. For example, when OR 1.75 is used to define diagnostic thresholds, 3746 women in the blinded HAPO cohort are classified as GDM. If birth weight >90th percentile (LGA) occurred in GDM at the non-GDM frequency (8.3%), there would be 311 LGA infants. However, the observed rate is 16.2% (607 LGA infants). The 296 additional or “excess” LGA infants are potentially preventable. At OR: 2.0, 2052 women would be classified as GDM. Applying the same kind of calculations yields 181 preventable cases of LGA infants (only 61% of the number for OR 1.75). Similar differentials are present for other outcomes. The IADPSG Consensus Panel acknowledged that in the final analysis the choice of thresholds for associations that are continuous and linear is arbitrary. After much consideration and debate, intermediate thresholds based on OR 1.75 were recommended for the diagnosis of GDM [3]. We continue to support that decision.

**To improve perinatal outcome, should the focus be on GDM, obesity, or both?**

Obesity is associated with numerous adverse health outcomes including cardiovascular disease, stroke, osteoarthritis, diabetes, GDM and some types of cancer. Efforts to prevent or treat obesity have had limited success; thus, current prevention and treatment strategies emphasize reducing risk factors such as dyslipidemia or prediabetes rather than treatment of obesity per se. Most intervention trials in obese pregnant women have not shown significant positive effects on pregnancy outcome [30,31]. Therefore, it is surprising that critiques of HAPO results and IADPSG recommendations [10–12] suggest that efforts to reduce adverse pregnancy
outcomes should be directed at obesity rather than GDM. GDM is considered "medicalization of healthy pregnancy", but nothing is said about how overweight and obesity might be viewed.

Conjecture that obesity has a larger impact on HAPO participants than GDM [10] was based in part on extrapolations of published HAPO results [32]. It was suggested that higher BMI is more strongly associated with risk of LGA infants than higher levels of FPG [10]. When frequencies of LGA and OR are examined with similar numbers of women in corresponding BMI and glucose categories (Supplementary Table S2), similarities are more apparent than differences. Furthermore, the potential impact of hyperglycemia on risk of perinatal outcomes is underestimated because the range of glucose values is truncated. Women with FPG > 5.8 mmol/L or with 2-h 75-g values >11.1 mmol/L (expected to have the greatest risk of adverse outcomes) were unblinded and excluded from analysis. However, there was no BMI above which women were excluded.

The focus on BMI and FPG does not take advantage of the fact that 1- and 2-h OGTT glucose values are also independently associated with HAPO Study outcomes. As shown in Table II, both GDM and obesity independently contribute to adverse pregnancy outcomes [1,2,32,33] and women who are obese and have GDM are clearly at highest risk [33]. The importance of both GDM and obesity should be emphasized rather than making choices.

### Should results of RCTs of treatment of mild GDM influence recommendations for diagnostic thresholds?

Two RCTs comparing active treatment for mild GDM to standard obstetric care were conducted in a timeframe overlapping the interval during which the HAPO Study was conducted [4,5]. In both RCTs, treatment, primarily diet/lifestyle modification, resulted in reduced birth weight, a lower frequency of LGA births and less preeclampsia or gestational hypertension. These effects of treatment have been acknowledged; however, interpretation of these findings has varied. In 2008, after publication of the ACHOIS RCT results and before conclusion of the MFMU RCT, the US Preventive Services Task Force concluded, "current evidence is insufficient to assess the balance of benefits and harms of screening for GDM, either before or after 24 weeks gestation" [14]. Based largely on these RCTs of mild GDM, authors of a systematic review concluded that treatment lowers the frequencies of LGA infants and shoulder dystocia; however reduced rates of preeclampsia were not mentioned [13]. Recently, a Cochrane report found that interventions in four relatively small randomized trials in pregnant women with hyperglycemia less than existing GDM diagnostic criteria reduced frequencies of macrosomia and LGA babies without increasing caesarean section rates [34].

Costs and consequences of treating mild GDM have been reported for ACHOIS [35] indicating that "it is likely that the general public in high-income countries such as Australia would find reductions in perinatal mortality and in serious perinatal complications sufficient to justify additional health service and personal monetary charges. Over the whole lifespan, the incremental cost per extra life-year gained is highly favorable." Ohno et al. [15] conducted a cost-effectiveness analysis of treating mild GDM based on MFMU trial results [5] and reported that "treating mild GDM is cost-effective in terms of improving maternal and neonatal outcomes including decreased rates of preeclampsia, CS, macrosomia, shoulder dystocia, permanent and transient brachial plexus injury, neonatal hypoglycemia, neonatal hyperbilirubinemia, and neonatal intensive care unit admissions."

Caution has been advised about inferring that benefits of treating mild GDM observed in the two RCTs apply to GDM diagnosed by IADPSG criteria [9–13]. Emphasis has been placed on the fact that a two-step process (glucose challenge test [GCT]/OGTT) was used to select most participants in both RCTs whereas eligible HAPO Study participants had only a 75-g 2-h OGTT [9–13]. Although this difference exists, we believe that the points that are summarized below also deserve consideration.

In ACHOIS [4] only a FPG and a 2-h sample following a 75-g 2-h glucose load were collected; in the MFMU trial [5] a 100-g 3-h OGTT was performed and in the HAPO Study [1] all participants underwent a 75-g OGTT with fasting, 1- and 2-h glucose measurements. OGTT eligibility criteria were different in the RCTs. In ACHOIS, all women with FPG less than 7.8 and a 2-h OGTT value of 7.8–11 mmol/L were eligible for enrollment [4]. MFMU trial participants [5] had at least 2 of 3 post 100-m glucose load values greater than 10.0, 8.6, or 7.8 mmol/L at 1, 2, and 3 h, respectively, but were eligible for enrollment only if FPG was less than 5.3 mmol/L. The number of potential MFMU trial participants excluded for a FPG equal to or greater than 5.3 mmol/L (1938) was twice the number enrolled in the RCT (958 [5]).

### Table I. Frequency of outcomes when all glucose values are below threshold or any one or more is equal to or above threshold.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>OR 1.5</th>
<th>OR 1.75</th>
<th>OR 2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>All values &lt; threshold</td>
<td>Any value ≥ threshold</td>
<td>Risk ratio</td>
<td>All values &lt; threshold</td>
</tr>
<tr>
<td>Birth weight &gt; 90th percentile</td>
<td>8.0%</td>
<td>14.3%</td>
<td>1.79***</td>
</tr>
<tr>
<td>Cord C-peptide &gt; 90th percentile</td>
<td>6.0%</td>
<td>15.4%</td>
<td>2.56***</td>
</tr>
<tr>
<td>Newborn percent body fat &gt; 90th percentile</td>
<td>8.0%</td>
<td>14.9%</td>
<td>1.86***</td>
</tr>
<tr>
<td>Preeclampsia</td>
<td>4.1%</td>
<td>8.6%</td>
<td>2.07***</td>
</tr>
<tr>
<td>Preterm delivery (&lt;37 weeks)</td>
<td>6.3%</td>
<td>8.7%</td>
<td>1.39***</td>
</tr>
<tr>
<td>Primary cesarean section</td>
<td>16.3%</td>
<td>23.3%</td>
<td>1.43***</td>
</tr>
<tr>
<td>Shoulder dystocia and/or birth injury</td>
<td>1.2%</td>
<td>1.7%</td>
<td>1.41**</td>
</tr>
<tr>
<td>Clinical neonatal hypoglycemia</td>
<td>1.9%</td>
<td>2.5%</td>
<td>1.28*</td>
</tr>
<tr>
<td>Hyperbilirubinemia</td>
<td>7.8%</td>
<td>9.9%</td>
<td>1.27***</td>
</tr>
<tr>
<td>Intensive neonatal care</td>
<td>7.7%</td>
<td>8.9%</td>
<td>1.16**</td>
</tr>
</tbody>
</table>

OR, odds ratio

Threshold values are OR 1.5 – FPG 5.0 (90 mg/dL), 1-h PG ≥ 9.3 mmol/L (167 mg/dL), 2 h ≥ 7.9 mmol/L (142 mg/dL), OR 1.75 – FPG ≥ 5.1 mmol/L (92 mg/dL), 1-h PG ≥ 8.5 mmol/L (153 mg/dL), OR 2.0 – FPG ≥ 5.3 (95 mg/dL), 1-h PG ≥ 10.0 mmol/L (181 mg/dL), 2 h ≥ 9.0 mmol/L (162 mg/dL).

ns, not significant; *p < .05; **p < .01; ***p < .001.
Table II. Relationship between maternal GDM, obesity, and outcomes.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>N</th>
<th>#</th>
<th>%</th>
<th>Model I OR</th>
<th>95% CI</th>
<th>Model II OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth weight &gt; 90th percentile&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No GDM, no obesity</td>
<td>17,244</td>
<td>1,339</td>
<td>7.8%</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDM, no obesity</td>
<td>2,791</td>
<td>401</td>
<td>14.4%</td>
<td>1.99</td>
<td>(1.77, 2.25)</td>
<td>2.19</td>
<td>(1.93, 2.47)</td>
</tr>
<tr>
<td>No GDM, obesity</td>
<td>2,247</td>
<td>278</td>
<td>12.4%</td>
<td>1.68</td>
<td>(1.46, 1.92)</td>
<td>1.73</td>
<td>(1.50, 2.00)</td>
</tr>
<tr>
<td>GDM, obesity</td>
<td>935</td>
<td>203</td>
<td>21.7%</td>
<td>3.29</td>
<td>(2.79, 3.89)</td>
<td>3.62</td>
<td>(3.04, 4.32)</td>
</tr>
<tr>
<td>Cord C-peptide &gt; 90th percentile&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No GDM, no obesity</td>
<td>14,886</td>
<td>916</td>
<td>6.2%</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDM, no obesity</td>
<td>2,419</td>
<td>386</td>
<td>16.0%</td>
<td>2.90</td>
<td>(2.54, 3.30)</td>
<td>2.49</td>
<td>(2.17, 2.85)</td>
</tr>
<tr>
<td>No GDM, obesity</td>
<td>1,829</td>
<td>201</td>
<td>11.0%</td>
<td>1.80</td>
<td>(1.52, 2.12)</td>
<td>1.77</td>
<td>(1.49, 2.11)</td>
</tr>
<tr>
<td>GDM, obesity</td>
<td>751</td>
<td>168</td>
<td>22.4%</td>
<td>4.14</td>
<td>(3.43, 5.00)</td>
<td>3.61</td>
<td>(2.94, 4.42)</td>
</tr>
<tr>
<td>Newborn percent body fat &gt; 90th percentile&lt;sup&gt;c&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No GDM, no obesity</td>
<td>14,367</td>
<td>1,143</td>
<td>8.0%</td>
<td>1.00</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDM, no obesity</td>
<td>2,338</td>
<td>331</td>
<td>14.2%</td>
<td>1.91</td>
<td>(1.67, 2.18)</td>
<td>1.98</td>
<td>(1.73, 2.27)</td>
</tr>
<tr>
<td>No GDM, obesity</td>
<td>1,854</td>
<td>233</td>
<td>12.6%</td>
<td>1.66</td>
<td>(1.43, 1.93)</td>
<td>1.65</td>
<td>(1.41, 1.93)</td>
</tr>
<tr>
<td>GDM, obesity</td>
<td>768</td>
<td>185</td>
<td>24.1%</td>
<td>3.67</td>
<td>(3.08, 4.38)</td>
<td>3.69</td>
<td>(3.06, 4.44)</td>
</tr>
</tbody>
</table>

The table is derived from Table II of [32]. N is the total number in the category, # is the number in the category with the outcome, % is the proportion in the category with the outcome.

GDM, gestational diabetes mellitus; OGTT, oral glucose tolerance test; OR, odds ratio.

<sup>a</sup>90th percentiles for gestational age (30–44 weeks only) were determined using quantile regression analyses for each of eight newborn gender-ethnic groups (Caucasian or Other, Black, Hispanic, Asian), with adjustment for gestational age, field center, and parity (0, 1, 2+). A newborn was considered to have a birth weight >90th percentile if the birth weight was greater than the estimated 90th percentile for the baby's gender, gestational age, ethnicity, field center, and maternal parity. Otherwise, the newborn was considered to have a birth weight ≤90th percentile.

<sup>b</sup>90th percentile of the values for the total HAPO sample. Model I: Adjusted for field Center. Model II: Model I adjustment + age, height and gestational age at the OGTT, smoking, alcohol use, hospitalization prior to delivery, family history of diabetes, mean arterial pressure, and cord glucose.

<sup>c</sup>Defined based on gender, ethnicity, field center, gestational age (36–44 weeks), and parity using quantile regression analysis. Model I: Adjusted for the variables used in estimating 90th percentiles. Model II: Model I adjustment + age, height and gestational age at the OGTT, smoking, alcohol use, hospitalization prior to delivery, family history of diabetes, mean arterial pressure, and cord glucose.

Other issues related to diagnosis of GDM

It has been suggested that the IADPSG thresholds lack validity because the OGTT has poor reproducibility and a single abnormal value from a single test can result in a diagnosis of GDM [10–12]. A two-step procedure (GCT followed by an OGTT in those with values above a prespecified threshold) was recommended as an alternative [10]. While this would assure test values meet or exceed a threshold on two occasions, there are significant limitations to this approach. First, time to diagnosis and initiation of treatment are delayed. Second, an appropriate GCT cut point with appropriate sensitivity and specificity for the detection of GDM using IADPSG recommended thresholds is not available. The GCT focuses on post glucose load thresholds and does not consider FPG. Finally, as pointed out in a recently published systematic review [38] approximately 20–25% of GDM cases are not identified by GCT.

The IADPSG did not have a prespecified plan that the diagnosis of GDM should be based on a single value equal to or...
greater than threshold. Reproducibility of an OGTT is a topic of longstanding debate and not unique to a discussion of thresholds for the diagnosis of GDM recommended by the IADPSG Consensus Panel nor is it unique to a diagnosis based on single or multiple values. In any circumstance where the association between variables is continuous, thresholds are arbitrarily chosen and there is variability in repeat measurements where values near the threshold lead to change in classification in both positive and negative directions. Despite these perceived limitations HAPO showed strong continuous associations between a single OGTT approximately 12 weeks prior to delivery and multiple perinatal outcomes. Associations with glucose measures were also more robust than those with hemoglobin A1c [39].

Potential negative consequences of diagnosing and treating GDM have been identified [10–13]. There was evidence that the diagnosis of GDM can increase risk of CS delivery [40,41]. This was not found in ACHOIS [4]. Furthermore, in the MFMU RCT the rate of CS was significantly lower in the actively treated group [5].

A number of diabetes prevention trials have achieved sustained delay/prevention of progression to diabetes with lifestyle intervention [42–44]. One included women with previous GDM [43,45]. The American Diabetes Association currently recommends testing to identify women with previous GDM who are at high risk for early progression to type 2 DM [7]. We consider that this opportunity for identification and treatment of women at risk of future diabetes outweighs theoretical negative effects of the diagnosis of GDM on health care costs and future insurability that have been emphasized [10–12].

**Work in progress**

The IADPSG Consensus Panel anticipated that based on regional demographics and clinical characteristics, investigators will develop optimal strategies for the diagnosis of GDM and for treatment that are cost-effective [3]. In keeping with this prediction Agarwal et al. [26] found that using the FPG concentration to “rule in and to rule out” GDM in the high-risk population of the UAE could avoid doing an OGTT in more than 50% of cases. Kalter-Leibovici et al. [46] recently concluded that one-third of the Israeli HAPO Study participants with GDM were at “low risk” for adverse outcomes and that in the future, such patients might be treated less intensively than others. Mission et al. [47] have used a decision-analytic model to investigate the cost-effectiveness of GDM diagnosis using the IADPSG guidelines. They found that compared to a two-step strategy (GCT followed by an OGTT if results is equal or greater than threshold) a 2-h OGTT at 24–28 weeks in all women is “expensive but cost-effective in improving maternal and neonatal outcomes.”

In addition to the work of the IADPSG and its Consensus Panel [3], other groups are independently considering strategies for the diagnosis of GDM. On November 29–December 1, 2010, the World Health Organization (WHO) held a “Consultation on the Diagnosis and Screening for Gestational Diabetes Mellitus”. It is anticipated that WHO will issue updated guidelines, possibly before the end of 2012. On October 29–31, 2012, the National Institutes of Health will hold a “Consensus Development Conference: Diagnosing Gestational Diabetes Mellitus” that will lead to the publication of a guideline report. Thus, by late 2012, we should know if a consensus on a globally applicable strategy for diagnosis and classification of hyperglycemia in pregnancy is feasible.

**Declaration of Interest:** The HAPO Study was supported by grants from the Eunice Kennedy Shriver National Institute of Child Health and Human Development and the National Institute of Diabetes and Digestive and Kidney Diseases (R01-HD34242 and R01-HD34243).

**References**


© 2012 Informa UK, Ltd.