

# SCREENING FOR GESTATIONAL DIABETES MELLITUS

The following Clinical Practice Guideline has been reviewed by the Maternal-Fetal Medicine Committee and approved by Executive and Council of the Society of Obstetricians and Gynaecologists of Canada.

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### Abstract:

**Objective:** The purpose of this document is to briefly review the existing data regarding the effect of a diagnosis of gestational diabetes mellitus (GDM), the different screening and diagnostic practices for GDM, and, finally, outline the recommended options for GDM screening in Canada.

**Options:** Consideration has been given to the existing screening practices for GDM including universal screening, risk factor-based screening, and the option of not screening for GDM.

**Outcomes:** The short- and long-term maternal-fetal outcomes in GDM were reviewed with emphasis given to examination of the data regarding the effect of diagnosis and treatment of GDM on these outcomes.

**Evidence:** A comprehensive search of the literature from 1990 through April 2002 using MEDLINE and the Cochrane Database and a review of randomized controlled trials (RCTs) was undertaken. Additional studies and clinical guidelines published outside this time frame but with specific clinical relevance were also reviewed. The level of evidence of the recommendations in this document has been determined using the criteria described by the Canadian Task Force on the Periodic Health Examination.

### Recommendations:

**I.** A single approach of testing for GDM cannot be recommended at the present as there is not enough evidence-based data proving the beneficial effect of a large screening program. Until a large prospective RCT shows a clear clinical benefit for

screening and consequently treating GDM, recommendations will by necessity be based on consensus or expert opinion.

Each of the following approaches is acceptable.

- a.** Routine screening of women at 24–28 weeks of gestation may be recommended with the 50 g glucose challenge test (GCT), using a threshold of 7.8 mmol/L (140 mg/dL), except in those women who fulfill the criteria for low risk, which includes the following:
  - maternal age < 25
  - Caucasian or member of other ethnic group with low prevalence of diabetes
  - pregnant body mass index (BMI)  $\leq 27$
  - no previous history of GDM or glucose intolerance
  - no family history of diabetes in first-degree relative
  - no history of GDM-associated adverse pregnancy outcomes.

The diagnostic test can be the 100 g oral glucose tolerance test (OGTT), as recommended by ACOG, or the 75 g OGTT, according to the American Diabetes Association (ADA) criteria. Use of the World Health Organization (WHO) criteria will approximately double the number of women diagnosed with GDM without an apparent clinical benefit. **(III-C)**

- b.** A small but significant number of Canadian obstetricians and centres have a policy of non-screening for GDM. Until evidence is available from large RCTs that show a clear benefit from screening for glucose intolerance in pregnancy, the option of not screening for GDM is considered acceptable. Conversely, there are no compelling data to stop screening when it is practiced. **(III-C)**

### Key Words

Gestational diabetes, diabetes, hyperglycemia, screening, diagnosis, pregnancy

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- c. The clinician should consider the recommendation of the Fourth International Workshop-Conference that women considered at high risk for GDM should undergo a diagnostic test as early in pregnancy as possible and that testing should be repeated at 24–28 weeks if initial results are negative. **(III-C)**
  - d. If GDM is diagnosed, glucose tolerance should be reassessed with a 75 g OGTT 6–12 weeks postpartum in order to identify women with persistent glucose intolerance. **(III-C)**
2. A large RCT is needed to quantify the advantages and disadvantages of routine screening for GDM. Furthermore, the need for universally accepted, outcome-based diagnostic criteria for GDM is emphasized. **(III-C)**

**Validation:** This guideline was reviewed by the SOGC Maternal-Fetal Medicine Committee.

**Sponsor:** The Society of Obstetricians and Gynaecologists of Canada.

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## INTRODUCTION

This document will review the existing data regarding the effect of a diagnosis of gestational diabetes mellitus (GDM) as well as the different screening and diagnostic practices for GDM, and will outline the recommended options for GDM screening in Canada. The level of evidence and quality of the recommendations in this guideline have been determined using the

criteria described by the Canadian Task Force on the Periodic Health Examination (Table 1).<sup>1</sup>

## METHODS

Due to the lack of evidence derived from randomized controlled trials (RCTs), these 2002 SOGC clinical practice guidelines on screening for GDM were based on the highest level of evidence available and on consensus reports published in the last decade by national obstetrical societies such as the SOGC (1992)<sup>2</sup> and ACOG (2001),<sup>3</sup> guidelines published by national endocrine societies such as the Canadian Diabetes Association (CDA) in 1998<sup>4</sup> and the American Diabetes Association (ADA) in 1998,<sup>5</sup> as well as guidelines that originated from dedicated meetings or task forces, such as the Canadian Task Force on the Periodic Health Examination in 1992<sup>6</sup> and the Fourth International Workshop-Conference on GDM.<sup>7</sup>

The guidelines reviewed varied in methodological quality and differed in several recommendations regarding whether there is a need for or benefit from screening for GDM; if there is a benefit, who should be screened; whether screening should be universal or whether risk stratification should be applied with further testing offered only to women in a specific risk category; the optimal mode of screening, i.e., is it the WHO 75 g test or the combined 50 g glucose challenge test (GCT) followed by the 100 g oral glucose tolerance test (OGTT); and what cutoff values should be used to define GDM.

A summary of recommendations from guidelines reviewed is provided in Table 2.

TABLE 1 QUALITY OF EVIDENCE ASSESSMENT <sup>1</sup>	CLASSIFICATION OF RECOMMENDATIONS
<p>The quality of evidence reported in these guidelines has been described using the Evaluation of Evidence criteria outlined in the Report of the Canadian Task Force on the Periodic Health Exam.</p> <p>I: Evidence obtained from at least one properly randomized controlled trial.</p> <p>II-1: Evidence from well-designed controlled trials without randomization.</p> <p>II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group.</p> <p>II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category.</p> <p>III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.</p>	<p>Recommendations included in these guidelines have been adapted from the ranking method described in the Classification of Recommendations found in the Report of the Canadian Task Force on the Periodic Health Exam.</p> <p>A. There is good evidence to support the recommendation that the condition be specifically considered in a periodic health examination.</p> <p>B. There is fair evidence to support the recommendation that the condition be specifically considered in a periodic health examination.</p> <p>C. There is poor evidence regarding the inclusion or exclusion of the condition in a periodic health examination, but recommendations may be made on other grounds.</p> <p>D. There is fair evidence to support the recommendation that the condition not be considered in a periodic health examination.</p> <p>E. There is good evidence to support the recommendation that the condition be excluded from consideration in a periodic health examination.</p>

## **DEFINITION OF GESTATIONAL DIABETES MELLITUS**

Gestational diabetes mellitus is defined as carbohydrate intolerance of variable severity with onset or first recognition during the present pregnancy. The definition applies whether or not insulin is used for treatment or the condition persists after pregnancy. It does not exclude the possibility that the glucose intolerance may have antedated the pregnancy.<sup>7,8</sup> GDM affects 1.1%<sup>9</sup>–14.3%<sup>10</sup> of the pregnant population in the USA, depending on the ethnic or racial composition of the population studied and on the diagnostic criteria used.<sup>11</sup> Canadian data from the 1994–1995 National Longitudinal Survey of Children and Youth<sup>12</sup> indicate that 6.5% of women reported “pregnancy diabetes” in their most recent pregnancy, while data from the Toronto Tri-Hospital Gestational Diabetes Project report a prevalence of 3.8% in their study population.<sup>13</sup>

## **INDICATIONS FOR SCREENING FOR GESTATIONAL DIABETES MELLITUS**

While the existence of an abnormality of glucose metabolism in some pregnant women cannot be disputed, a debate exists as to the clinical value and benefit of screening for GDM. Although

an association between several maternal-fetal outcomes and the level of maternal hyperglycemia has been reported,<sup>13-17</sup> no RCTs have conclusively shown that diagnosis and treatment of glucose intolerance will lead to a reduction in the immediate and long-term effects of GDM on the mother or child. Conflicting evidence exists as to the effect of diagnosis and treatment of GDM on perinatal mortality and the rates of macrosomia, shoulder dystocia, birth trauma, Caesarean section rate, preeclampsia, immediate neonatal metabolic complications, and the long-term implications of GDM on the woman and her offspring.

## **POSSIBLE EFFECTS OF GDM**

### **DIAGNOSIS AND MANAGEMENT**

#### **I. REDUCTION IN PERINATAL MORTALITY**

Although an increase in perinatal mortality in women found to have GDM<sup>18,19</sup> has been reported, recent studies have not been able to confirm this finding.<sup>16</sup> Aside from the possibility that there is no such effect, there are other reasons that may explain this discrepancy between studies. The overall decrease in perinatal mortality in recent years<sup>20</sup> means that studies now require very large sample sizes in order to have the power to show an association between GDM and perinatal mortality. Thus, excess

TABLE 2

### **GUIDELINES ON GDM 1992–2001**

<b>Organization</b>	<b>Date</b>	<b>Policy</b>	<b>Screening Test</b>	<b>Diagnostic Test</b>
Canadian Task Force on the Periodic Health Examination <sup>6</sup>	1992	Insufficient evidence to recommend screening	–	–
SOGC <sup>2</sup>	1992	Universal	50 g GCT	100 g OGTT
Fourth International Workshop-Conference on GDM <sup>7</sup>	1997	Selective	Optional: 2-step 50/100 g GCT/OGTT (threshold 7.2 mmol/L or 7.8 mmol/L) or 1 step 75 g GCT	75 or 100 g OGTT (Carpenter-Coustan conversion)
CDA <sup>4</sup>	1998	Selective	50 g GCT	75 or 100 g OGTT (Carpenter-Coustan conversion)
ADA <sup>5</sup>	1998	Selective	50 g GCT (threshold 7.2 mmol/L)	100 g OGTT (NDDG conversion)
ACOG <sup>3</sup>	2001	Universal or selective	50 g GCT (threshold 7.2 mmol/L or 7.8 mmol/L)	100 g OGTT (Either Carpenter-Coustan or NDDG conversion)

ACOG: American College of Obstetricians and Gynecologists

ADA: American Diabetes Association

CDA: Canadian Diabetes Association

NDDG = National Diabetes Data Group

7.2 mmol/L = 130 mg/dL; 7.8 mmol/L = 140 mg/dL

GCT = glucose challenge test

OGTT = oral glucose tolerance test

fetal deaths due to unrecognized GDM could go unnoticed in smaller studies. In addition, recent studies are confounded by labelling bias that leads to increased surveillance and interventions that in themselves may have a major impact on perinatal mortality and could mask a true cause and effect relationship.

## 2. REDUCTION OF MACROSOMIA RATE

Fetal macrosomia is associated with both shoulder dystocia and dystocia in labour. Shoulder dystocia (SD) occurs in 1%–2% of pregnancies, with the majority of cases occurring in non-macrosomic fetuses.<sup>21</sup> However, in pregnancies complicated by GDM the incidence of SD is increased for all birth weights, with a three-fold increase when birth weight is > 4000 g.<sup>22,23</sup> Although the majority of macrosomic fetuses are not born to mothers with GDM, 10%–25% of infants born of GDM pregnancies are macrosomic.<sup>24,25</sup> Many of the risk factors for macrosomia are similar to the risk factors for GDM. Several studies have shown that maternal obesity rather than GDM may be the determining factor in the development of macrosomia,<sup>24,26</sup> while other studies continue to show an independent increased risk of macrosomia in GDM pregnancies.<sup>13,25,27</sup>

There are fairly consistent data showing that screening and the subsequent management of GDM may reduce the incidence of macrosomia.<sup>13,28</sup> In the Toronto Tri-Hospital study, treatment of GDM reduced the incidence of macrosomia, although the birth trauma rate was not reduced.<sup>13,28</sup> Langer *et al.*, in a non-randomized prospective study, showed a significantly decreased incidence of both macrosomia and SD using an intensified management strategy with their primarily Hispanic population.<sup>17</sup>

## 3. REDUCTION IN PREECLAMPSIA

While the increase in incidence of preeclampsia in women with pregestational diabetes is well documented,<sup>29</sup> there are conflicting reports as to the effect of GDM on the development of hypertensive disorders of pregnancy.<sup>13,29,30</sup> There are no conclusive data showing that the identification and treatment of GDM will affect the rate of preeclampsia.

## 4. REDUCTION OF CAESAREAN SECTION RATE

Although treatment of GDM reduces the incidence of macrosomia this is not reflected in a lower Caesarean section (CS) rate. In the Toronto Tri-Hospital study women treated for GDM had a higher CS rate (33% vs. 20%) despite a lower macrosomia rate, probably the result of labelling bias.<sup>31</sup> In a Cochrane Database review examining the effect of dietary treatment on outcome of pregnancies complicated by glucose intolerance, there was no effect on CS rates (odds ratio 0.97, 95% confidence interval 0.65–1.44).<sup>32</sup>

## 5. BRACHIAL PLEXUS INJURY

Brachial plexus injury (BPI) occurs in 0.06%<sup>21</sup>–0.26%<sup>33</sup> of deliveries but occurs in 16%–23% of births complicated by

shoulder dystocia.<sup>21,33,34</sup> Conversely, in 46%–56% of cases of brachial plexus injury there is no recorded incident of SD.<sup>34,35</sup> GDM is an independent risk factor for BPI with a relative risk of 1.9–3.19,<sup>36,37</sup> but in only 6%–10% of brachial plexus injuries is maternal GDM documented.<sup>38,39</sup> As 80%–90% of brachial plexus injuries resolve within 1 year, the overall incidence of permanent birth injury after SD is 1.6%.<sup>40,41</sup> There are no data showing that treatment of women with GDM leads to a significant reduction in the incidence of permanent BPI, in part due to the large number of cases needed to demonstrate this effect. There are retrospective data suggesting that unmanaged or unrecognized GDM is linked to higher rates of birth trauma.<sup>25</sup>

Several studies have shown that an estimated 740<sup>42</sup> to 3695<sup>43</sup> prophylactic Caesarean deliveries would be required to eliminate a single permanent birth injury in the general obstetric population. In the GDM population, this number is reduced to 489 prophylactic Caesarean sections per prevented case, at a projected cost of \$880,000 per case prevented.<sup>43</sup>

## 6. REDUCTION OF THE IMMEDIATE NEONATAL METABOLIC COMPLICATIONS RELATED TO MATERNAL HYPERGLYCEMIA

It has been shown that maternal euglycemia in labour reduces the risks of hypoglycemia, hypocalcemia, hyperbilirubinemia, and polycythemia,<sup>17,44,45</sup> although large babies, regardless of the maternal glycemic status, are also at risk for these complications.<sup>46</sup> Thus, many neonatal nurseries have the same surveillance protocol for both babies of GDM mothers and macrosomic babies without a maternal history of GDM. It remains to be shown if non-macrosomic GDM neonates also have a significantly increased risk of metabolic complications; if this were the case, it would lend support to the importance of diagnosing GDM in pregnancy and the consequent labelling of the offspring for intensified postnatal surveillance.

## 7. PREVENTION OF THE LONG-TERM EFFECTS OF GDM ON BOTH THE CHILD AND THE MOTHER

Women developing GDM are at risk of developing type 2 diabetes. The magnitude of this risk varies among different ethnic groups, ranging from 9% in Caucasians,<sup>47</sup> 11.9% in Latinos,<sup>48</sup> and 25% in women of Mediterranean or east-Asian descent.<sup>47</sup> In studies with longer follow-up periods, the overall incidence of type 2 diabetes after the index pregnancy rises to 40%,<sup>49</sup> while there is evidence of rates as high as 70% in Canadian Aboriginal women.<sup>50</sup> There is no evidence that treatment of GDM will reduce this risk, although there may be some health benefit in the identification of GDM due to the consequent increased surveillance and earlier diagnosis of type 2 diabetes in this group.<sup>51</sup> There is limited data showing that GDM increases the incidence of diabetes and obesity in children of GDM mothers<sup>52–55</sup> though the long-term effect of *in utero* therapy on these children is not known.

## BENEFITS OF SCREENING

Screening for GDM and its consequent diagnosis lead to interventions that are likely to reduce the incidence of macrosomia<sup>7</sup> while possibly increasing the CS rate.<sup>13,31</sup> Reduction of macrosomia is only an intermediate endpoint, with reduction of birth trauma and possibly neonatal metabolic disorders being the true goal of GDM diagnosis and treatment. Evidence of other health benefits for the child or mother is lacking. The justification of screening for GDM needs to be reassessed by a large prospective RCT that has the design and power to detect these clinically important short- and long-term outcomes.

## UNIVERSAL VERSUS SELECTIVE SCREENING

Although uncertainty exists as to the value of diagnosis and treatment of GDM, universal screening for this entity is widely practiced.<sup>56</sup> In order to reduce the burden of screening on women and the health care system, the concept of selective screening was introduced. Selective screening originally consisted of taking a personal and family history in order to identify a high-risk population in need of further directed testing.<sup>2,57</sup> Women with any of the risk factors listed in Table 3 were advised to perform a 50 g glucose challenge test.

Screening by risk factors alone has a sensitivity of 63% and a specificity of 56%.<sup>57</sup> In other words, 37%–50% of women with GDM may go undiagnosed using this approach.<sup>57,58</sup> Due to this low sensitivity, most guidelines prior to 1995 recommended universal biochemical screening.

Recent data<sup>59</sup> and reviews of existing data suggesting that women at low risk for GDM could be exempt from biochemical screening led the American Diabetes Association to revise their guidelines to recommend that women who are 25 years old or younger, who are Caucasian and are not obese (< 20% over desired body weight or BMI  $\leq 27$  kg/m<sup>2</sup>) could be exempt from screening.<sup>5</sup> This revised concept of selective screening will still result in screening 90% of all pregnant patients.<sup>60</sup> Thus many clinicians continue the practice of universal screening.

TABLE 3

### RISK FACTORS FOR GDM<sup>2,7,57</sup>

1. Previous history of gestational diabetes or glucose intolerance
2. A family history of diabetes
3. Previous macrosomia (> 4,000 g)
4. Previous unexplained stillbirth
5. Previous neonatal hypoglycemia, hypocalcemia, or hyperbilirubinemia
6. Advanced maternal age
7. Obesity
8. Repeated glycosuria in pregnancy
9. Polyhydramnios
10. Suspected macrosomia

## CURRENT INTERNATIONAL SCREENING PRACTICES FOR GDM

### CANADA

Universal screening for GDM is practiced by 84% of Canadian obstetricians<sup>61</sup> although several medical centres in Saskatchewan (Personal communication, Dr Roger Turnell and Dr George Carson) and the metropolitan Hamilton area (Personal communication, Dr Patrick Mohide) have discontinued routine prenatal glucose screening.<sup>62</sup> Additional local data from the University of Sherbrooke supports a policy of not screening for GDM or of screening only when risk factors are present (Personal communication, Dr Daniel Blouin).

### UNITED STATES

Universal screening is the standard in the United States, with 94%–97% of obstetricians screening all patients.<sup>56,63</sup>

### UNITED KINGDOM

In a recent survey,<sup>64</sup> only 17% of physicians in the UK practiced universal screening, while 11% did not screen for GDM and 72% screened in the presence of maternal risk factors.

## SCREENING ALTERNATIVES

Three methods of biochemical screening for GDM have been described.

### SCREENING WITH GLUCOSE CHALLENGE TEST FOLLOWED BY AN ORAL GLUCOSE TOLERANCE TEST

Screening with a 50 g glucose challenge test (GCT) followed by a 100 g oral glucose tolerance test (OGTT) was recommended by ACOG<sup>3</sup> and the first three International Workshops on GDM<sup>65-67</sup> and also endorsed by the SOGC<sup>2</sup> in 1992. In the GCT, plasma glucose is measured 1 hour after ingestion of a 50 g pure glucose load in 150 mL of fluid and may be performed without regard to the time of day or time of last meal. Opinions differ as to the optimal cutoff value for the 50 g GCT. A value of 7.2 mmol/L (130 mg/dL) will identify 90% of women with GDM, but 20%–25% of all women screened will need to continue to the 100 g OGTT.<sup>7,57</sup> Raising the cutoff value to 7.8 mmol/L (140 mg/dL) will identify only 80% of women with GDM but decrease to 14%–18% the number of women who will have GCT results that necessitate further testing.<sup>7</sup> Naylor *et al.*<sup>59</sup> in the Toronto Tri-Hospital Study showed that different cutoff values for the 50 g GCT can be assigned to subgroups of the tested population based on a clinical risk factor scoring system. Low-risk individuals were not tested, while for intermediate-risk patients the 7.8 mmol/L (140 mg/dL) threshold was maintained. For high-risk patients the threshold was lowered to 7.1 mmol/L (128 mg/dL), achieving an 82.6% detection rate with only 16%

false positives in this group. This strategy allowed 34.6% of the study population to avoid the glucose challenge test altogether without compromising detection rates.<sup>59</sup> Sermer *et al.*,<sup>68</sup> applying receiver-operator characteristic curve analysis to the data from the Tri-Hospital Study,<sup>13</sup> demonstrated that the most efficient cutoff points for the GCT vary according to the time elapsed from the subject's last meal, thus suggesting that the threshold values for the GCT need to be adjusted accordingly.

Based on the *1998 Clinical Practice Guidelines for the Management of Diabetes in Canada*,<sup>4</sup> the recommended screening test is the 50 g GCT. If the plasma glucose level at 1 hour is  $\geq 7.8$  mmol/L, an oral glucose tolerance test is warranted. If the plasma glucose level at 1 hour is  $\geq 10.3$  mmol/L, then GDM can be diagnosed without further testing.

### SCREENING WITH 75 G OGTT

Although the 75 g OGTT is usually used as a one-step diagnostic test (described below), some investigators have reported the use of the 75 g test as a screening test with one-hour values  $\geq 7.8$  mmol/L and 8.0 mmol/L identifying women that need to proceed to a diagnostic 100 g or 75 g tolerance test.<sup>69,70</sup>

### RANDOM BLOOD GLUCOSE OR FASTING BLOOD GLUCOSE

Random blood glucose or fasting blood glucose measurements have been suggested as screening options that are more economical and well tolerated than glucose challenge tests.<sup>71,72</sup> There is a lack of conclusive data documenting the reproducibility, sensitivity, and specificity of these tests.

### DIAGNOSTIC CRITERIA FOR GESTATIONAL DIABETES MELLITUS

The following diagnostic criteria are based on the *1998 Clinical Practice Guidelines for the Management of Diabetes in Canada*.<sup>4</sup>

### 1. FASTING OR RANDOM BLOOD SUGARS

A fasting plasma glucose level  $>7.0$  mmol/L (126 mg/dL) or a random plasma glucose  $> 11.1$  mmol/L (200 mg/dL) meets the threshold for the diagnosis of gestational diabetes if confirmed on a subsequent day, and precludes the need for any glucose challenge.

### 2. TESTING WITH THE 75 G OGTT

The 75 g two-hour OGTT is the diagnostic test recommended by the WHO and is practiced in most of the world excluding North America where the 100 g three-hour OGTT is the principal diagnostic test.<sup>73</sup> Several recent North American guidelines<sup>3,7,8</sup> have emphasized the need for common diagnostic criteria although still allowing both approaches. The Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study is a large (n = 25,000) prospective study on GDM worldwide that has also adopted the 75 g approach. The new guidelines<sup>3,7,8</sup> together with the HAPO study are likely to shift even more North Americans to the 75 g screening.

There is no consensus regarding the criteria for the 75 g OGTT in pregnancy. The WHO criteria have the advantage of requiring only two blood samples, but since the threshold values are less stringent, approximately 7%–8% of the population tested will be diagnosed with GDM. The more stringent ADA<sup>74</sup> criteria require three blood samples but will decrease the number of women diagnosed with GDM to 2%–3%.<sup>75</sup> Table 4 summarizes the diagnostic criteria for the 75 g OGTT as proposed by several medical organizations. The data from the HAPO study and other large studies may lead to a standardization of the diagnostic criteria based on thresholds associated with identifiable clinical outcomes.

### 3. THE 100 G OGTT

Despite criticism of the 100 g OGTT,<sup>76</sup> in view of its popularity in North America, a 100 g glucose load may be used in diagnosing GDM. Diagnostic criteria are either the Carpenter-Coustan

TABLE 4

CRITERIA FOR DIAGNOSIS OF GDM WITH THE 75 G OGTT

Organization	Fasting	1 h PG	2 h PG	Diagnostic Criteria for GDM
WHO <sup>73</sup>	$\geq 7.0$ mmol/L (126 mg/dL)	Not measured	$\geq 7.8$ mmol/L (140 mg/dL)	One abnormal value
Fourth International Workshop <sup>7</sup> /ADA <sup>74</sup>	$\geq 5.3$ mmol/L (95 mg/dL)	$\geq 10.0$ mmol/L (180 mg/dL)	$\geq 8.6$ mmol/L (155 mg/dL)	Two or more abnormal values
<i>Clinical Practice Guidelines for the Management of Diabetes in Canada</i> <sup>4</sup>	$\geq 5.3$ mmol/L (95 mg/dL)	$\geq 10.6$ mmol/L (190 mg/dL)	$\geq 8.9$ mmol/L (160 mg/dL)	GDM: Two or more abnormal values IGT: One abnormal value

PG: Post glucose  
ADA: American Diabetes Association  
IGT: Impaired glucose tolerance

Status	Carpenter-Coustan Conversion <sup>79</sup> Plasma or Serum Glucose Level		NDDG Conversion <sup>80</sup> Plasma Level	
	mg/dL	mmol/L	mg/dL	mmol/L
Fasting	95	5.3	105	5.8
One hour	180	10.0	190	10.6
Two hour	155	8.6	165	9.2
Three hour	140	7.8	145	8.0

NDDG: National Diabetes Data Group  
Two or more values must be met or exceeded.  
The test should be performed after 8–14 hour fast and following 3 days of unrestricted diet (>150 g carbohydrate per day).

or NDDG conversion of the original O'Sullivan values<sup>77</sup> (Table 5). Schwartz *et al.*, based on a retrospective analysis of 8557 OGTT results, estimated that replacing the NDDG criteria with the Carpenter and Coustan criteria would increase by 54% the number of pregnant women with a diagnosis of GDM and would also increase costs, while only minimally affecting prevalence of infant macrosomia.<sup>78</sup>

#### 4. POSTPARTUM TESTING

Women diagnosed with GDM in pregnancy should have a fasting blood sugar and 75 g OGTT to determine their glycemic status 6–12 weeks postpartum<sup>8</sup> (Table 6).

#### RECOMMENDATIONS

1. A single approach of testing for GDM cannot be recommended at the present as there is not enough evidence-based data proving the beneficial effect of a large screening program. Until a large prospective RCT shows a clear clinical

benefit for screening and consequently treating GDM, recommendations will by necessity be based on consensus or expert opinion.

Each of the following approaches is acceptable.

- a. Routine screening of women at 24–28 weeks of gestation may be recommended with the 50 g glucose challenge test (GCT), using a threshold of 7.8 mmol/L (140 mg/dL), except in those women who fulfill the criteria for low risk, which includes the following:
  - maternal age < 25
  - Caucasian or member of other ethnic group with low prevalence of diabetes
  - pregnant body mass index (BMI) ≤ 27
  - no previous history of GDM or glucose intolerance
  - no family history of diabetes in first-degree relative
  - no history of GDM-associated adverse pregnancy outcomes.

	Diabetes Mellitus	Impaired Glucose Tolerance (IGT)	Impaired Fasting Glycaemia (IFG)
Fasting plasma glucose (FPG)	≥ 7.0 mmol/L (126 mg/dL)	≤ 7.0 mmol/L (126 mg/dL)	≥ 6.1 mmol/L (110 mg/dL) and < 7.0 mmol/L (126 mg/dL)
	or	and	
2-hour 75 g value	≥ 11.1 mmol/L (200 mg/dL)	≥ 7.8 mmol/L (140 mg/dL) < 11.1 mmol/L (200 mg/dL)	< 7.8 mmol/L (140 mg/dL)

Adapted from: WHO Consultation: Definition, diagnosis and classification of diabetes mellitus and its complications; 1999.<sup>73</sup>

The diagnostic test can be the 100 g oral glucose tolerance test (OGTT) as recommended by ACOG,<sup>3</sup> or the 75g OGTT, according to the American Diabetes Association (ADA)<sup>74</sup> criteria. Use of the World Health Organization (WHO) criteria will approximately double the number of women diagnosed with GDM without an apparent clinical benefit. (III-C)

b. A small but significant number of Canadian obstetricians and centres have a policy of non-screening for GDM. Until evidence is available from large RCTs that shows a clear benefit from screening for glucose intolerance in pregnancy, the option of not screening for GDM is considered acceptable. Conversely, there are no compelling data to stop screening when it is practiced. (III-C)

c. The clinician should consider the recommendation of the Fourth International Workshop-Conference<sup>7</sup> that women considered at high risk for GDM should undergo a diagnostic test as early in pregnancy as possible and that testing should be repeated at 24–28 weeks if initial results are negative. (III-C)

d. If GDM is diagnosed, glucose tolerance should be reassessed with a 75 g OGTT 6–12 weeks postpartum in order to identify women with persistent glucose intolerance.<sup>8,73</sup> (III-C)

2. A large RCT is needed to quantify the advantages and disadvantages of routine screening for GDM. Furthermore, the need for universally accepted, outcome-based diagnostic criteria for GDM is emphasized. (III-C)

## ACKNOWLEDGEMENTS

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*These guidelines replace SOGC Committee Opinion No. 1 dated June 1992.*

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