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Focus on Gestational Diabetes

Gestational diabetes (GDM) is defined as carbohydrate intolerance of varying degrees of severity with onset or first recognition during pregnancy. GDM increases the risk of maternal hypertensive disorders, cesarean delivery, fetal macrosomia, neonatal hypoglycemia, jaundice, polycythemia, and hypocalcemia. In addition, fasting hyperglycemia (whole blood glucose > 95 mg/dl or plasma glucose >105 mg/dl) may be associated with an increase in the risk of intrauterine fetal death during the last 4–8 weeks of gestation [1].

Diagnosis [1]

“**A** fasting plasma glucose level >126 mg/dl (7.0 mmol/l) or a casual plasma glucose >200 mg/dl (11.1 mmol/l) meets the threshold for the diagnosis of diabetes, if confirmed on a subsequent day, and precludes the need for any glucose challenge.”[1] In the absence of this degree of hyperglycemia patients may be evaluated using a 1 hour 50 gram oral glucose tolerance test (OGTT) as screening test, or proceed directly to a diagnostic 3 hour 100 gram OGTT [1]

Sweet Success recommends that all pregnant women be screened for gestational diabetes at 24-28 weeks, or earlier if risk factors are present. Screening is usually done using the 1 hour oral glucose tolerance test.

Patients should be screened at their first prenatal visit if any of the following risk factors are present[2]:

- Family history of diabetes in first-degree relatives
- Previous history of:
 - Gestational diabetes
 - Macrosomia
 - Unexplained stillbirth
 - Malformed infant
- >25 years of age
- BMI >30
- Glucosuria > 2+
- Member of an ethnic/racial group with a high prevalence of diabetes (i.e., Hispanic-American, Native American, Asian-American, African-American, Pacific Islander, or of Indigenous Australian ancestry)
- Taking medications causing hyperglycemia (i.e. terbutaline, prednisone)

1 hour 50 gram OGTT [2]

The test can be done at any time of the day. Fasting is not required.

Administer a 50 gram glucose load followed by a one-hour plasma glucose:

- Negative test if : < 140 mg/dl*
- Positive test if: ≥ 140 mg/dl

*The cutoff of 140 provides a sensitivity of 80%. Using a threshold of 130 increases the sensitivity to 90%.

For values 140 mg/dl to 179 mg/dl follow-up with a 3-hour 100 gram OGTT within one week.

For values > 180 mg/dl, a fasting blood sugar should be checked as soon as possible.

- If the fasting value is ≥ 95 and the screening test ≥ 180 mg/dl then treatment for gestational diabetes is recommended.
- If the fasting value is less than 95 then proceed with the 3-hour OGTT.
- A woman evaluated early based on risk factors who is found to be normoglycemic, should be retested at 24-28 weeks.

3-hour 100 Gram Oral Glucose Tolerance Test (OGTT) [2]

The 3-hour OGTT is done after an **overnight fast for at least 8 hours** but not more than 14 hours after at least three days of unrestricted diet and physical activity.

Abnormal 3-hour 100 gram OGTT values are:

- Fasting ≥ 95 mg/dl
- One hour ≥ 180 mg/dl
- Two hour ≥ 155 mg/dl
- Three hour ≥ 140 mg/dl

At least two out of four values must be equaled or exceeded to diagnose gestational diabetes.

If only one value is elevated on the 3 hour OGTT then manage with diet and exercise, and consider retesting at 32 to 34 weeks for patients with risk factors. Evaluation for fetal macrosomia near term is also recommended.

Therapy Diet

Patients should be referred for nutritional counseling with individualization of diet based on height and weight. The ADA recommends ~ 30 kcal/kg /d based on prepregnancy weight for nonobese patients [3]. Obese patients (BMI >30) may be placed on moderate caloric restriction 25 kcal/kg actual weight per day [1]. However, ketonuria should be avoided. [4]. Carbohydrate intake should be limited to less than 40 percent of total calories [1].

Exercise [5]

An exercise program may obviate the need for insulin therapy. The program should include a minimum of three episodes of exercise per week, each >15 min. 2–4 weeks may be required before a lowering of blood sugar occurs.

Recommended Target Capillary Blood Glucose Levels [2]

Time	Glucose Value
Fasting	70 - 90mg/dl
Before meals	70 - 90 mg/dl
1 hour after meals	100 -130 mg/dl
2 hours after meals	90 - 120 mg/dl
Bedtime	90 - 120 mg/dl
2:00 to 3:00 AM	80 - 100 mg/dl

Insulin [1]

If after 2 weeks [4] diet and exercise therapy fail to maintain fasting whole blood glucose < 95 or 1-h postprandial or whole blood glucose to < 140 mg/dl then insulin therapy is

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generally recommended [1].

However, intensive therapy may actually worsen perinatal outcome in the mother with a small for gestational age fetus [6]. Ultrasound assessment of fetal growth in conjunction with evaluation maternal glycemia is, therefore, appropriate in selecting pregnancies that would benefit from intensive therapy [7].

Insulin may be initiated using the following guidelines [2]

Weeks	Total daily Insulin
1-18	0.7 U/kg*
18-26	0.8 U/kg
26-36	0.9 U/kg
36-40	1.0 U/kg

*(actual weight)

For a twice daily dosing schedule 2/3 of the total insulin dose (2/3 as NPH and 1/3 as regular insulin) is given ½ hour before breakfast. The remaining third (1/2 as NPH and 1/2 as regular insulin) is given ½ hour before dinner.

Although glyburide has been used in the treatment of GDM further studies are needed in a larger patient population to establish its safety and efficacy before it can be recommended for general use [1,4].

Surveillance [5]

- Ultrasound is recommended for the detection of congenital anomalies for women in whom GDM has been diagnosed in the 1st trimester or who present with a fasting glucose concentration >>120 mg/dl (6.7 mmol/l).
- Monitor fetal movements during the last 8–10 weeks of pregnancy
- Evaluate maternal blood pressure, body weight, and urinary protein at each prenatal visit.
- "Non-stress testing" should be considered from 32-34 weeks' gestation onward in ≥ A2DM, and at or near term in those requiring only dietary management

Macrosomia [4]

Patients should be counseled regarding possible cesarean delivery when the estimated fetal weight exceeds 4,500 g. When the estimated fetal weight is 4000 to 4,500 grams additional factors such as past delivery history and clinical pelvimetry may be helpful in considering the mode of delivery.

“Operative deliveries should be avoided, in patients with GDM who have an estimated fetal weight of 4,000 g or more and a prolonged second stage of labor.”[4]

Cesarean delivery should be considered in patients with an estimated fetal weight > 4000 grams and failure of descent or protracted labor [4,8] .

Delivery

Prolongation of gestation past 38 weeks increases the risk of fetal macrosomia without reducing cesarean rates, so that delivery during the 38th week is reasonable unless obstetric considerations dictate otherwise [1, 5].

Amniocentesis for assessment of fetal lung maturity is not felt to be indicated in well-controlled patients after 38 weeks' gestation as long as there is reasonable certainty about the estimation of the gestational age [5].

On the evening before elective induction or elective Cesarean section, the usual dose of NPH may be given. On the morning of elective induction insulin is withheld and blood glucose monitored every 1 to 3 hours.[2]

Glucose Monitoring in Labor[2]

- Do initial blood glucose per fingerstick on admission.
- If blood glucose is > 110 mg, discontinue D5LR if in use and substitute LR. Check blood glucose in one hour.
- If blood glucose is between 70 and 110 mg/dl, repeat blood glucose q 3 hours and record.
- Once active labor begins or glucose levels fall below 70 mg/dl, the infusion is changed from LR to D5LR and delivered at a rate of 125 ml/hr .
- If blood glucose. >= 110 mg may treat using insulin drip as in Table1.
 - Other insulin algorithms are just as acceptable.
- If blood glucose < 110 mg repeat blood glucose every 3 hrs and record.

Table 1. Insulin Drip

Blood glucose (mg/dl)	Insulin (U/hr)
110 to 140	1.0
141 to 160	2.0
161 to 180	2.5
181 to 200	3.0
201 to 220	4.0

Adapted from Hollingsworth and Moore [9].

Postpartum [10]

- GDM—Usually no therapy required
- Type I—When eating restart one-third to one-half of the antepartum daily dose, or 60% of prepregnancy dose
- Type II-- When eating restart prepregnancy insulin regimen or oral hypoglycemics if not breastfeeding.

It is important that mothers be tested 6 weeks postpartum with a glucose challenge test, because the deleterious effects of diabetes on the mother's health and her subsequent pregnancies are easier to prevent than to treat.

If the fasting glucose levels during pregnancy were 105 to 130 mg/dl, 50% of mothers will subsequently be found to be overtly diabetic. If fasting blood sugars were > 130 mg/dL then 86 % of women will become overtly diabetic [11].

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