



# Ambulatory Management of Gestational Diabetes

With gestational diabetes affecting up to 5% of all pregnancies, it is important to be aware of the different circumstances in which it may present.

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**G**estational diabetes (GD) affects 3% to 5% of all pregnancies. Untreated GD has an increased risk of perinatal morbidity and mortality, as well as maternal morbidity. The most effective treatment approach involves a multidisciplinary team in an ambulatory setting. The following case examples illustrate common issues in the management of gestational diabetes.

## Case #1 — The Value of Diagnosing GD

*M.M. is a 25-year-old gravida 1 (G1) parity 0 (P0) at 24 weeks gestation. She was*

*slightly overweight prior to pregnancy and her weight gain has been higher than expected. A maternal aunt developed Type 2 diabetes at a young age. She has been researching GD on the Internet, and has noticed some conflicting information. She wants your opinion of the value of screening and treatment for GD.*

Untreated GD can lead to a number of complications. Macrosomia is associated with increased risks of operative delivery, birth injury, childhood obesity and an increased incidence of Type 2 diabetes at a young age. Metabolic complications include delayed lung development, neonatal hypoglycemia, hypocalcemia and

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## Gestational Diabetes



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jaundice. Adverse outcomes, however, can be prevented with treatment. There are a number of risk factors that increase the chance of a woman developing GD, including: advanced maternal age; high body mass index (BMI); ethnic predisposition; having previously given birth to large infants; and family history. The history of this patient clearly indicates a need for screening.

While some believe that very low-risk women do not need routine screening (none of above risk factors), many studies have shown that universal screening is the best approach.

### Case #2 — Approaches To Diagnosis

*B.D. is a 35-year-old G3 P2 at 12 weeks gestation, with a normal BMI. She had GD in her previous pregnancy, which was controlled by diet and activity. She had an uncomplicated term spontaneous vaginal delivery (SVD) of a 3,400 g infant. She found both the glucose tolerance test (GTT) and the capillary testing to be unpleasant, but she does want another successful outcome. She asks you if it is possible to prevent GD in this pregnancy and how to diagnose GD early if it is present.*

The risk of a recurrence of GD is at least 50%. Adopting a healthy diet and regular exercise program may decrease the chance of developing GD. There are several published criteria for diagnosing GD. These reflect the fact that the risk of adverse outcomes is directly related to maternal glucose levels, with no clear cut-off point between normal and abnormal.

Table 1

## THREE-HOUR 100-GRAM GLUCOSE TOLERANCE TEST VALUES

- FBG > 5.3 mmol/L
- 1 hr > 10.0 mmol/L
- 2 hr > 8.6 mmol/L
- 3 hr > 7.8 mmol/L

If two or more values are met or exceeded: gestational diabetes  
 If one value is met or exceeded: impaired glucose tolerance

The authors recommend following the recommendations of the Fourth International Workshop-Conference on Gestational Diabetes Mellitus, which proposes that screening be done with a one-hour 50-g glucose challenge, with an abnormal value being 7.8 mmol/L or higher. While this is routinely done between 24 and 28 weeks of gestation, women at high risk are often screened earlier in their pregnancy. An abnormal 50-g test is best followed by a three-hour GTT to make the diagnosis (Table 1). Women with a 50-g test greater than 10.3 mmol/L, or those who cannot tolerate the GTT, can proceed directly to capillary blood glucose (CBG) testing.

**Initial Clinical Visit.** Following an abnormal GTT, the woman is seen in the diabetes-in-pregnancy clinic to begin management. On her initial visit, the woman spends one hour with the nurse educator and with the dietitian. This initial educational session is an important time to establish rapport, assess individual learning needs and to stress that this is a manageable condition. The roles of each team member should be explained and contact numbers should be provided. Topics for discussion include the pathophysiology of GD, risks to the mother and baby if untreated, future

pregnancies and risk of Type 2 diabetes. The basic management of diet, activity and insulin, if required, also should be outlined.

The woman should be taught how to test her CBG levels (a loaner meter is provided) and urine ketones. Testing schedules and record keeping are taught as well. Questions and discussion are encouraged. A take-home booklet should be provided, as the amount of information can be quite overwhelming for the patient.

Basic principles of diet therapy should be provided at this time. The importance of avoiding simple sugars and spreading food throughout the day must be emphasized. Most women are given a diet of three meals

and three snacks. A detailed diet history is necessary because it is important to match the prescribed diet to the types of food that the woman is used to eating. Adequate weight gain is important in the management of GD.

A regular daily exercise/activity program is an important component in managing diabetes during pregnancy. With consistently scheduled exercise, serum glucose

An abnormal 50-g test is best followed by a three-hour glucose tolerance test to make the diagnosis.

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Table 2

**CASE #3 BLOOD SUGAR SCHEDULE**

Date	Breakfast		Lunch		Dinner		Bedtime
	AC	PC	AC	PC	AC	PC	AC
Jan. 26	5.2	8.0	4.1	8.2	4.4	7.7	5.0
Jan. 27	5.4	8.1	4.3	8.1	4.2	7.5	4.8
Jan. 28	5.1	8.5	4.2	7.8	4.3	7.3	5.1
Jan. 29	5.5	8.2	4.4	7.9	5.1	7.9	5.9

BG goals are: 5.0 mmol/L or less before meals and bedtime snack; 7.2 mmol/L or less after meals  
AC = before meal; PC = after meal

A regular daily exercise program is an important component in managing diabetes during pregnancy.

levels are significantly reduced, since exercise facilitates insulin binding to, and affinity for, its receptors in the muscles.

**Return Clinic Visit.** After several days of diet, exercise and CBG testing, the woman returns to the clinic to meet with all team members.

CBG results are to be reviewed and necessary changes should be made to diet and activity. If levels are stable, the frequency of testing may be decreased.

Testing technique should be observed and the meter's memory should be checked for accuracy.

Insulin may need to be started. Follow-up visits are arranged as needed.

Diabetes management is time-consuming and expensive. In the authors' clinic, patients receive ongoing encouragement for the hard work they have done. The ultimate goal is a healthy mother and baby.

The following case studies provide examples of some common patterns of glu-

cose levels and the authors' suggestions for management.

## Case #3 — Diet Therapy

*D.L. is 30 weeks pregnant. Her total weight gain is normal, but she has not gained any weight since she was seen initially last week. She is hungry before breakfast and has been showing small to moderate ketones before breakfast. D.L. is not able to exercise after lunch due to her work schedule. Her blood sugars for the last four days are shown in Table 2.*

Her results show that she is not receiving enough calories. This is reflected by her hunger, lack of weight gain and presence of ketones. This results in her high bedtime and fasting values due to stimulation of fat breakdown.

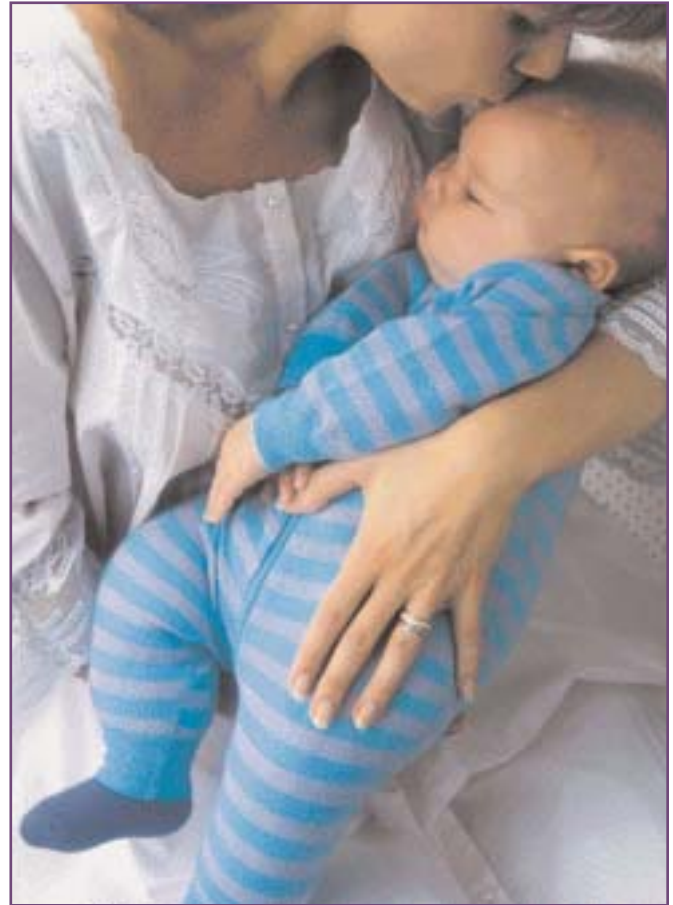
Increasing her calories will both alleviate her hunger and improve her glucose values at these times. Her high post-meal levels can be improved by shifting food away from meals and into her snacks. This should result in normal post-meal levels without increasing the pre-meal values. It is likely that she will be able to be controlled on diet therapy for the entire pregnancy.

### Case #4 – Insulin Therapy

*R.Y. has been diagnosed at 29 weeks with abnormal glucose tolerance (AGT). She returns to the clinic after five days of blood glucose testing. She has no ketonuria or hunger. Her average values are: before breakfast 5.7, and after breakfast 8.7; before lunch 5.2, and after lunch 7.5; before supper 6.5, and after supper 7.1; and bedtime 6.2*

Sometimes, even the most heroic nutritional efforts are not enough to achieve normal blood glucose values. Her values are high at all times, indicating there is no room to shift food to improve glucose values. Insulin is started when glucose values remain high after all possible diet and activity changes have been made. In general, women whose pre-meal values are greater than 5.5 mmol/L or post-meal values are greater than 7.8 mmol/L should all be started on insulin. Pre-meal values of 5.0 mmol/L to 5.5 mmol/L or post-meal values of 7.2 mmol/L to 7.8 mmol/L require individual judgment. For example, evidence of macrosomia on ultrasound would indicate this baby is not tolerating this degree of hyperglycemia, and the mother, therefore, should be started on insulin.

Insulin requirements are extremely variable in pregnancy, with daily doses ranging from 10 to several hundred units. We usually start with a small dose, between two and 10 units of each type of insulin, depending on the specific CBG levels. All women with GD in the authors' clinic are controlled on a split-dose insulin regimen with NPH and/or regular insulin taken before breakfast and after supper. Premixes are not ideal for pregnancy, as one cannot do the fine adjustments needed to obtain good control.

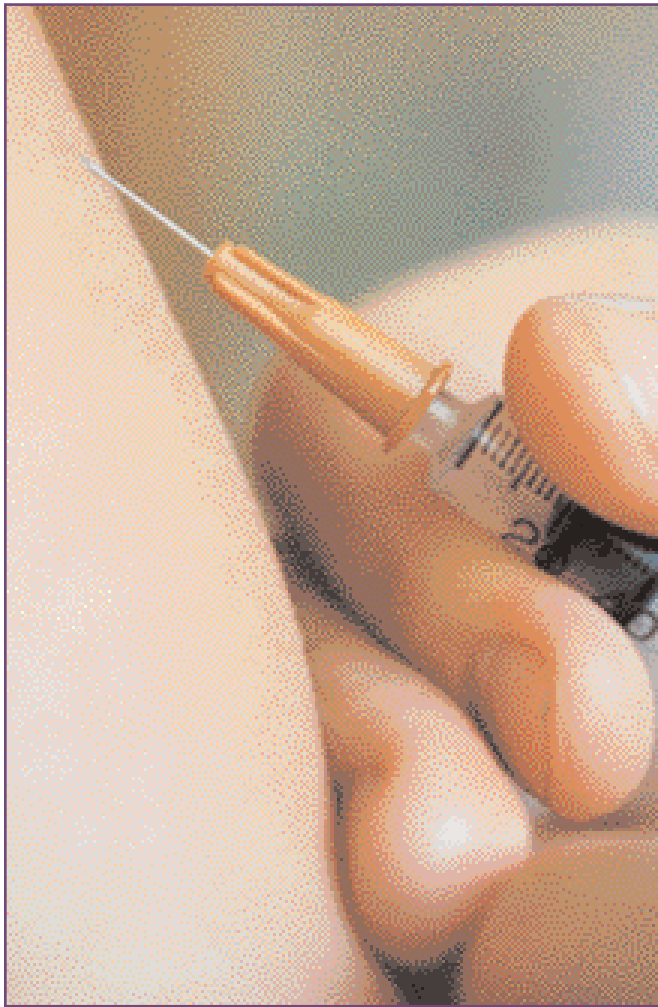


In spite of apprehension about using insulin, women are usually very motivated to protect their baby and adjust to taking insulin without difficulty. Most learn to prepare and inject insulin in 30 minutes.

We provide them with an insulin pamphlet, so they do not have to worry about remembering everything they are told. Specific instructions regarding dose and injection schedules should be written down for the patient. Women who find it difficult initially to mix insulin can start on one type, and learn to

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Almost all women are able to do their own injections.

mix when they have become more familiar with self-injection. Almost all women are able to do their own injections.

The nurses in the authors' clinic are certified in insulin adjustment. We ask women to call daily until CBG levels are stable and, consequently, they have developed some skill in self-adjustment. We maintain frequent contact as needed until delivery.

In order to adjust insulin safely, diet and activity should be stable. Careful question-

ing may be necessary to determine any variations. Regular CBG monitoring prior to breakfast, lunch, supper and bedtime snack should be done. These values should be under 5.0 mmol/L. Post-meal values may be checked weekly, with the target of less than 7.2 mmol/L. Women are asked to write down all results rather than storing them on the meter's memory, so they may be able to see patterns. They also are asked to make notes of any variations, which may influence CBG values.

CBG values may not be accurately reported for a number of reasons. We ask women to bring their meters to all appointments, so that we can verify their records with the meter's memory if necessary.

Insulin changes are made daily when hyperglycemia persists. The usual increase made by the nurses in the authors' clinic is two units for each type of insulin per injection, with a maximum increase of 10% of the current dose of each type. When larger increases are involved, the physician is contacted. Once euglycemia is achieved, contact is maintained to ensure that further increases are made as needed. Women are instructed about prevention and treatment in case they experience hypoglycemia, although this is rare in GD.

Insulin dose is adjusted according to the usual principles:

- High pre-breakfast: increase NPH before supper if no nocturnal hypoglycemia (unusual in GD);
- High pre-lunch: increase regular insulin before supper;
- High pre-supper: increase NPH before breakfast; and
- High bedtime: increase regular insulin before supper.

The physician is always available for problems, and when the clinic is closed.

## Case #5 – Labor Management

*R.Y. is now 40 weeks and doing well on insulin. She took her usual pre-breakfast dose of insulin at 7:30 a.m. She is admitted in active labor at 10:00 a.m., and is concerned about glucose control during labor.*

The goal in labor is to keep maternal glucose levels below 8.0 mmol/L in order to prevent neonatal hypoglycemia. Women become very insulin sensitive during labor and may require small doses of subcutaneous regular insulin. We test CBG every two hours until active labor, and then hourly, and use the following sliding scale.

If CBG is:

- 8.1-11.0 mmol/L give one unit regular insulin;
- 11.1-14.0 mmol/L give two units regular insulin; and
- > 14.0 mmol/L give three units regular insulin.

Hypoglycemia is uncommon and treated with juice or intravenous glucose as need-

ed. Ketones are not good fuel during labor, and should be treated with intravenous D10 W until clear.

## Post-partum

A fasting CBG is done about 24 hours post-partum and should be less than 6.0 mmol/L. Higher values require follow-up. Counseling should be provided about the importance of a healthy lifestyle, the risk of recurrent GD and the increased lifetime risk of Type 2 diabetes (as high as 40% after 10 years).

### Suggested Reading

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