In addition to causing complications during pregnancy and delivery, gestational diabetes can carry lasting health risks for both mother and child. Here's how to keep short- and long-term problems at bay.

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Once viewed strictly as a complication of pregnancy, gestational diabetes mellitus (GDM) is now recognized as a complex metabolic condition that can present problems for mother and child later in life. Up to 9% of pregnant women develop GDM, and women who develop the condition during one pregnancy have a 50% – 70% chance of being affected by the disease in subsequent pregnancies.¹,²

These women also have a 30% – 50% chance of developing Type 2 diabetes later in life and face an increased risk of suffering from cardiovascular disease, hypertension, or stroke prematurely.¹ Likewise, there are long-term implications for their children, who face an increased risk of diabetes and obesity in adolescence and adulthood.²

The good news, though, is that with early intervention, diligent monitoring, and disease management, GDM can usually be controlled and most, if not all, of its adverse effects avoided. Your role in patient care, therefore, will be key.

### Pregnancy and diabetes: Understanding the link

A complex interplay of hormones makes pregnant women particularly prone to hyperglycemia. Placental lactogen, estrogen, and progesterone create insulin resistance, where the effectiveness of insulin in lowering the levels of blood sugar is diminished. Peripheral insulin sensitivity—which well the body responds to insulin—decreases and by the third trimester, it’s only half of what it was in the first trimester.¹ At the same time, basal hepatic glucose production increases, which increases blood glucose.³

Maternal insulin production typically increases to compensate for these changes. But not all women produce enough insulin to meet the rising demand. Those who don’t, develop GDM, defined as glucose intolerance that begins or is first detected during pregnancy.

Left untreated, gestational diabetes increases the risk of preeclampsia and preterm labor.¹ What’s more, excess glucose crosses the placental barrier and causes macrosomia—excessive fetal growth. Women with GDM have an increased risk of a difficult, instrument-assisted delivery or a delivery by Cesarean section, usually because of the infant’s size.

A vaginal delivery puts an infant with macrosomia at risk for shoulder dystocia—a complication in which the baby’s shoulder becomes stuck on the mother’s pelvic bone. Shoulder dystocia can cause Erb’s palsy, paralysis of the arm that usually resolves within a few days or weeks but in some cases may have lasting effects.¹ More importantly, if the baby remains stuck, shoulder dystocia can lead to fetal hypoxia, and possibly even death.¹

Poor maternal glycemic control endangers the fetus in other ways, as well. GDM can cause intrauterine hypoxemia and placental insufficiency, resulting in fetal polycythemia, an excess of red blood cells that increases blood viscosity and can lead to problems both before and after birth because the blood becomes too thick. Newborns may also develop hypoglycemia as a result of the excess insulin they produce during gestation.¹

Right after delivery, respiratory distress is a rare but potentially serious complication.¹ An infant who secretes excess insulin to deal with increased maternal
Glucose might experience delayed lung maturity, which increases his risk for respiratory distress.

Critical interventions hinge on knowing who's at risk

Successful treatment of GDM depends upon early detection and intervention. The earlier you intervene, the more time you'll have to help the mother maintain normal blood glucose levels and create a healthier intrauterine environment.

Whenever you see a pregnant woman, whether for a prenatal checkup or any other reason, assess her risk factors for GDM. These include obesity, family history of diabetes or GDM, previous delivery of a baby who was large for his gestational age, and polycystic ovarian syndrome.

Ethnic background plays a role, too: GDM is up to 10 times more prevalent among Native Americans than it is among the general population. African-Americans are one-and-a-half times more likely to develop gestational diabetes than their Caucasian counterparts. Hispanics and Pacific Islanders also have an increased risk.

Whether screening for the condition should be selective or universal is subject to ongoing debate. The American Diabetes Association recommends selective screening, excluding low-risk women—those with a normal pre-pregnancy weight, no ethnic risk factors, and no family history of diabetes or personal history of difficult pregnancy.

The American College of Obstetricians and Gynecologists (ACOG) takes a different approach. Since most cases of GDM develop in the fifth or sixth month of pregnancy, ACOG recommends universal screening at 24 – 28 weeks' gestation. As a practical matter, an estimated 90% of obstetricians screen all their pregnant patients.

The 50 gm, one-hour glucose screening test (GST), which measures a patient's blood glucose levels an hour after she drinks a glucose solution, is the most widely used method. Fasting isn't required, and the test can be given at any time of day. Traditionally, a blood glucose level >140 mg/dL has been the threshold for further investigation, but there's evidence that using >130 mg/dL as the cutoff identifies 10% more cases of GDM.

If a patient exceeds the threshold being used, she will typically undergo a 100 gm, three-hour glucose tolerance test (GTT). Here, blood glucose is measured after the patient fasts for eight to 14 hours and again at one, two, and three hours after she consumes 100 gm of glucose.

A diagnosis of GDM requires two or more glucose values to exceed the criteria. Some clinicians use a fasting level ≥95 mg/dL, a one-hour level ≥180 mg/dL, a two-hour level ≥155 mg/dL, and a three-hour level ≥140 mg/dL as the threshold. Others set the threshold at 105, 190, 165, and 145 mg/dL, respectively.

A diagnosis of GDM leads to a focus on diet, exercise

To maintain tight control, a woman with GDM needs to eat a balanced diet, increase her physical activity, and closely monitor her glucose levels, typically testing her blood by fingerstick immediately after waking in the morning and after each meal. About 85% of patients can achieve the targets—before-meal levels of 80 – 95 mg/dL and two-hour post-prandial levels of <120 mg/dL—with lifestyle changes alone.

To help make lifestyle changes a reality, your GDM patient will need to receive nutritional counseling from a registered dietitian. While the optimal diet hasn’t been determined, patients are generally advised to limit their carbohydrate intake to 35% – 40% of their total daily calories.

Recommendations for total caloric intake are based on body mass index. A pregnant woman of normal weight (BMI of 20 – 25) should consume 30 kcal/kg/day, underweight patients (BMI <20) should take in 35 – 38 kcal/kg/day, and overweight or obese patients should restrict their intake.

Quick Facts

- Gestational diabetes mellitus increases a mother's and child's risk of developing diabetes later in life.
- While about 85% of women with gestational diabetes can control it with diet and exercise, the remaining 15% need drug therapy.
- Regular blood glucose tests are recommended for anyone who has had gestational diabetes.
Take to 20–25 kcal/kg/day. Teach your patient that to sustain steady blood glucose levels, she should divide her daily intake into three main meals supplemented by three or four snacks. Her dietitian can help her create a realistic, culturally appropriate eating plan.

Encourage your patient to exercise regularly, too, and point out that even moderate exercise will lower her blood glucose levels. Tell her to consult her physician, who will determine how much and how intensely she can exercise without increasing her risk of preterm contractions.

Walking for 20–30 minutes three or four times a week may be the easiest, and most widely recommended, exercise for pregnant women. But no matter what activity your patient engages in, stress the need to stop immediately and call the doctor if she experiences dizziness, pain, or contractions while exercising.

Make sure your patient can recognize the signs and symptoms of low blood sugar—sweating, nervousness, shakiness, weakness, extreme hunger, slight nausea, dizziness, headache, and blurred vision—and tell her to keep low-fat milk, fruit juice, candy, or other quick-sugar foods readily available. Tell her that if she develops these symptoms, she should eat one of these foods first and then call her healthcare provider.

Support is also a crucial component of your nursing care. Listening to your patient’s concerns and emphasizing your desire to help can go a long way toward alleviating the anxiety that typically accompanies a diagnosis of gestational diabetes. Assess her stress level and coping techniques. Determine what support systems are available for your patient, and make appropriate referrals, if necessary.

Is your patient a candidate for drug therapy?

Because GDM typically isn’t diagnosed until the fifth or sixth month of pregnancy, there’s a small window of opportunity for intervention. As a result, many clinicians prescribe drug therapy if a two-week diet and exercise regimen fails to achieve target glucose levels.

Insulin is the only FDA-approved treatment for GDM, but some patients have had good results with oral hypoglycemics, particularly glyburide (Diabeta, Glynase, others) and metformin (Glucophage, Glumetza). They are much easier to store and ad-

A collaborative diabetes program spells “Sweet Success”

Because gestational diabetes mellitus affects many aspects of a woman’s life, the most effective programs are interdisciplinary. Ideally, they should include nurses, physicians, dietitians, and social workers, collaborating to provide individualized support and education.

One program that takes such collaboration to heart is Sweet Success, which operates within the framework of a larger government-funded initiative called the California Diabetes and Pregnancy Program. CDAPP is primarily a nurse-led interdisciplinary initiative that divides the state into regions. Each region has a coordinator, nurse educator, dietitian, and behavior medicine specialist who provides training and resources to clinical sites affiliated with the Sweet Success program.

Women are referred to a Sweet Success affiliate by their primary care provider. Because the program uses consistent guidelines for screening and treatment, the women get top-notch care early in pregnancy. Nurse educators, registered dietitians, and behavior medicine specialists provide individual counseling. And each patient has frequent contact with a nurse who monitors blood glucose levels via fax and phone at least every two weeks and as often as every day, if needed. The cost for this care is covered by the woman’s insurance.

As the name suggests, Sweet Success has been extremely effective since its inception more than 20 years ago. An analysis by CDAPP found that the program has decreased both maternal and neonatal morbidity, including preterm deliveries, macrosomia, birth defects, NICU admissions, and maternal admissions for diabetes control. Sweet Success affiliates report that they cared for more than 17,000 women in 2004. The Sweet Success model has spread beyond California, with similar programs in at least 38 states. To find out if there’s a program near you, call the Sweet Success resource center at (858) 536-5090 or visit www.llu.edu/llumc/sweetsuccess.

Keeping a close eye on fetal growth

For women who manage to control GDM with diet and exercise, routine prenatal care—along with regular blood glucose testing—is sufficient. For those who require drug therapy, however, more intensive fetal monitoring is recommended. The purpose, of course, is to prevent fetal compromise and stillbirth by detecting any abnormalities and intervening as needed.

Many clinicians perform weekly or biweekly non-stress tests starting at 32 weeks’ gestation. Some also recommend lung maturity testing as well as ultrasound to detect macrosomia, but ultrasound results for fetal weight aren’t always accurate. If the physician orders any of these prenatal tests, carefully explain what’s being done and what each test may reveal.

The vast majority of women with GDM have an uncomplicated vaginal delivery at between 37 and 42 weeks’ gestation. There’s no evidence that intervention is necessary before 41 or 42 weeks if the fetus is of normal weight and the pregnancy is progressing without difficulty. Elective delivery might be considered, though, if the fetal weight exceeds 4,000 gm or the mother has poor glycemic control, vasculopathy-related hypertension, or a history of stillbirth.

Immediately postpartum, infants of women with GDM face the risk of hypoglycemia and respiratory distress. Hypoglycemia usually resolves when the baby is fed, but an infant who’s symptomatic may need 10% dextrose administered IV. Monitor the baby’s blood glucose every hour until it stabilizes.

Respiratory distress is the most serious complication. An infant whose respiration is compromised may need supplemental oxygen, ventilatory support, and surfactant replacement until he can breathe on his own.

Postpartum follow-up is especially important

Because GDM is a risk factor for diabetes for both mother and child, follow-up testing is essential. The ADA recommends that women undergo a two-hour, 75 gm GTT at their six-week postpartum checkup. A patient whose results show impaired glucose tolerance needs to be reminded of the importance of continuing the lifestyle changes she made while pregnant and undergoing annual testing. If her levels at six weeks are normal, she should be tested once every three years.

There are no standards for follow-up of a child born to a woman with GDM. However, given the child’s heightened risk of diabetes and obesity in adolescence and adulthood, you’ll need to make sure his pediatrician knows the mother had GDM and encourage the mother to share this information with all future healthcare providers.

Today it’s clear that GDM is anything but a simple complication of pregnancy. In years to come, we may learn even more about the role of GDM in the development of adult-onset diseases, including diabetes, obesity, and cardiovascular disease. For now, we can continue to intervene and improve outcomes, one family at a time. RN

REFERENCES

OBJECTIVES
After reading the article you should be able to:
1. Describe the physiological changes that result in gestational diabetes mellitus (GDM).
2. Describe how GDM affects the mother and fetus.
3. Develop a teaching plan for the woman with GDM.

Circle the one best answer for each question below. Transfer your answers to the card that follows page 40.

1. All of the following hormonal changes that occur during pregnancy can make women prone to hyperglycemia EXCEPT:
   a. Peripheral insulin sensitivity decreases.
   b. Basal hepatic glucose production increases.
   c. Placental lactogen decreases insulin resistance.
   d. Placental estrogen and progesterone create insulin resistance.

2. Gestational diabetes mellitus (GDM) is defined as glucose intolerance that:
   a. Begins or is first detected during pregnancy.
   b. Begins during the first trimester and continues throughout the pregnancy.
   c. Begins during the second trimester and continues throughout the pregnancy.
   d. Is present and well-controlled prior to pregnancy but becomes difficult to control during pregnancy.

3. Untreated GDM can result in all of the following EXCEPT an increase in the risk of:
   a. Preeclampsia.
   b. Preterm labor.
   c. A breech delivery.
   d. A Cesarean delivery.

4. Patients with GDM are generally advised to limit carbohydrate intake to what percentage of their total daily calories?
   a. 15% - 20%.
   b. 22% - 26%.
   c. 25% - 33%.
   d. 35% - 40%.

5. Poor maternal glycemic control can result in intrauterine hypoxemia and placental insufficiency, endangering the fetus by causing:
   a. Polyhydramnios.
   b. Pancytopenia.
   c. Hyperglycemia.
   d. Hypothyroidism.

6. Right after delivery, the most serious risk to the newborn is:
   a. Bleeding.
   b. Polycythemia.
   c. Hyperglycemia.
   d. Respiratory distress.

7. Women who develop GDM during one pregnancy have what chance of developing it in subsequent pregnancies?
   a. 10% - 20%.
   b. 20% - 40%.
   c. 30% - 50%.
   d. 50% - 70%.

8. Women who develop GDM during one pregnancy have what chance of developing Type 2 diabetes later in life?
   a. 10% - 20%.
   b. 20% - 30%.
   c. 30% - 50%.
   d. 50% - 70%.

9. Women who develop GDM are at increased risk for all of the following EXCEPT:
   a. Stroke.
   b. Glaucoma.
   c. Hypertension.
   d. Cardiovascular disease.

10. Risk factors for GDM include all of the following EXCEPT:
    a. Obesity.
    b. Under 20 years of age.
    c. Family history of diabetes.
    d. Polycystic ovarian syndrome.

11. GDM is 10 times more prevalent in:
    a. Asians.
    b. Hispanics.
    c. Native Americans.
    d. African-Americans.

12. Up to what percentage of pregnant women develop GDM?
    a. 9%.
    b. 11%.
    c. 13%.
    d. 15%.

13. The American College of Obstetricians and Gynecologists recommends universal screening for GDM at:
    a. 12 - 16 weeks' gestation.
    b. 18 - 22 weeks' gestation.
    c. 24 - 28 weeks' gestation.
    d. 30 - 34 weeks' gestation.

14. During a vaginal delivery, infants with macrosomia are at high risk for:
    a. Hemangiomas.
    b. Meconium stool.
    c. Shoulder dystocia.
    d. Cord strangulation.

15. Which threshold level of blood glucose has been shown to identify the most cases of GDM?
    a. 125 mg/dL.
    b. 130 mg/dL.
    c. 135 mg/dL.
    d. 140 mg/dL.

16. To maintain tight control of GDM, before-meal target levels of blood glucose should be:
    a. 60 - 75 mg/dL.
    b. 80 - 95 mg/dL.
    c. 100 - 115 mg/dL.
    d. 120 - 130 mg/dL.

17. To sustain steady blood glucose levels, a woman with GDM should divide her daily food intake into:
    a. Two main meals supplemented by three or four snacks.
    b. Two main meals supplemented by five to seven snacks.
    c. Three main meals supplemented by one or two snacks.
    d. Three main meals supplemented by three or four snacks.

18. The American Diabetes Association recommends women with GDM have which study done at the six-week postpartum checkup?
    a. Hemoglobin A1C.
    b. Fasting blood sugar level.
    c. 50 gm one hour glucose screening test.
    d. 75 gm two-hour glucose tolerance test.

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