Gestational Diabetes: Overview and Management Strategies

2 Contact Hours

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First Published: October 5, 2013
Course Expires: July 30, 2017

Acknowledgments
RN.com acknowledges the valuable contributions of...
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**Purpose**
The purpose of this CE activity is to provide information to the healthcare professional (HCP) about gestational diabetes (GD) and to explore common health concerns related to this disease. The HCP will also be provided with the necessary tools to educate women about the impact of healthy lifestyle modifications on reducing the incidence of GD, and to review available pharmacotherapies with patients.

**Learning Objectives**
**After successful completion of this course, you will be able to:**
1. Define how gestational diabetes affects mother and baby
2. Identify different types of diabetes
3. Identify the effects of pregnancy on blood glucose levels
4. Describe methods to keep blood sugar under control
5. Identify how gestational diabetes can affect women later in life

**Introduction**
Diabetes is often detected in women during their childbearing years and can affect the health of both the mother and her unborn child.

Poor control of diabetes in a woman who is pregnant increases the chances for birth defects and other problems for the baby.

It can also cause serious complications for the woman (CDC, 2010).

Appropriate healthcare before and during pregnancy can help to prevent poor outcomes that can result in miscarriage, birth defects or stillbirth.
Gestational diabetes is of special concern since diabetes can affect the health of a mother and her unborn child.

**Diabetes Defined**

Diabetes is a condition in which the body cannot use the carbohydrates (sugars and starches) it takes in as food to make energy. The body either makes too little insulin in the pancreas or cannot use the insulin it makes to process fuel (carbohydrates) into energy. As a result, the body collects extra sugar in the blood and excretes some sugar into the urine. The extra sugar circulating in the blood associated with the condition known as diabetes can damage organs of the body such as the heart, kidneys, and eyes.

There are three common types of diabetes:

1. **Type 1 diabetes:** The pancreas makes so little insulin that the body can't use blood sugar for energy. Type 1 diabetes must be controlled with daily insulin shots or an insulin pump.

2. **Type 2 diabetes:** The body either makes too little insulin or can't use the insulin it makes to use blood sugar for energy. Type 2 diabetes can often be controlled through exercising regularly and eating a proper diet. Some people with type 2 diabetes may have to take oral hypoglycemics, insulin or both.

3. **Gestational Diabetes (GD):** A type of diabetes that occurs in a pregnant woman who did not have diabetes before becoming pregnant. GD can often be controlled through regular exercise and eating a proper diet; however, some women may need to take insulin as well. GD usually resolves after pregnancy, but not in all cases.

Research indicates that approximately 50% of women who have had GD will develop type 2 diabetes later in life (National Diabetes Information Clearinghouse [NDIC], 2006).

**Knowledge Check 1**

The term given to pre-existing diabetes disease in pregnant women.

A type of diabetes that occurs during pregnancy in the absence of disease prior to gestation.

Continuous low blood sugar levels in pregnant women.

The correct answer is: A type of diabetes that occurs during pregnancy in the absence of disease prior to gestation.

**Prevalence of Gestational Diabetes**

According to the National Diabetes Information Clearinghouse (2008), gestational diabetes occurs in approximately 3 to 8 pregnancies of every 100 in America.

This represents more than 200,000 cases each year.

**Risk Factors for Gestational Diabetes**

Although any woman can develop gestational diabetes during pregnancy, some of the factors that may increase the risk include the following:

- Obesity

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• Family history of diabetes
• Previous delivery of a very large infant, a still birth, or a child with a birth defect
• Excessive amniotic fluid (polyhydramnios)
• Age: Women who are older than 25 are at a greater risk for developing gestational diabetes than younger women

(NDIC, 2006)

Knowledge Check 2
Risk factors for gestational diabetes include:
Obesity, polyhydramnios and advanced maternal age.
Previous still birth, small-for-gestational age fetus, heart disease.
Family history of obesity, multiple pregnancies and pre-existing pancreatic disease.

The correct answer is: Obesity, polyhydramnios and advanced maternal age.

Pathophysiology of Gestational Diabetes
Although the exact cause of gestational diabetes is unknown, there are some theories as to why the condition occurs.

The placenta supplies the developing fetus with nutrients and produces a variety of hormones to maintain the pregnancy. Some of these hormones, namely estrogen, cortisol and human placental lactogen can have a blocking effect on insulin. This is called contra-insulin effect, which usually begins about 20 to 24 weeks into the pregnancy.

As the placenta grows, more of these hormones are produced, and insulin resistance becomes greater.

Normally, the pancreas is able to make additional insulin to overcome insulin resistance, but when the production of insulin is not enough to overcome the effect of the placental hormones, gestational diabetes results.

Excess adiposity (fat) is an important modifiable risk factor for the development of gestational diabetes. Mechanisms linking excess adiposity to elevated risk of GD are not completely understood, but recent evidence points to the crucial role of specific hormones and cytokines (“adipokines”) secreted by the adipose tissue (NIH, 2010).

Pathophysiology of Gestational Diabetes
An increase in insulin resistance occurs, which decreases maternal uptake of glucose into tissues and inhibits the suppression of lipolysis. This results in weight gain and resulting hypertension in the mother, but also increases fetal glucose levels and fetal weight gain. If not managed appropriately, excessive glucose delivered to the fetus in utero will lead to large birth weight (macrosomia) and potential birth trauma, such as shoulder dystocia (Hutcheon, 2006).

Women with gestation diabetes are at risk for uncontrolled hypertension, pre-eclampsia, cesarean section and postpartum diabetes (Riskin-Mashiah, 2009).

Complications of Gestational Diabetes During Pregnancy
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The complications of gestational diabetes are usually manageable and preventable. The key to prevention is careful control of blood sugar levels as soon as the diagnosis of gestational diabetes is established.

Pregnancy is usually a time when a woman’s body goes through many physiologic changes as it nurtures the growth and development of the fetus. All pregnant women require more nutrients, rest and energy to sustain a healthy pregnancy. They also need to be physically active.

When a woman with diabetes is pregnant, changes in her blood sugar can fluctuate rapidly. If a woman with diabetes does not keep good control of her blood sugar, her risk factors for developing some of the common problems of diabetes will increase. Those individuals who are already experiencing health problems related to their diabetes might accelerate any health problems.

Out of control blood sugar during pregnancy has the potential to lead to a spontaneous abortion (miscarriage). It can also lead to hypertension. Hypertension has been linked to numerous health problems during pregnancy including premature birth, seizures and strokes during labor and delivery. Elevated blood sugar levels can also cause a woman to produce especially large amounts of amniotic fluid. This is significant since increased amounts of amniotic fluid around the baby can result in preterm labor (CDC, 2010).

Pregnant woman with uncontrolled diabetes usually produce large infants. Besides causing additional discomfort to the woman during the last few months of pregnancy, an extra large baby can lead to problems during delivery for both the mother and the infant.

Normal blood sugar levels are between 70-110 mg/dL.

Knowledge Check 3
A blood sugar less than ___ is considered to be hypoglycemia.

60
75
90
105

The correct answer is 60.

Effects of Diabetes on the Newborn
Infants of mothers with gestational diabetes are vulnerable to several chemical imbalances, such as low serum calcium and low serum magnesium levels; but, in general, there are two major problems of gestational diabetes:

- **Macrosomia**: Refers to a baby who is considerably larger than normal. All of the nutrients the fetus receives come directly from the mother's blood. If the maternal blood has too much glucose, the pancreas of the fetus senses the high glucose levels and produces more insulin in an attempt to use this glucose. The fetus converts the extra glucose to fat. Even when the mother has gestational diabetes, the fetus is able to produce all the insulin it needs. The combination of high blood glucose levels from the mother and high insulin levels in the fetus results in large deposits of fat which causes the fetus to grow excessively large.
Hypoglycemia: Occurs when maternal blood glucose levels remain high during pregnancy, causing the fetus to have a high level of insulin in its circulation. After delivery, the baby continues to have a high insulin level, but it no longer has the high maternal glucose supply. This results in a severe drop in the newborn's blood sugar level. The infant's blood sugar level should be closely monitored after birth, and if the level is too low, it may be necessary to give the baby glucose intravenously.

Effects of Diabetes on the Newborn
Unlike type 1 diabetes, gestational diabetes generally does not cause birth defects. Birth defects usually originate sometime during the first trimester of pregnancy. But, the insulin resistance from the contra-insulin hormones produced by the placenta does not usually occur until approximately the 24th week. Women with gestational diabetes generally have normal blood sugar levels during the critical first trimester.

If a woman with diabetes has problems that lead to a preterm birth, the baby might have breathing problems, heart problems, bleeding into the brain, intestinal problems and vision problems.

Research indicates that a large baby born to a woman with diabetes has an increased risk of being obese and/or developing type 2 diabetes later in life.

Identifying Women at Risk: Prenatal Management
It is important to identify and appropriately manage women with gestational diabetes as early in the pregnancy as possible. This will minimize complications in both the mother and infant.

The 2013 American Diabetes Association practice guidelines recommend screening for undiagnosed type 2 diabetes at the first prenatal visit in all women with diabetes risk factors. The guidelines also recommend that all women with a history of gestational diabetes should have lifelong screening for diabetes at least every 3 years (ADA, 2013).

Women who are at risk for developing gestational diabetes should be evaluated for use of drugs with potential teratogenic effects. Many drugs used to treat diabetes and diabetic complications are contraindicated in pregnancy, including statins, ACE inhibitors, and angiotensin receptor antagonists. If possible, these patients should receive counseling prior to conception (ADA, 2013).

The patient with GD should be closely monitored for hypertension and pre-eclampsia.

Surveillance for Potential Complications
Surveillance for potential complications related to GD should begin as soon as the disease is detected. Aggressive monitoring and intervention can reduce or prevent complications for both mother and baby.

Fetal well-being and the potential for pre-term labor needs to be assessed closely during pregnancy. Weekly monitoring should start at 32 weeks gestation and include a non-stress test (Electronic fetal monitoring is recommended to compare the infant's heart rate during movement and rest. An acceleration in heart rate is expected with or after movement in the healthy fetus. However, the heart rate may not increase during the testing period).

Some protocols may include a biophysical profile (BPP). A BPP test measures the health of the fetus during pregnancy, and may include a non-stress test with electronic fetal monitoring and a fetal
ultrasound. The BPP measures the baby's heart rate, muscle tone, movement, breathing, and the amount of amniotic fluid surrounding the fetus.

Daily fetal kick counts starting at 34 weeks gestation and monthly obstetric ultrasound to assess fetal growth should be performed. Prenatal visit frequency should be based on blood sugar control.

Screening Tool for Gestational Diabetes
Identifying women at risk can help prevent uncontrolled gestational diabetes. A simple check list can provide important screening information for healthcare professionals to evaluate the risk of a woman developing gestational diabetes.

Important information to include on a screening tool to identify gestational diabetes includes:

- **Family History**: Identifying an immediate family member with diabetes.
- **Ethnicity**: African American, American Indian, Asian American, Hispanic/Latino, or Pacific Islander are at higher risk for the development of gestational diabetes.
- **Age**: Women over the age of 25 years are at greater risk.
- **Obesity**: There is a higher risk of developing gestational diabetes in a woman who is overweight.
- **Previous history**: History of gestational diabetes or history of delivering a previous infant weighing more than 9 pounds.
- **Diagnosis of "pre-diabetes"**: A condition in which blood glucose levels are higher than normal, but not yet high enough for a diagnosis of diabetes. Other names for it are "impaired glucose tolerance" and "impaired fasting glucose."

If the woman answers yes to any of these screening questions, she is at risk for the development of gestational diabetes.

Testing for Gestational Diabetes
Testing for gestational diabetes will depend on maternal risk factors. A general guideline is as follows:

- **High risk for developing of gestational diabetes**: Establish baseline blood glucose levels at the first prenatal visit. If the test results are normal, maternal blood levels will be checked again between weeks 24 and 28 of the pregnancy. High risk includes obesity, history of GD, family history of diabetes, or presence of glycosuria (glucose in urine).

- **Average risk for developing gestational diabetes**: Initial testing of baseline blood glucose levels between weeks 24 and 28 of pregnancy. Average risk includes the presence of one or more risk factors.

- **Low risk for developing gestational diabetes**: The healthcare provider may decide the mother does not need glucose testing. Low risk includes the absence of any risk factors. (NDIC, 2006).

Depending on a patient’s risk factors and blood glucose test results, additional tests may be performed.

Testing for Gestational Diabetes
Screening Glucose Challenge Test
Gestational diabetes is usually diagnosed with a 75 gram oral glucose screening test (OGTT), which involves drinking a glucose drink followed by measurement of blood sugar levels after one and two hours. The current American Diabetes Association (ADA) guidelines recommend this test be performed between 24–28 weeks of gestation in women not previously diagnosed with overt diabetes. The OGTT should be performed in the morning after an overnight fast of at least 8 hours. The diagnosis of GD is made when any of the following plasma glucose values are exceeded:

- Initial Fasting level: >92 mg/dL (5.1 mmol/L)
- Fasting after 1 hour: >180 mg/dL (10.0 mmol/L)
- Fasting after 2 hours: >153 mg/dL (8.5 mmol/L)

(ADA, 2013).

If this test shows a blood sugar level of greater than 140 mg/dL, a three-hour glucose tolerance test (GTT) may be performed after a few days of following a special diet. If results of the second test are in the abnormal range, gestational diabetes will be diagnosed (ADA, 2013).

Women who have been diagnosed with gestational diabetes may require additional testing due to diabetes. Tests might include:

- An ultrasound exam, to check fetal growth
- "Kick counts" to check the baby's activity (the time between the baby's movements) or special "stress" tests (NDIC, 2006)

The Hemoglobin A1c Test
The hemoglobin A1c test, also known as HbA1c, glycated hemoglobin test, or glycohemoglobin, is an important blood test used to determine how well diabetes is being controlled. Hemoglobin A1c provides an average of blood sugar control over a 6 to 12 week period and is used in conjunction with home blood sugar monitoring to make adjustments to management.

When blood glucose levels are high, excess glucose binds to hemoglobin causing it to become glycated. The average amount of glucose in the blood can therefore be determined by measuring a hemoglobin A1c level.

The amount of hemoglobin A1c will reflect the last several weeks of blood sugar levels, typically encompassing a period of 6 to 12 weeks.

For people without diabetes, the normal range for the hemoglobin A1c test is between 4% and 6%.

The goal for people with diabetes is a hemoglobin A1c less than 7%. The higher the hemoglobin A1c, the higher the risks of developing complications related to diabetes (WebMD, 2009).

**The HbA1c test is used to determine how well blood sugar levels are being controlled over a 6 to 12 week period, but would not be used as a diagnostic screening tool for gestational diabetes.**

Intrapartum Management of GD
Blood glucose monitoring is a critical part of the intrapartum and postpartum management of GD.

The following guidelines may be used for monitoring blood glucose during the intrapartum period in an
uncomplicated labor:
- Finger stick blood sugar every 1 to 2 hours
- Goal is to maintain blood sugar between 80 to 110 mg/dl
- Check urine ketones with each void

In the postpartum period, the following guidelines may be used:
- Check finger stick blood sugar hourly for 2 to 4 hours
- Thereafter, if stable, reduce finger stick blood sugar to before meals and at bedtime
- If stable, decrease monitoring to a fasting morning blood sugar

**Initial Treatment for GD**
The initial treatment for gestational diabetes is lifestyle modification, diet and exercise. The usual recommendation is a 1900-2400-kcal/day diet with carbohydrate restriction to 35-40% of total calories. Simple sugars should be avoided, with complex and high-fiber carbohydrates being favored (Pridjian 2010).

If lifestyle modification does not result in euglycemia, pharmacotherapy, often with insulin, may be necessary. Optimal glycemic goals include a fasting blood glucose level of less than 96 mg/dL, 1-hour post-prandial level of less than 130 to 140 mg/dL, and 2-hour post-prandial of less than 120 mg/dL (Evensen, 2012).

Women with gestational diabetes should be monitored for components of metabolic syndrome, such as central obesity, dyslipidemia, and hypertension. Patients with gestational diabetes and hypertension should be treated to a target blood pressure of systolic blood pressure 110–129mmHg and a diastolic of 65–79 mmHg. Lowering blood pressure beyond this may be associated with impaired fetal growth (ADA, 2013).

**Knowledge Check 4**
The standard dietary recommendation for pregnant women with or at risk for GD is a:
- Less than a 1900 kcal/day with protein restrictions.
- 1900-2400 kcal/day diet with carbohydrate restrictions.
- 1900-2000 kcal/day diet with fat restrictions of 35-45% of total calories.

The correct answer is: 1900-2400 kcal/day diet with carbohydrate restrictions.

**Postpartum Management of GD**
Postpartum care is very similar for any new mother. However, there are a few differences related to both the current issues with blood sugar and the risk for type 2 diabetes in the future.

For the postpartum mother with GD the following guidelines are generally used:
- Advise her to check finger stick blood sugar hourly for 2 to 4 hours. Thereafter, if stable, reduce finger stick blood sugar to before meals and at bedtime. When these measurements are stable, decrease monitoring to a fasting morning blood sugar.
- Actively encourage her to breastfeed, since breast milk decreases the infant’s risk of developing type 2 diabetes later in life (NIH, 2010).
• Advise a follow up ophthalmology exam 6 to 8 weeks postpartum. Since diabetes is associated with vision problems, follow-up with an ophthalmologist is recommended.

• Suggest counseling for prevention of type 2 diabetes.

• Advise her on contraceptive/family planning issues.

Adjustments in Lifestyle
Women who have been diagnosed with gestational diabetes will frequently have to make changes or modifications to their current lifestyle to control their diabetes. Two major areas of change are diet and exercise.

Women diagnosed with gestational diabetes should talk with a dietitian or a diabetes educator who will design a meal plan to help choose foods that are healthy for the mother and the baby. Using a meal plan will help keep blood glucose within a target range. The plan will provide guidelines on which foods to eat, how much to eat, and when to eat. Choices, amounts, and timing are all important in keeping blood glucose levels within the target range.

A registered dietitian should be consulted to provide patient-centered nutritional recommendations. Support for individualized medical nutritional therapy (MNT), administered by specially-trained dietitians is stated in the most recent ADA guidelines (ADA, 2013). Women with gestational diabetes should be instructed to walk one to two miles at least three times a week, if able (Pridjian 2010).

Nutritional counseling should be combined with recommendations for exercise and be culturally appropriate. The amount and distribution of carbohydrate should be based on clinical parameters, such as hunger, blood glucose levels, weight gain, and (rarely) ketone levels (Evensen, 2012).

Please see Appendix One for additional dietary recommendations for patients with gestational diabetes.

Nutritional Recommendations
Women are generally advised to:

• Limit sweets

• Eat three small meals and one to three snacks every day

• Be careful about when and how much carbohydrate-rich food is eaten; it is advisable to follow the meal plan that will indicate when to eat carbohydrates and how much to eat at each meal and snack

• Include fiber in meals in the form of fruits, vegetables, and whole-grain crackers, cereals, and bread

Adjustments in Lifestyle: Exercise and Insulin
Exercise
Physical activity, such as walking and swimming, can help women reach their blood glucose targets. Having a discussion with the healthcare team about the type of activity that is best will help to establish realistic plans for activity. If an exercise regime is already in progress this routine should also be discussed (NDIC, 2006).
Insulin
In addition to a meal plan and physical activity, some women with gestational diabetes will need insulin to reach their blood glucose targets. If insulin is necessary, the healthcare team will instruct the woman how to give herself insulin. It is important to note that insulin is not harmful to the fetus since it cannot move from the maternal bloodstream to the baby’s.

Insulin is preferred over oral hypoglycemic drugs because of its safety during pregnancy, since it does not cross the placenta. Some authorities recommend an initial daily insulin dose of 0.7-0.8 units/kg actual body weight in the first trimester, followed by 1.0 unit/kg in the second trimester, and 1.2 unit/kg in the third trimester. However, insulin requirements are difficult to predict a priori and depend on many factors, especially dietary adherence. Starting at 0.7 units/kg will reduce the chance of hypoglycemia (Pridjian, 2010).

Insulin Recommendations
Because of their excellent track record and safety profile, NPH is usually the preferred intermediate acting insulin product, and insulin lispro (Humalog) is the preferred ultra-short acting product. Only human insulin products should be used for gestational diabetes. Alternative long-acting agents, such as insulin glargine and insulin detemir, have not been well-studied prospectively in this population (Evensen, 2012). More details about insulin products with respect to their onset duration and usual dosages can be found in Table 1.

Table 1: Commercially-Available Insulin Products (Adapted from Cupp, 2010)

<table>
<thead>
<tr>
<th>Type of Insulin</th>
<th>Products</th>
<th>Onset of Action</th>
<th>Peak Time to Action</th>
<th>Duration of Action</th>
<th>Administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultra-rapid-acting</td>
<td>Lispro (Humalog®)</td>
<td>15-30 min</td>
<td>30 min-2.5 hr</td>
<td>3-6.5 hr</td>
<td>SQ within 15 min before meal or immediately after meal</td>
</tr>
<tr>
<td></td>
<td>Aspart (Novolog®)</td>
<td>10-20 min</td>
<td>40-50 min</td>
<td>3-5 hr</td>
<td>SQ 5-10 min before meals; May give IV</td>
</tr>
<tr>
<td></td>
<td>Glulisine (Apidra®)</td>
<td>25 min</td>
<td>45-48 min</td>
<td>4-5.3 hr</td>
<td>SQ within 15 min before meal; May give IV or IM</td>
</tr>
<tr>
<td>Short-acting</td>
<td>Regular (Humulin R®, Novolin R®)</td>
<td>0.5-1 hr</td>
<td>2-4 hr</td>
<td>5-8 hr</td>
<td>SQ 30 min-1hr before meal; May give IV or IM</td>
</tr>
<tr>
<td>Intermediate-acting</td>
<td>NPH (Humulin N®, Novolin N®)</td>
<td>1-2 hr</td>
<td>4-14 hr</td>
<td>Up to 24 hr</td>
<td>SQ once daily at bedtime, OR SQ BID (in the morning and with evening meal or at bedtime)</td>
</tr>
<tr>
<td>Long-acting</td>
<td>Glargine (Lantus®)</td>
<td>1 hr</td>
<td>None</td>
<td>24 hr</td>
<td>SQ once daily at same time each day</td>
</tr>
<tr>
<td></td>
<td>Detemir (Levemir®)</td>
<td>1-2 hr</td>
<td>None/6-8 hr</td>
<td>Up to 24 hr</td>
<td>SQ once daily with evening meal or at bedtime, OR SQ BID (in the morning and with evening meal or at bedtime)</td>
</tr>
<tr>
<td>Premixed:</td>
<td>Humulin 70-30®, Novolin 70-30®,</td>
<td>Kinetics reflect that of the individual components</td>
<td>Humulin 70/30®, Novolin 70-30®,: SQ 30 min before meals; Humalog Mix 75-25®, Novolog Mix 70-30®: Within 15 min before meal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>intermediate and</td>
<td>Humalog Mix 75-25®, Novolog Mix</td>
<td>70-30®</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


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As discussed, insulin is the preferred pharmacotherapeutic agent in gestational diabetes. However, metformin and glyburide have had limited study in these women, and do not appear to be teratogenic (Evensen, 2012). Since these drugs and other oral agents are not FDA-approved for this indication, they are considered off-label and will not be discussed.

**Adjustments in Lifestyle: Education**

**Patient Education**

If the healthcare provider has determined that a woman with gestational diabetes should check her blood glucose, detailed instruction should be provided. Teaching should include:

- How to use a blood glucose meter
- How to prick the finger to obtain a drop of blood
- The target blood glucose range
- When to check the blood glucose

A blood glucose may need to be tested:

- Upon rising
- Just before meals
- One or two hours after breakfast
- One or two hours after lunch
- One or two hours after dinner

**Adjustments in Lifestyle: Special Instructions for Insulin Administration**

Although it is not common for women with gestational diabetes to develop hypoglycemia, there is an increased risk of developing hypoglycemia if they are taking insulin. Because of this, it is important for women with gestational diabetes to recognize the signs of low blood sugar. It is also important to educate them not to delay or skip meals and about the timing of when to take insulin and when to eat.

For women with gestational diabetes who take insulin, it’s important to:

- Teach them when the effects of insulin are peaking. Low blood sugar is more common at these times, depending on how an individual’s body uses insulin and glucose.
- Recommend physical activity, but caution patients to monitor their blood sugar levels closely during exercise. Because both insulin and physical activity lower blood sugar levels, when combined they can cause a rapid drop in blood sugar levels. Advise patients to test their blood sugar before beginning any physical activity. If the level is low, a snack should be immediately consumed and the blood sugar level re-tested prior to starting an activity. Advise patients to be smart about how much physical activity they do, how much they eat, and how much insulin is needed.
- Advise patients to be prepared for fluctuating blood sugar levels at all times. Insulin supplies should be carried at all times. Some form of sugar should be carried at all times as well, in case the blood sugar drops too low. The best form of sugar for an emergency is glucose paste or glucose tablets. These can be purchased at any drug store or pharmacy.
- Advise patients to test blood sugar levels regularly and any time they begin to feel dizzy, faint, or
tired.

- Encourage patients to report any abnormal blood sugar level to their healthcare provider right away, in case a change in the treatment plan is needed (NIH, 2006).

**Testing for Diabetes after Pregnancy**

Most healthcare providers will usually ask the woman to have a blood glucose test approximately 6 to 12 weeks after the baby is born to see whether or not she might still have diabetes. For most women, gestational diabetes resolves after pregnancy. Women are still at risk, however, of having gestational diabetes during future pregnancies or developing type 2 diabetes later in life.

It is estimated that after pregnancy, 5-10% of women who had gestational diabetes will be found to have type 2 diabetes later in life. Women who have had gestational diabetes also have a 20-50% chance of developing diabetes in the next five to ten years following pregnancy (NDIC, 2006).

**Additional Tests**

In addition to glucose checks, women with gestational diabetes may need to learn how to test for ketones in the morning urine or in the blood. High levels of ketones indicate that the body is using body fat for energy instead of the food that has been eaten. Using fat for energy is not recommended during pregnancy since ketones may be harmful to the baby. If ketone levels are high, the woman may need to change the type or amount of food she eats, the time of meals or time that snacks are consumed.

**Lowering the Risk**

Women with a history of gestational diabetes can help to lower their risk for developing type 2 diabetes later in life. According to a study by the Diabetes Prevention Program (DPP), participants randomly assigned to an intensive lifestyle intervention reduced their risk for type 2 diabetes by 58%. These individuals lost 5-7% of their body weight by following a low-fat, low-calorie meal plan and participating in 30 minutes of physical activity five days per week. The powerful reduction in risk of diabetes shown in the DPP was found in all subgroups including several hundred women with a history of gestational diabetes.

**Preventing Problems Related to Diabetes**

An individual diagnosed with diabetes who keeps her blood sugar as close to normal as possible usually has fewer problems than a person who does not keep her blood sugar in control. To help keep blood sugar in control, a strict lifestyle plan is essential and includes:

- Eating healthy foods
- Exercising regularly
- Frequent blood sugar monitoring
- Taking prescribed medications as indicated
- Learning to adjust food intake, exercise, and insulin depending on blood sugar results
- Regular follow up care with a healthcare provider

**Important Points to Remember About GD**

Women who have had gestational diabetes can lower their risk of developing diabetes later in life by controlling modifiable risk factors, such as obesity and physical inactivity.
These women should receive additional follow-up and teaching with a focus on lifestyle planning. Women should learn about factors such as:

- Getting tested for diabetes 6 to 12 weeks after the baby is born, then at least every three years thereafter.
- Talking to their physician if they plan to become pregnant again.
- Breastfeeding to lower their child’s risk for diabetes.
- Reaching their pre-pregnancy weight 6 to 12 months after the baby is born. Then, if she is still overweight, work to lose at least 5-7% (10 to 14 pounds for a person who weighs 200 pounds) of body weight slowly, over time, and keep it off.
- Eating foods low in fat and calories.
- Getting 30 minutes of physical activity, five days a week.
- Helping their children lower their risk for type 2 diabetes by learning to make healthy food choices, being physically active 60 minutes a day, and not becoming overweight.
- Encouraging their family to follow a healthy lifestyle by eating small portions of healthy foods and exercising more.
- Offering counseling and assistance for smoking cessation, if applicable.
- Encouraging and promoting all appropriate immunizations, prior to conception, if possible. An annual flu shot is universally recommended unless contraindicated (e.g. egg allergy).

Knowledge Check 5
Women who have had gestational diabetes should get 30 minutes of physical activity five days a week.

True
False

The correct answer is True.

Conclusion
In this course, you learned:
Women who are at risk of developing gestational diabetes require additional monitoring and care during pregnancy.

Without appropriate screening and treatment the risks of complications to the mother and infant have the potential to increase dramatically.

Women who do develop gestational diabetes should also consider lifestyle changes such as dietary and exercise planning after the pregnancy to prevent against developing type 2 diabetes later in life.

Appendix One
Dietary Recommendations for Gestational Diabetes
The first step in managing gestational diabetes is to educate the mother regarding dietary changes that she should make to help keep her blood sugar level within normal range, while still eating a healthy diet.
One of the most effective ways of keeping blood sugar levels in normal range is by monitoring the amount of carbohydrates in the diet.

Carbohydrates are found in the following healthy foods:

- Milk and yogurt
- Fruits and juices
- Rice, grains, cereals and pasta
- Breads, tortillas, crackers, bagels and rolls
- Dried beans, split peas and lentils
- Potatoes, corn, yams, peas and winter squash

Sweets and desserts, such as sugar, honey, syrups, pastries, cookies, soda and candy also typically have large amounts of carbohydrate, and should be avoided at all times.

**Consulting With A Registered Dietitian**

It is important to educate the patient about the importance of consulting with a registered dietitian to have an assessment of the diet completed. The dietitian will calculate the amount of carbohydrates needed and teach the patient how to count carbohydrates.

The following dietary recommendations will help maintain safe blood sugar levels during pregnancy:

- Distribute foods between three meals and two or three snacks each day.
- Eating too much at one time can cause blood sugar spikes. It is very important that no meals are skipped to maintain stable blood glucose levels.
- Reasonable portions of starch should be consumed. Starchy foods eventually turn into glucose so it's important not to be excessive. However, starch should be included in every meal. A reasonable portion is about one cup of total starch per meal, or two pieces of bread.
- Limit milk consumption. Although milk is a healthy food and an important source of calcium, it is also a liquid form of carbohydrate and drinking too much at one time can raise blood sugar.
- Limit fruit portions, as fruit is high in natural sugars. Limit fruit intake to three portions of fruit per day.

**Breakfast matters**

Blood sugar can be difficult to control in the morning because of normal fluctuations in hormone levels. Refined cereals, fruits and even milk may not be well tolerated in the morning meal. If the patient’s post-breakfast blood sugar level increases too much after having these foods, then these foods should not be consumed in the morning. A breakfast that consists of starch plus protein is usually tolerated the best.

Advise patients to avoid fruit juice, as it is a concentrated source of carbohydrate. Since it is liquid, juice can raise blood sugar quickly.

Strictly limit sweets and desserts as these foods often contain large amounts of fat and offer very little in terms of nutrition. Additionally, all regular sodas and sugar-sweetened beverages should be avoided.
Safe Sweeteners
The following sweeteners have been approved as safe to eat during pregnancy:
- Aspartame, which includes Equal, NutraSweet, Natra Taste
- Acesulfame K, which includes Sunett
- Sucralose, which includes Splenda
UCSF Medical Center, 2013

Keeping food records
Instruct the mother to record all of the foods and food amounts consumed each day, as this will help her monitor her carbohydrate intake. Also, encourage the use of measuring cups for accuracy when possible.

Additional Resources for Patient Education
American Diabetes Association:
http://www.diabetes.org/diabetes-basics/gestational/

National Institutes of Health:

American Academy of Family Physicians:

Medline Plus for Patients:

References


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Note: All dosages given are for adults unless otherwise stated. The information on medications contained in this course is not meant to be prescriptive or all-encompassing. You are encouraged to consult with physicians and pharmacists about all medication issues for your patients.