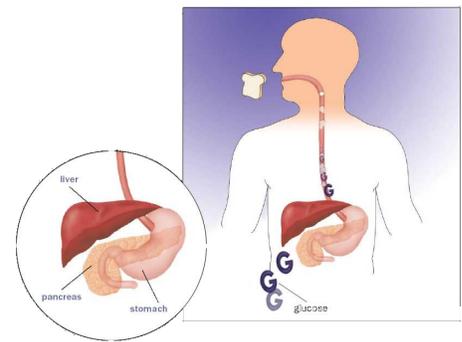


What is Diabetes?

Diabetes Mellitus is the name for a group of diseases that results from blood glucose (blood sugar) levels that are too high.

Glucose comes from food that is digested. When we eat, most of the sugar and starch in food is changed to glucose. Stored glucose can also be broken down by the liver in times of need.

Glucose is essential since it is the body's main energy source.



Whenever glucose is in the blood, insulin is needed to help manage and balance glucose levels.

Insulin is a hormone that is made by beta cells in the pancreas (an organ in the body near the stomach). The pancreas is signaled to release insulin when glucose is in the blood. Insulin is released by the pancreas to help move the glucose into the cells so it can then be used for energy. Insulin is sometimes referred to as “the key” that unlocks the cells allowing glucose to enter.

Diabetes results when either the pancreas does not make enough insulin or the body does not respond to the insulin (also known as insulin resistance). As a consequence, sugar builds up in the blood. Over time, this can lead to serious health problems, such as heart disease, vision loss, and kidney disease.

Types of Diabetes

There are different types of diabetes. Type 1 and type 2 diabetes are the most common forms of the disease, but there are also others, such as gestational diabetes, which occurs during pregnancy, and monogenic diabetes. Even though the types of diabetes are different, the risk of complications from high blood sugars is relatively the same.

- More than 30 million people in the United States have diabetes, and 1 in 4 of them do not know they have it.

- More than 84 million US adults (over a third) have prediabetes, and 90% of them do not know they have it.

- Diabetes is the 7th leading cause of death in the United States.

- Type 2 diabetes accounts for about 90% to 95% and Type 1 accounts for about 5% of all diabetes.

- In the last 20 years, the number of adults diagnosed with diabetes has more than tripled as the American population has aged and become more overweight or obese.

- Medical costs and lost work and wages for people with diagnosed diabetes total \$327 billion yearly.

- Medical costs for people with diabetes are twice as high as for people who don't have diabetes.

Type 1 Diabetes

- Type 1 Diabetes is an autoimmune disease. Autoimmune diseases occur when the immune system attacks the body's own tissues and organs. With Type 1 diabetes, the immune system injures or destroys the beta cells in the pancreas. The beta cells then are unable to produce insulin.
- People with type 1 diabetes must take insulin in order to live. They can either take insulin shots or wear an insulin pump. Insulin cannot be taken as a pill because the acid in the stomach would destroy it before it could get into the bloodstream.
- Overall Type 1 diabetes is far less common than type 2.
 - Overall about 5-10% of people with diabetes have type 1.
 - However, in children and adolescents, type 1 diabetes accounts for 50-80% of people with diabetes.
- Type 1 diabetes can develop at any age but is typically diagnosed in children, teens, and young adults.
- Sometimes older patients are diagnosed with this form of diabetes. This subgroup is referred to as latent autoimmune diabetes in adults (LADA).
 - LADA is a slow, progressive form of type 1 diabetes.
- Doctors/scientists do not know the exact cause of type 1 diabetes, but they do believe it has both genetic and environmental factors.

The signs/symptoms of type 1 diabetes can come on gradually or suddenly. Sign/symptoms include:

- ✓ Frequent urination
- ✓ Excessive thirst & hunger
- ✓ Fatigue/tiredness
- ✓ Blurred vision
- ✓ Tingling or loss of feelings in hands & feet
- ✓ Unintentional weight loss

Type 2 Diabetes

- This is the most common type of diabetes. 90-95% of all diabetes cases are type 2.
- Unlike type 1 diabetes, people with type 2 diabetes still produce their own insulin. The problem is that the body does not produce enough insulin or the body no longer responds to the insulin effectively (this is referred to as insulin resistance).
- Type 2 diabetes can develop at any age. Even children present with type 2 diabetes, but it is most commonly diagnosed in middle-aged and older adults.
- Type 2 diabetes may be controlled with a combination of diet, weight management and exercise. However, treatment also may include glucose-lowering medications (oral and/or injectable) or insulin injections.

Factors increasing the risk for developing type 2 diabetes include:

- ✓ being overweight or obese
- ✓ having more abdominal fat
- ✓ being 45 years of age or older
- ✓ having a family history of diabetes
- ✓ being African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, Native Hawaiian, or Pacific Islander
- ✓ having high blood pressure
- ✓ having low levels of HDL (good) cholesterol
- ✓ having high levels of triglycerides
- ✓ having a history of gestational diabetes or giving birth to a baby weighing 9 pounds or more
- ✓ not being physically active
- ✓ having a history of heart disease or stroke
- ✓ having polycystic ovary syndrome (PCOS)
- ✓ having acanthosis nigricans (dark, thick, and velvety skin around your neck or armpits)



Gestational Diabetes



Gestational diabetes is a type of diabetes that affects pregnant women who have not previously been diagnosed with type 1 or type 2 diabetes.

The placenta produces large amounts of hormones that may cause insulin resistance.

Gestational diabetes usually is diagnosed in the middle of pregnancy. The usual timing for gestational diabetes testing is between 24-28 weeks. Women who are over the age of 35, overweight/obese, or have a family history of diabetes may be tested earlier and more often.

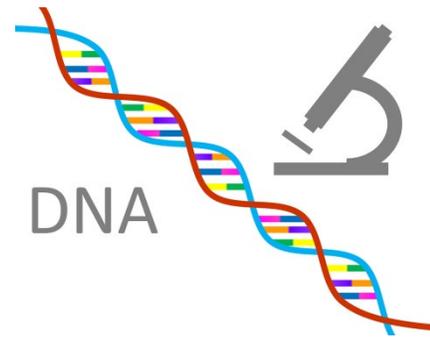
Women can have gestational diabetes with more than one pregnancy.

Woman with gestational diabetes can deliver healthy babies and for many, the diabetes goes away after the baby is born. However, women who have had gestational diabetes are at an increased risk of developing type 2 diabetes later in life.

Treatment for gestational diabetes includes:

- Expectant mothers with gestational diabetes will need more frequent doctor checkups, especially during the last three months of pregnancy.
 - The doctor will monitor blood sugars but the mother may also have to monitor their blood sugar multiple times per day at home.
- Exercise and a healthy diet are key parts to gestational diabetes treatment.
 - Diet should focus on fruits, vegetables, whole grains, and lean proteins.
 - Nutritional needs will be different for each woman with gestational diabetes so it is advised she meet with a dietitian to help develop a meal plan.
- Sometimes diet and exercise are not enough to control blood sugars, and insulin injections maybe required to lower blood sugar.
 - Between 10 and 20 percent of women with gestational diabetes need insulin to reach their blood sugar goals.

Monogenic Diabetes



- Monogenic diabetes are rare forms of diabetes that result from mutations or changes in a single gene.
- Both type 1 and 2 diabetes are polygenic which means there are multiple genetic and environmental factors contributing to the development of the disease.
- The gene mutation is frequently inherited from one or both parents, but sometimes the gene mutation develops spontaneously (the mutation is not carried by either of the parents).
- Most mutations that cause monogenic diabetes reduce the body's ability to produce insulin.
- Estimated to be only 1-5% of all diabetes.

Examples of Monogenic Diabetes:

1. Neonatal diabetes mellitus (NDM)
 - a. NDM occurs in newborns and young infants (6-12 months old).
 - b. Often mistaken for type 1 diabetes, but type 1 diabetes is very rarely seen before that young age.
2. Maturity-onset diabetes of the young (MODY)
 - a. MODY is much more common than NDM and usually first occurs in adolescence or early adulthood.
 - b. MODY may be confused with type 1 or type 2 diabetes.

Treatment

- Treatment can vary, depending on the particular gene involved.
- Some are able to manage their diabetes with diet and exercise, and others need to use oral medications or insulin.
- People with this rare form of diabetes are typically very insulin sensitive and use smaller doses of insulin compared to people with type 2 diabetes. Their bodies make insulin, but not enough and not always at the right time.

Testing for Diabetes

Diagnosis of diabetes, prediabetes, and gestational diabetes can be made through blood tests. There are four different types of blood test that could be given. Each of the tests measures the amount of glucose in the blood at different times. In order to confirm a diabetes diagnosis, two abnormal blood tests are required. Even though these initial blood tests can diagnosis diabetes, they do not indicate the type of diabetes a person has.

Types of test:

1. Glycated hemoglobin (A1C)
 - Gives an estimated of the average blood glucose levels over the last 3 months
 - Measures the percentage of blood glucose attached to hemoglobin (oxygen carrying protein in red blood cells)
2. Fasting plasma blood glucose (FPG)
 - This is a blood test taken after not eating or drinking for 8 hours prior to test
 - Someone is diagnosed with diabetes if the blood sugar levels is high on two different FPG tests (see chart below)
3. Oral glucose tolerance test (OGTT)
 - First there is a fasting blood test (no eating or drinking for 8 hours prior to the test)
 - Then a person consumes a sugary drink (75 grams of glucose) and another blood test is performed 2 hours later
4. Random plasma glucose test (RPG)
 - Test can be given at any time no matter when someone has eaten
 - Usually only given to those with other diabetes symptoms



Diagnosis	A1C	FPG	OGTT	RPG
Normal	Below 5.7%	Below 100 mg/dL	Below 140 mg/dL	
Prediabetes	5.7-6.4%	100-125 mg/dL	140-199 mg/dL	
Diabetes	6.5% or above	126 mg/dL or above	200 mg/dL or above	200 mg/dL or above

Testing for Gestational Diabetes

Gestational diabetes can be diagnosed one of two ways.

In the one-step strategy, a fasting blood test (no eating or drinking for 8 hours prior to the test) is done. Then a person consumes a sugary drink (75 grams of glucose) and repeat blood tests are performed 1 hour and 2 hours later. This test is done typically between 24 and 28 weeks of the pregnancy in women not previously diagnosed with diabetes. The diagnosis of gestational diabetes is made when any of the following blood sugar values are met or exceeded:

- Fasting: 92 mg/dL
- 1 h: 180 mg/dL
- 2 h: 153 mg/dL

In the two-step strategy, a person consumes a sugary drink (50 gram of glucose) without fasting and one blood test is performed 1 hour later. This test is done typically between 24 and 28 weeks of the pregnancy in women not previously diagnosed with diabetes. If the 1 hour blood sugar is ≥ 130 mg/dL, then another test is done. For this second test, a fasting blood test is done. Then a person consumes a sugary drink (100 grams of glucose) and repeat blood tests are performed 1 hour, 2 hours, and 3 hours later. The diagnosis of gestational diabetes is made when 2 of the 4 blood sugar values are met or exceeded:

- Fasting: 95 mg/dL
- 1 h: 180 mg/dL
- 2 h: 155 mg/dL
- 3 h: 140 mg/dL

Additional Testing for Type 1 Diabetes:

In confirming a type 1 diabetes diagnosis, blood may also be tested for autoantibodies (proteins that indicate the body is attacking itself). These are often (but not always) present with type 1 diabetes but not with type 2.

The urine may also be tested for ketones (produced when the body burns fat for energy), which may also indicate insulin deficiency and suggest type 1 diabetes.

Genetic Testing for Monogenic Diabetes

Genetic testing can diagnose most forms of monogenic diabetes. Testing of the genetic information in a blood sample can determine whether a person has a gene causing MODY or neonatal diabetes.

People who were diagnosed with diabetes before six-to-nine months old should consider having genetic testing for monogenic forms of neonatal diabetes.

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