

Diabetes

Introduction

Diabetes is a disorder of metabolism—the way the body uses digested food for growth and energy. Most of the food people eat is broken down into glucose, the form of sugar in the blood. Glucose is the main source of fuel for the body.

After digestion, glucose passes into the bloodstream, where it is used by cells for growth and energy. For glucose to get into cells, insulin must be present. Insulin is a hormone produced by the pancreas, a large gland behind the stomach.

When people eat, the pancreas automatically produces the right amount of insulin to move glucose from blood into the cells. In people with diabetes, however, the pancreas either produces little or no insulin, or the cells do not respond appropriately to the insulin that is produced. Glucose builds up in the blood, overflows into the urine, and passes out of the body in the urine. Thus, the body loses its main source of fuel even though the blood contains large amounts of glucose.

Symptoms of diabetes

People who think they might have diabetes must visit a physician for diagnosis. They might have SOME or NONE of the following symptoms:

- Frequent urination
- Excessive thirst
- Unexplained weight loss
- Extreme hunger
- Sudden vision changes
- Tingling or numbness in hands or feet
- Feeling very tired much of the time
- Very dry skin
- Sores that are slow to heal
- More infections than usual.

Nausea, vomiting, or stomach pains may accompany some of these symptoms in the abrupt onset of insulin-dependent diabetes, now called type 1 diabetes.

Risk factors for diabetes

Being overweight or obese.

Having a parent, brother, or sister with diabetes.

Being African American, American Indian, Asian, Pacific Islander, or Hispanic American/Latino heritage.

Having a prior history of gestational diabetes or birth of at least one baby weighing more than 9 pounds.

Having high blood pressure measuring 140/90 or higher.

Having abnormal cholesterol with HDL ("good") cholesterol is 35 or lower, or triglyceride level is 250 or higher.

Being physically inactive—exercising fewer than three times a week.

Risk factors for type 2 diabetes include older age, obesity, family history of diabetes, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity, and race/ethnicity.

Risk factors are less well defined for type 1 diabetes than for type 2 diabetes, but autoimmune, genetic, and environmental factors are involved in developing this type of diabetes.

Gestational diabetes occurs more frequently in people with a family history of diabetes than in other groups. Obesity is also associated with higher risk. Women who have had gestational diabetes have a 35% to 60% chance of developing diabetes in the next 10–20 years.

Other specific types of diabetes, which may account for 1% to 5% of all diagnosed cases, result from specific genetic syndromes, surgery, drugs, malnutrition, infections, and other illnesses.

Types of diabetes

The three main types of diabetes are

- type 1 diabetes
- type 2 diabetes
- gestational diabetes

Type 1 Diabetes

Type 1 diabetes is an autoimmune disease. An autoimmune disease results when the body's system for fighting infection—the immune system—turns against a part of the body. In diabetes, the immune system attacks and destroys the insulin-producing beta cells in the pancreas. The pancreas then produces little or no insulin. A person who has type 1 diabetes must take insulin daily to live.

At present, scientists do not know exactly what causes the body's immune system to attack the beta cells, but they believe that autoimmune, genetic, and environmental factors, possibly viruses, are involved. Type 1 diabetes accounts for about 5 to 10 percent of diagnosed diabetes. It develops most often in children and young adults but can appear at any age.

Symptoms of type 1 diabetes usually develop over a short period, although beta cell destruction can begin years earlier. Symptoms may include increased thirst and urination, constant hunger, weight loss, blurred vision, and extreme fatigue. If not diagnosed and treated with insulin, a person with type 1 diabetes can lapse into a life-threatening diabetic coma, also known as diabetic ketoacidosis.

Type 2 Diabetes

The most common form of diabetes is type 2 diabetes. About 90 to 95 percent of people with diabetes have type 2. This form of diabetes is most often associated with older age, obesity, family history of diabetes, previous history of gestational diabetes, physical inactivity, and certain ethnicities. About 80 percent of people with type 2 diabetes are overweight or obese.

Type 2 diabetes is increasingly being diagnosed in children and adolescents, especially among African American, Mexican American, Asian and Pacific Islander youth.

When type 2 diabetes is diagnosed, the pancreas is usually producing enough insulin, but for unknown reasons the body cannot use the insulin effectively, a condition called insulin resistance. After several years, insulin production decreases. The result is the same as for type 1 diabetes—glucose builds up in the blood and the body cannot make efficient use of its main source of fuel.

The symptoms of type 2 diabetes develop gradually. Their onset is not as sudden as in type 1 diabetes. Symptoms may include fatigue, frequent urination, increased thirst and hunger, weight loss, blurred vision, and slow healing of wounds or sores. Some people have no symptoms.

Gestational Diabetes

Some women develop gestational diabetes late in pregnancy. Although this form of diabetes usually disappears after the birth of the baby, women who have had gestational diabetes have a 40 to 60 percent chance of developing type 2 diabetes within 5 to 10 years. Maintaining a reasonable body weight and being physically active may help prevent development of type 2 diabetes.

Gestational diabetes is caused by the hormones of pregnancy or a shortage of insulin. Women with gestational diabetes may not experience any symptoms.

Diagnosis of Diabetes

The fasting blood glucose test is the preferred test for diagnosing diabetes in children and non pregnant adults. The test is most reliable when done in the morning. However, a diagnosis of diabetes can be made based on any of the following test results, confirmed by retesting on a different day:

- A blood glucose level of 126 milli grams per deciliter (mg/dL) or higher after an 8-hour fast. This test is called the fasting blood glucose test.
- A blood glucose level of 200 mg/dL or higher 2 hours after drinking a beverage containing 75 grams of glucose dissolved in water. This test is called the oral glucose tolerance test (OGTT).
- A random —taken at any time of day—blood glucose level of 200 mg/dL or higher, along with the presence of diabetes symptoms.

Prediabetes

People with prediabetes have blood glucose levels that are higher than normal but not high enough for a diagnosis of diabetes. This condition raises the risk of developing type 2 diabetes, heart disease, and stroke.

Prediabetes is also called impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), depending on the test used to diagnose it. Some people have both IFG and IGT.

- IFG is a condition in which the blood glucose level is high—100 to 125 mg/dL—after an overnight fast, but is not high enough to be classified as diabetes. The former definition of IFG was 110 mg/dL to 125 mg/dL.
- IGT is a condition in which the blood glucose level is high—140 to 199 mg/dL—after a 2-hour OGTT, but is not high enough to be classified as diabetes.

Those with prediabetes are likely to develop type 2 diabetes within 10 years, unless they take steps to prevent or delay diabetes.

The good news is that people with prediabetes can do a lot to prevent or delay diabetes. Studies have clearly shown that people can lower their risk of developing diabetes by losing 5 to 7 percent of their body weight through diet and increased physical activity. A major study of more than 3,000 people with IGT found that diet and exercise resulting in a 5 to 7 percent weight loss—about 10 to 14 pounds in a person who weighs 200 pounds—lowered the incidence of type 2 diabetes by nearly 60 percent. Study participants lost weight by cutting fat and calories in their diet and by exercising—most chose walking—at least 30 minutes a day, 5 days a week.

Scope and impact of diabetes

Diabetes is widely recognized as one of the leading causes of death and disability. However, diabetes is likely to be underreported as the underlying cause of death on death certificates. Diabetes is associated with long-term complications that affect almost every part of the body. The disease often leads to blindness, heart and blood vessel disease, stroke, kidney failure, amputations, and nerve damage. Uncontrolled diabetes can complicate pregnancy, and birth defects are more common in babies born to women with diabetes.

Who gets diabetes?

Diabetes is not contagious. People cannot “catch” it from each other. However, certain factors can increase the risk of developing diabetes.

Type 1 diabetes occurs equally among males and females but is more common in whites than in nonwhites. Data from the World Health Organization’s Multinational Project for Childhood Diabetes indicate that type 1 diabetes is rare in most African, American Indian, and Asian populations. However, some northern European countries, including Finland and Sweden, have high rates of type 1 diabetes. The reasons for these differences are unknown.

Type 1 diabetes develops most often in children but can occur at any age.

Type 2 diabetes is more common in older people, especially in people who are overweight, and occurs more often in African Americans, American Indians, some Asian Americans, Native Hawaiians and other Pacific Islander Americans, and Hispanics/ Latinos.

Management of diabetes

Before the discovery of insulin in 1921, everyone with type 1 diabetes died within a few years after diagnosis. Although insulin is not considered a cure, its discovery was the first major breakthrough in diabetes treatment.

Today, healthy eating, physical activity, and taking insulin are the basic therapies for type 1 diabetes. The amount of insulin must be balanced with food intake and daily activities.

Doctors may also prescribe another type of injectable medicine. Blood glucose levels must be closely monitored through frequent blood glucose checking. People with diabetes also monitor blood glucose levels several times a year with a laboratory test called the A1C. Results of the A1C test reflect average blood glucose over a 2- to 3-month period.

Healthy eating, physical activity, and blood glucose testing are the basic management tools for type 2 diabetes. In addition, many people with type 2 diabetes require one or more diabetes medicines—pills, insulin, and other injectable medicine—to control their blood glucose levels.

Adults with diabetes are at high risk for cardiovascular disease (CVD). In fact, at least 65 percent of those with diabetes die from heart disease or stroke. Managing diabetes is more than keeping blood glucose levels under control—it is also important to manage blood pressure and cholesterol levels through healthy eating, physical activity, and the use of medications, if needed. By doing so, those with diabetes can lower their risk. Aspirin therapy, if recommended by a person's health care team, and smoking cessation can also help lower risk.

People with diabetes must take responsibility for their day-to-day care. Much of the daily care involves keeping blood glucose levels from going too low or too high. When blood glucose levels drop too low—a condition known as hypoglycemia—a person can become nervous, shaky, and confused. Judgment can be impaired, and if blood glucose falls too low, fainting can occur.

A person can also become ill if blood glucose levels rise too high.

People with diabetes should see a health care provider who will help them learn to manage their diabetes and who will monitor their diabetes control. Most people with diabetes get care from primary care physicians—internists, family practice doctors, or pediatricians. Often, having a team of providers can improve diabetes care. A team can include

- a primary care provider such as an internist, a family practice doctor, or a pediatrician
- an endocrinologist—a specialist in diabetes care
- a dietitian, a nurse, and other health care providers who are certified diabetes educators—experts in providing information about managing diabetes
- a podiatrist—for foot care
- an ophthalmologist or an optometrist—for eye care

The team can also include other health care providers, such as cardiologists and other specialists. The team for a pregnant woman with type 1, type 2, or gestational diabetes should include an obstetrician who specializes in caring for women with diabetes. The team can also include a pediatrician or a neonatologist with experience taking care of babies born to women with diabetes.

The goal of diabetes management is to keep levels of blood glucose, blood pressure, and cholesterol as close to the normal range as safely possible.

Prevention of diabetes

Researchers are making progress in identifying the exact genetics and "triggers" that predispose some individuals to develop type 1 diabetes, but prevention remains elusive.

A number of studies have shown that regular physical activity can significantly reduce the risk of developing type 2 diabetes. Type 2 diabetes is associated with obesity.

Is there a cure for diabetes?

In response to the growing health burden of diabetes, the diabetes community has three choices: prevent diabetes; cure diabetes; and improve the quality of care of people with diabetes to prevent devastating complications.

Several approaches to "cure" diabetes are currently under investigation:

- Pancreas transplantation
- Islet cell transplantation (islet cells produce insulin)
- Artificial pancreas development
- Genetic manipulation (fat or muscle cells that don't normally make insulin have a human insulin gene inserted — then these "pseudo" islet cells are transplanted into people with type 1 diabetes).

Each of these approaches still has a lot of challenges, such as preventing immune rejection; finding an adequate number of insulin cells; keeping cells alive; and others. But progress is being made in all areas.