
Diabetes

Public Education

Correspondence: Exon Publications, Brisbane, Australia; Email: books@exonpublications.com

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Abstract

Diabetes is a chronic metabolic disorder characterized by elevated blood sugar levels due to problems with insulin production, action, or both. There are two main types: Type 1, where the body does not produce insulin, and Type 2, where the body does not use insulin effectively. Gestational diabetes, which occurs during pregnancy, is another form. Diabetes affects millions worldwide, leading to complications such as heart disease, kidney damage, and nerve damage if left uncontrolled. This article offers a comprehensive guide to understanding diabetes, its causes, symptoms, risk factors, diagnosis, treatment options, and lifestyle modifications necessary to manage the condition. It also explores the role of genetics, detailing specific genes involved in diabetes development, and provides an overview of the medications and therapies

available, including insulin and oral drugs. The goal of this article is to provide valuable information for individuals living with diabetes, their loved ones, and anyone seeking to understand the condition better.

Introduction

Diabetes is one of the most common chronic conditions affecting people worldwide. It occurs when the body is unable to properly regulate blood sugar (glucose), which is a vital source of energy for cells. Normally, insulin, a hormone produced by the pancreas, helps glucose enter cells to be used for energy. In people with diabetes, either the body does not produce enough insulin, or the cells become resistant to insulin's effects, causing glucose to accumulate in the blood. Over time, high blood sugar can lead to severe complications affecting the heart, kidneys, eyes, and nerves. Understanding the different types of diabetes, how it is diagnosed, and the available treatment options is essential for managing the condition effectively and improving quality of life. In this article, we will cover all aspects of diabetes, from its causes and symptoms to how it can be managed through medication, diet, and exercise (1-3).

What is Diabetes?

Diabetes is a metabolic disorder that results in high levels of blood sugar. The pancreas produces insulin, which is necessary to regulate glucose levels in the blood and allow it to enter the cells for energy. When insulin production is impaired or when cells become resistant to insulin, glucose builds up in the bloodstream, leading to hyperglycemia. There are three main types of diabetes: Type 1, Type 2, and gestational diabetes.

Type 1 diabetes is an autoimmune disorder where the body's immune system mistakenly attacks and destroys insulin-producing cells in the pancreas, known as beta cells. As a result, individuals with Type 1 diabetes do not produce insulin and require lifelong insulin therapy. This type of diabetes often begins in childhood or adolescence, though it can occur in adults.

Type 2 diabetes, the most common form, occurs when the body becomes resistant to insulin, and the pancreas cannot produce enough insulin to meet the body's needs. This leads to elevated blood sugar levels. Type 2 diabetes typically develops in adults, especially those who are overweight, inactive, or have a family history of diabetes. However, it is increasingly being diagnosed in younger populations, including children and adolescents.

Gestational diabetes occurs during pregnancy and usually resolves after childbirth. However, women who experience gestational diabetes are at a higher risk of developing Type 2 diabetes later in life.

Causes of Diabetes

The causes of diabetes differ depending on the type. Type 1 diabetes is believed to be caused by a combination of genetic predisposition and environmental triggers. Certain genes, such as HLA-DRB1, HLA-DQB1, and INS, have been associated with an increased risk of developing Type 1 diabetes. Environmental factors, such as viral infections, may also play a role in triggering the autoimmune response that leads to the destruction of insulin-producing beta cells in the pancreas.

In contrast, Type 2 diabetes is largely influenced by lifestyle factors, though genetics also play a significant role. The gene TCF7L2 has been linked to an increased risk of developing Type 2 diabetes. Obesity, particularly visceral fat around the abdomen, is a major risk factor for Type 2 diabetes because it leads to insulin resistance. Physical inactivity, an unhealthy diet high in processed foods and sugar, and a sedentary lifestyle further contribute to the risk of developing this form of diabetes. In addition, individuals with a family history of Type 2 diabetes are more likely to develop the condition.

Gestational diabetes is primarily caused by hormonal changes during pregnancy. The placenta produces hormones that interfere with insulin's effectiveness, leading to insulin resistance. Women who are overweight, have a family history of diabetes, or have previously had gestational diabetes are at higher risk.

Symptoms of Diabetes

The symptoms of diabetes can vary depending on the type and how high blood sugar levels are. Common symptoms of Type 1 and Type 2 diabetes include frequent urination, excessive thirst, extreme hunger, unexplained weight loss, fatigue, blurred vision, and slow-healing sores or infections. Individuals with Type 1 diabetes may experience these symptoms suddenly, while those with Type 2 diabetes may have milder symptoms that develop over time or go unnoticed for years.

In Type 2 diabetes, early symptoms are often subtle and can include increased thirst and frequent urination, especially at night. Other symptoms, such as blurred vision and fatigue, may be attributed to aging or other conditions,

which is why many people with Type 2 diabetes remain undiagnosed for several years.

Gestational diabetes may not cause noticeable symptoms, which is why routine screening during pregnancy is important. However, women may experience increased thirst, frequent urination, and fatigue, similar to other forms of diabetes.

If left untreated, diabetes can lead to complications such as nerve damage (neuropathy), kidney disease (nephropathy), eye problems (retinopathy), and cardiovascular disease. In extreme cases, very high blood sugar levels can lead to diabetic ketoacidosis (DKA) in Type 1 diabetes, which is a life-threatening condition requiring immediate medical attention.

Risk Factors for Diabetes

Several risk factors increase the likelihood of developing diabetes, depending on the type. For Type 1 diabetes, genetic predisposition plays a significant role, with certain genes increasing the risk. Having a family member with Type 1 diabetes increases the chances of developing the condition. Environmental factors, such as exposure to viral infections, may trigger the autoimmune response that leads to Type 1 diabetes.

In Type 2 diabetes, risk factors include obesity, particularly abdominal fat, physical inactivity, a poor diet high in refined sugars and fats, and a family history of diabetes. Individuals with high blood pressure, high cholesterol, or a history of heart disease are also at increased risk. Age is another factor, with the risk of developing Type 2 diabetes increasing

as people get older, although it is becoming more common in younger individuals due to rising obesity rates.

Gestational diabetes risk factors include being overweight or obese, having a family history of diabetes, being over the age of 25, and having had gestational diabetes in a previous pregnancy. Women from certain ethnic groups, such as African American, Hispanic, Native American, and Asian American, are also at higher risk of developing gestational diabetes.

Diagnosis of Diabetes

Diabetes is diagnosed through various blood tests that measure blood sugar levels. The most common diagnostic test is the fasting plasma glucose (FPG) test, which measures blood sugar after an individual has fasted for at least eight hours. A fasting blood sugar level of 126 milligrams per deciliter (mg/dL) or higher indicates diabetes.

Another test, the oral glucose tolerance test (OGTT), measures blood sugar two hours after consuming a sugary drink. A blood sugar level of 200 mg/dL or higher after the test indicates diabetes. The hemoglobin A1c (HbA1c) test is also widely used, as it measures the average blood sugar level over the past two to three months. An HbA1c level of 6.5% or higher indicates diabetes.

For gestational diabetes, screening is typically done between the 24th and 28th weeks of pregnancy using the OGTT. If blood sugar levels are elevated during the test, a diagnosis of gestational diabetes is made.

Once diagnosed, regular monitoring of blood sugar levels is essential to managing diabetes effectively. Blood glucose

meters, continuous glucose monitors (CGMs), and HbA1c tests are commonly used to track blood sugar levels and adjust treatment plans accordingly.

Treatment Options for Diabetes

The treatment of diabetes depends on the type and severity of the condition. For Type 1 diabetes, insulin therapy is essential because the body cannot produce insulin. Insulin is administered through injections or an insulin pump to regulate blood sugar levels. Different types of insulin are available, including rapid-acting, long-acting, and intermediate-acting insulin. Individuals with Type 1 diabetes need to monitor their blood sugar levels frequently and adjust their insulin doses based on food intake, physical activity, and other factors.

In Type 2 diabetes, treatment often begins with lifestyle changes such as adopting a healthy diet, increasing physical activity, and losing weight. These changes can help the body use insulin more effectively and lower blood sugar levels. If lifestyle changes are not enough to control blood sugar, oral medications may be prescribed. Metformin (Glucophage) is the most commonly prescribed medication for Type 2 diabetes, as it helps lower blood sugar levels by reducing glucose production in the liver and improving insulin sensitivity.

Other medications for Type 2 diabetes include sulfonylureas, which stimulate the pancreas to produce more insulin, and SGLT2 inhibitors like empagliflozin (Jardiance), which help the kidneys remove excess glucose from the blood. In some cases, individuals with Type 2 diabetes may also require insulin therapy, particularly if oral medications are not sufficient to control blood sugar levels.

For gestational diabetes, treatment typically involves dietary changes, exercise, and monitoring blood sugar levels. In some cases, insulin therapy may be needed to keep blood sugar levels within a healthy range during pregnancy.

The Role of Lifestyle in Managing Diabetes

Lifestyle plays a crucial role in managing diabetes, especially for individuals with Type 2 diabetes. A healthy diet is one of the most important factors in controlling blood sugar levels. Foods that are high in fiber, such as fruits, vegetables, whole grains, and legumes, help slow the absorption of sugar and improve blood sugar control. Limiting the intake of processed foods, refined carbohydrates, and sugary drinks can also help prevent spikes in blood sugar levels.

Regular physical activity is essential for managing diabetes, as it helps the body use insulin more effectively and lowers blood sugar levels. Exercise can also help individuals lose weight and reduce the risk of complications such as heart disease. Activities such as walking, swimming, cycling, and strength training are particularly beneficial for individuals with diabetes.

Maintaining a healthy weight is important for managing Type 2 diabetes, as excess weight, especially around the abdomen, contributes to insulin resistance. Even modest weight loss can significantly improve blood sugar control and reduce the risk of complications.

In addition to diet and exercise, stress management is important for individuals with diabetes. Chronic stress can

increase blood sugar levels and interfere with the body's ability to use insulin effectively. Relaxation techniques such as deep breathing, meditation, and yoga can help reduce stress and improve overall well-being.

Complications of Diabetes

If left untreated or poorly managed, diabetes can lead to a variety of serious complications. Over time, high blood sugar levels can damage blood vessels and nerves, leading to complications in different parts of the body.

One of the most common complications of diabetes is cardiovascular disease, which includes conditions such as heart attack, stroke, and high blood pressure. Individuals with diabetes are at a higher risk of developing heart disease due to damage to blood vessels caused by elevated blood sugar levels.

Diabetic neuropathy, or nerve damage, is another common complication of diabetes. This condition affects the nerves in the hands, feet, and legs, leading to symptoms such as pain, tingling, numbness, and weakness. In severe cases, neuropathy can lead to infections or ulcers that may require amputation.

Diabetes can also damage the kidneys, leading to diabetic nephropathy. This condition can result in kidney failure, which may require dialysis or a kidney transplant. Diabetic retinopathy, a complication affecting the eyes, can lead to vision loss and blindness if not treated early.

Prevention of Diabetes

Preventing Type 2 diabetes involves adopting a healthy lifestyle that includes a balanced diet, regular physical activity, and maintaining a healthy weight. Eating a diet rich in fruits, vegetables, whole grains, and lean proteins can help prevent insulin resistance and reduce the risk of developing Type 2 diabetes.

Regular physical activity is essential for preventing diabetes, as it helps the body use insulin more effectively and maintains a healthy weight. Engaging in at least 30 minutes of moderate exercise, such as walking or cycling, on most days of the week can significantly reduce the risk of developing diabetes.

For individuals with prediabetes, losing weight through diet and exercise can prevent or delay the onset of Type 2 diabetes. Regular screening for diabetes is important, especially for individuals with a family history of the condition or other risk factors such as obesity or high blood pressure.

Conclusion

Diabetes is a complex condition that requires ongoing management and care. By understanding the causes, symptoms, and treatment options for diabetes, individuals can take control of their health and prevent complications. Whether managing Type 1, Type 2, or gestational diabetes, a combination of medication, lifestyle changes, and regular monitoring is essential for maintaining healthy blood sugar levels and preventing long-term complications. With the right support and education, individuals with diabetes can lead healthy, fulfilling lives.

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