

# **What is Diabetes?**

Diabetes Symptoms

Diagnosis of Diabetes

Type 1 Diabetes

Type 2 Diabetes

Diabetes Complications

What is Insulin?

Treatments for Diabetes

Self-Monitoring

Food Planning

Exercise

Hypoglycemia

Hyperglycemia

Taking Insulin

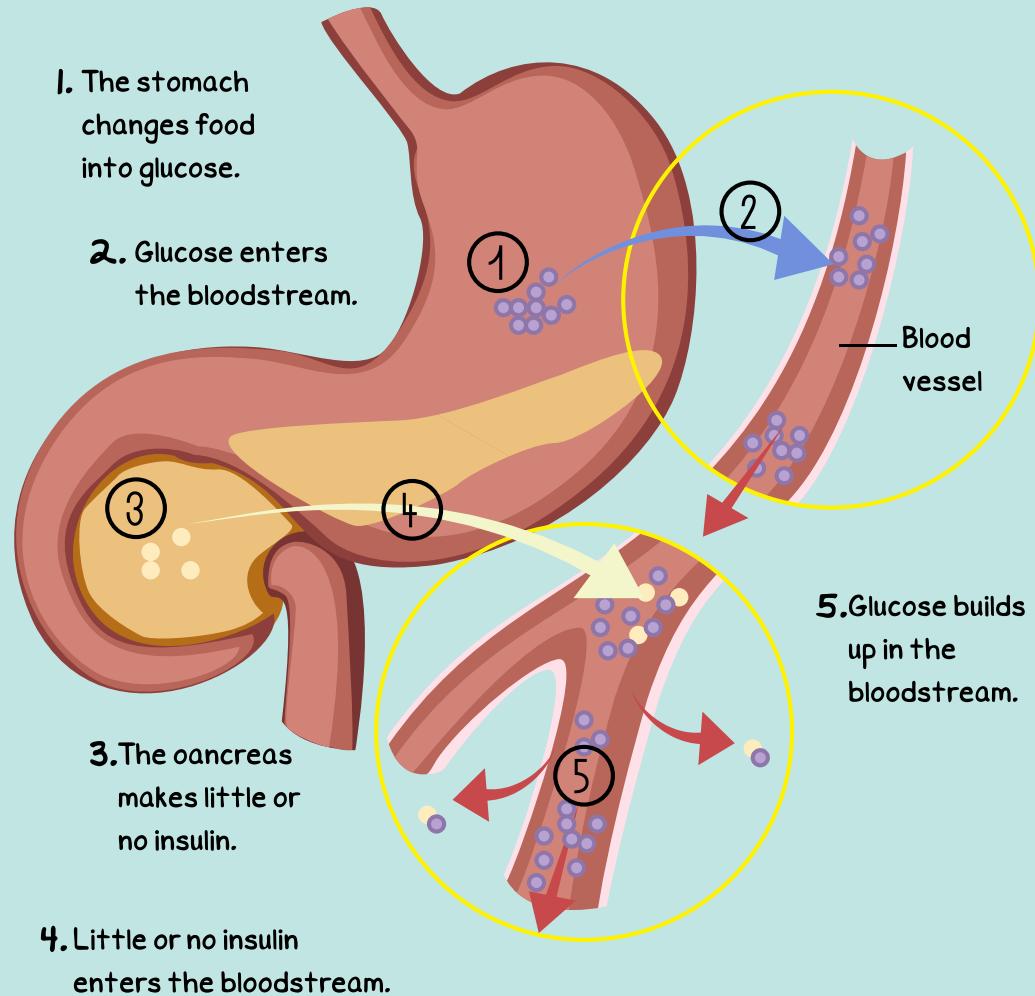
Insulin Pumps

Latest Research



# Diabetes Overview

Diabetes is a number of diseases that involve problems with the hormone insulin. Normally, the pancreas (an organ behind the stomach) releases insulin to help your body store and use the sugar and fat from the food you eat. Diabetes can occur when the pancreas produces very little or no insulin, or when the body does not respond appropriately to insulin. As yet, there is no cure. People with diabetes need to manage their disease to stay healthy.



# Common symptoms of diabetes

The most common signs and symptoms of diabetes are:

## Frequent urination

Excessive thirst and frequent urination are classic symptoms of diabetes.

If your insulin is ineffective, or not there at all, your kidneys cannot filter the glucose back into the blood. The kidneys will take water from your blood in order to dilute the glucose - which in turn fills up your bladder.



## Disproportionate thirst

If you are urinating more than usual, you will need to replace that lost liquid. You will be drinking more than usual

## Intense hunger

As the insulin in your blood is not working properly, or is not there at all, and your cells are not getting their energy, your body may react by trying to find more energy. You will become hungry.



## Unusual weight loss

This is more common among people with Diabetes Type 1. As your body is not making insulin it will seek out another energy source. Muscle tissue and fat will be broken down for energy. As Type 1 is of a more sudden onset and Type 2 is much more gradual, weight loss is more noticeable with Type 1.



## Weight gain

This might be the result of the above symptom (intense hunger).

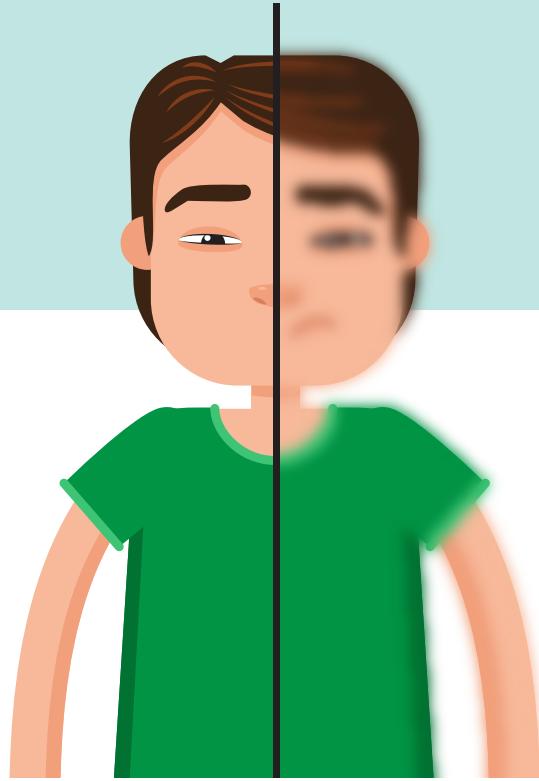
## Increased fatigue

If your insulin is not working properly, or is not there at all, glucose will not be entering your cells and providing them with energy. This will make you feel tired.



## Blurred vision

This can be caused by tissue being pulled from your eye lenses. This affects your eyes' ability to focus. With proper treatment this can be treated.



## Irritability

## Cuts and bruises don't heal properly or quickly

When there is more sugar (glucose) in your body, its ability to heal can be undermined.

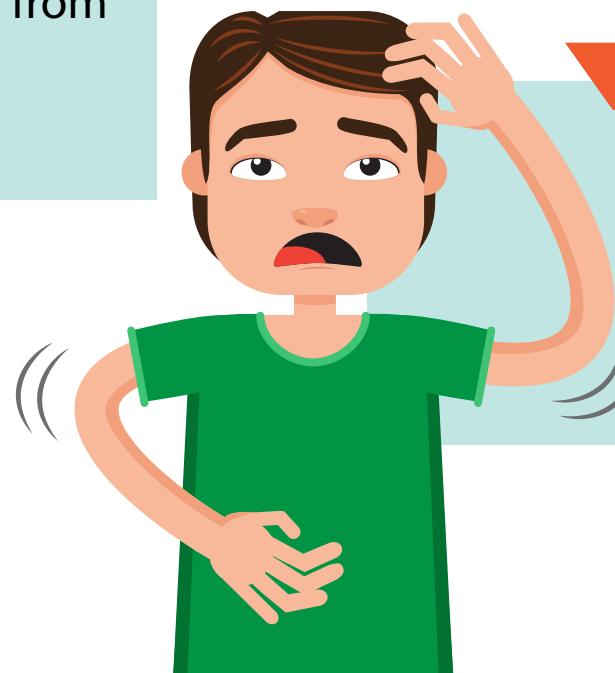
## More skin and/or yeast infections

When there is more sugar in your body, its ability to recover from infections is affected. Women with diabetes find it especially difficult to recover from bladder and vaginal infections.



## Itchy skin

A feeling of itchiness on your skin is sometimes a symptom of diabetes.



## Gums are red and/or swollen

If your gums are tender, red and/or swollen this could be a sign of diabetes. Your teeth could become loose as the gums pull away from them.



## Frequent gum disease/infection

As well as the previous gum symptoms, you may experience more frequent gum disease and/or gum infections.



## Sexual dysfunction among men

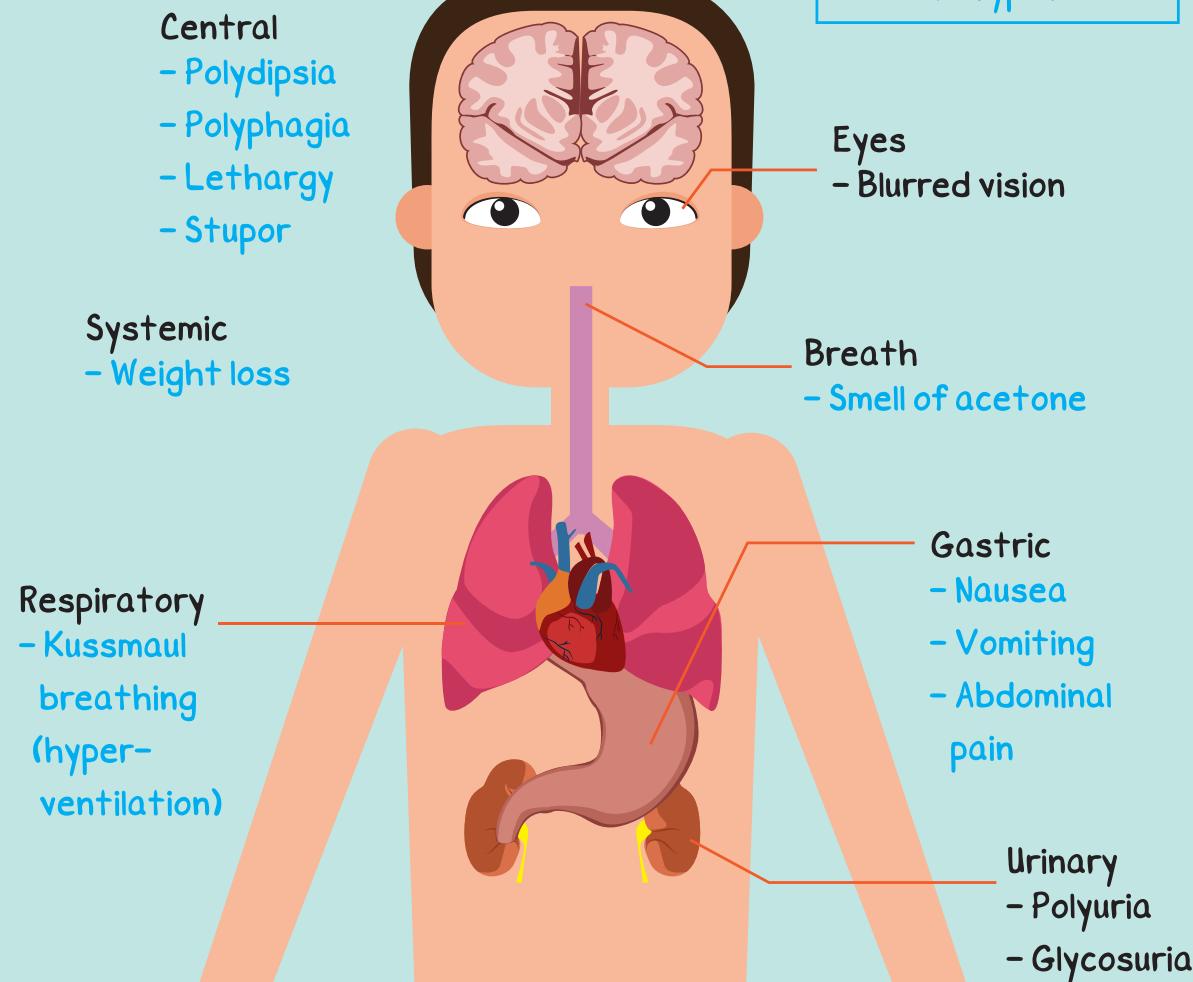
If you are over 50 and experience frequent or constant sexual dysfunction (erectile dysfunction), it could be a symptom of diabetes.



## Numbness or tingling, especially in your feet and hands

If there is too much sugar in your body your nerves could become damaged, as could the tiny blood vessels that feed those nerves.

# Main Symptoms of Diabetes



# Diabetes diagnosis

Diabetes can often be detected by carrying out a urine test, which finds out whether excess glucose is present.

If you are worried that you may have some of the above symptoms, you are recommended to talk to your Doctor.

Before tests are conducted, a diagnosis may be suspected when patients report certain symptoms. Doctors will evaluate these symptoms by asking questions about the patient's medical history.



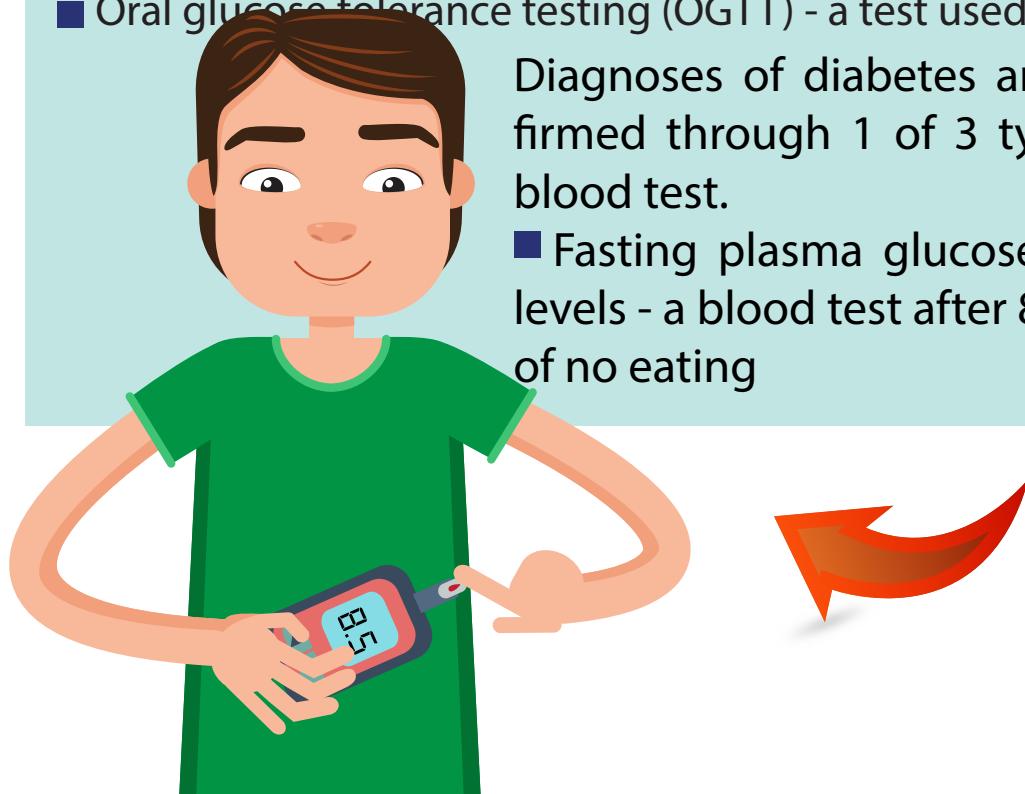
It's recommended diabetes testing for anyone overweight at the age of 45 years and over, alongside anyone under the age of 45 with one or more of the following risk factors:

- Hypertension (high blood pressure)
- High cholesterol
- History of diabetes in the family
- African-American, Asian-American, Latino/Hispanic-American, Native American or Pacific Islander background
- History of gestational diabetes (diabetes during pregnancy) or delivering a baby over 9 lbs.

## Blood test for diagnosis of diabetes

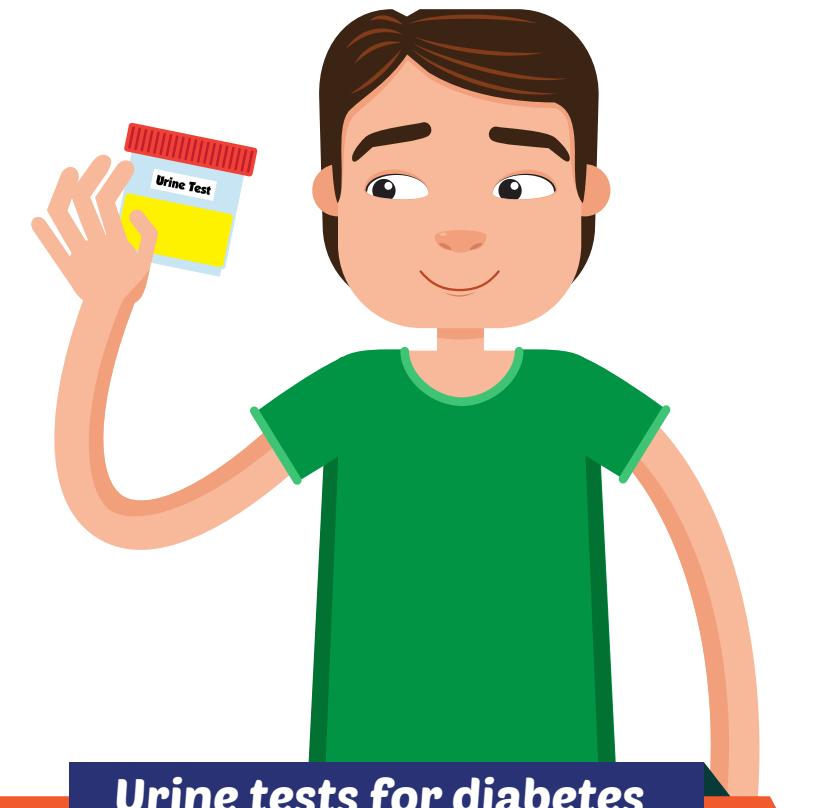
Diagnoses of diabetes are confirmed through 1 of 3 types of blood test.

- Fasting plasma glucose (FPG) levels - a blood test after 8 hours of no eating
- Glycosylated hemoglobin (HbA1c) - to measure a marker of the average blood glucose level over the past 2-3 months
- Oral glucose tolerance testing (OGTT) - a test used less



Diagnoses of diabetes are confirmed through 1 of 3 types of blood test.

- Fasting plasma glucose (FPG) levels - a blood test after 8 hours of no eating



## Urine tests for diabetes diagnosis

Urine tests are no longer used to make a diagnosis of diabetes, although they were once common. Blood tests are used instead because urine tests are not sensitive or specific enough and offer only a crude indication of high blood sugar levels.<sup>2,8</sup>

# Type 1 Diabetes: Causes and Symptoms

## What is type 1 diabetes?

Type 1 diabetes usually first appears in childhood or adolescence.

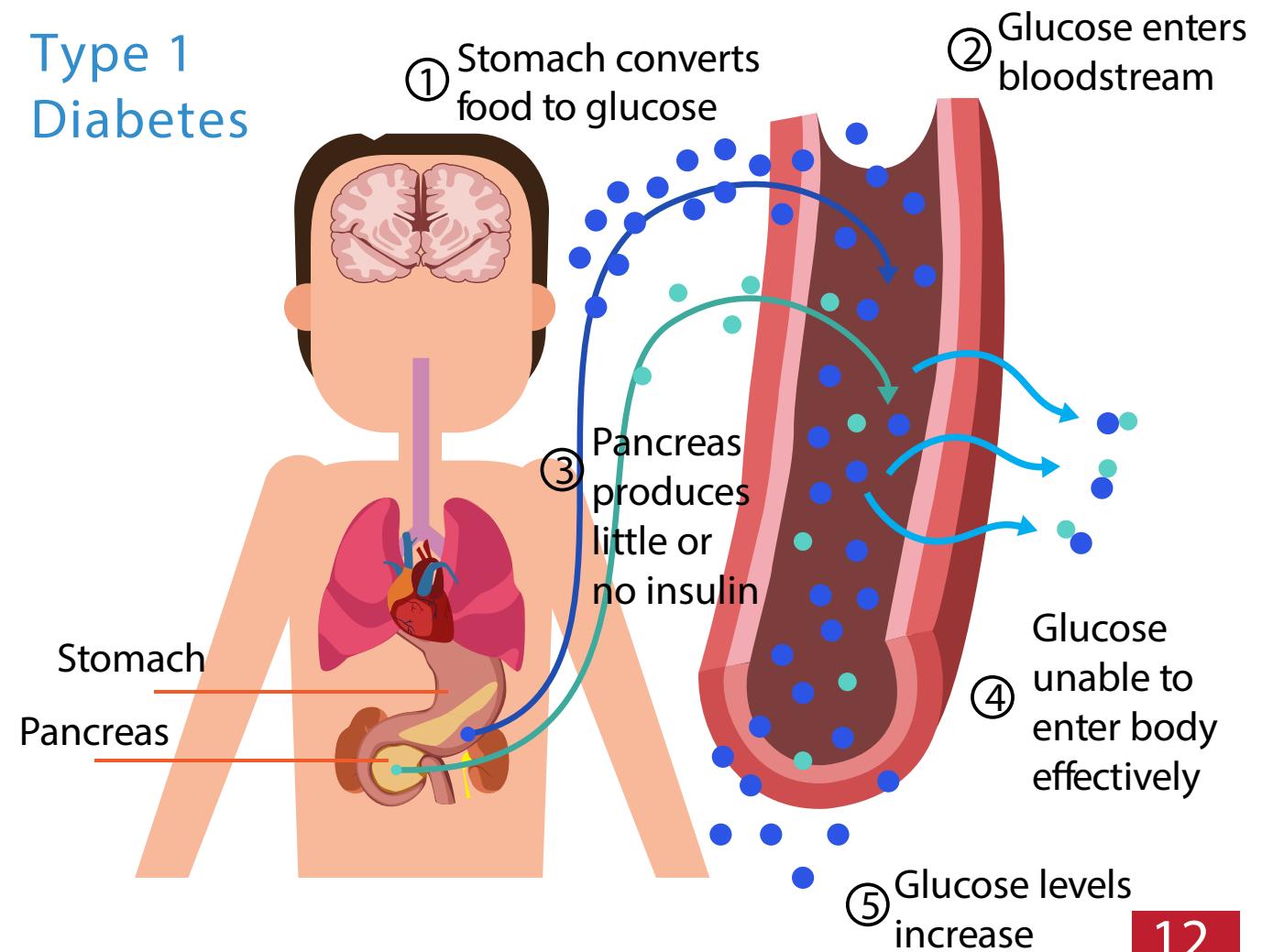
While type 2 diabetes is often preventable, type 1 diabetes mellitus is not.

Type 1 diabetes is an autoimmune disease in which the immune system destroys cells in the pancreas.

Typically, the disease first appears in childhood or early adulthood. Type 1 diabetes used to be known as insulin-dependent diabetes mellitus (IDDM), but the disease can have an onset at any age.

In type 1 diabetes, the pancreas is unable to produce any insulin, the hormone that controls blood sugar levels.<sup>2,3</sup>

## Type 1 Diabetes



Insulin production becomes inadequate for the control of blood glucose levels due to the gradual destruction of beta cells in the pancreas. This destruction progresses without notice over time until the mass of these cells decreases to the extent that the amount of insulin produced is insufficient.<sup>2</sup>

Type 1 diabetes typically appears in childhood or adolescence, but its onset is also possible in adulthood.<sup>2</sup>

When it develops later in life, type 1 diabetes can be mistaken initially for type 2 diabetes. Correctly diagnosed, it is known as latent autoimmune diabetes of adulthood.<sup>2</sup>



## Causes of type 1 diabetes

The gradual destruction of beta cells in the pancreas that eventually results in the onset of type 1 diabetes is the result of autoimmune destruction. The immune system turning against the body's own cells is possibly triggered by an environmental factor exposed to people who have a genetic susceptibility.

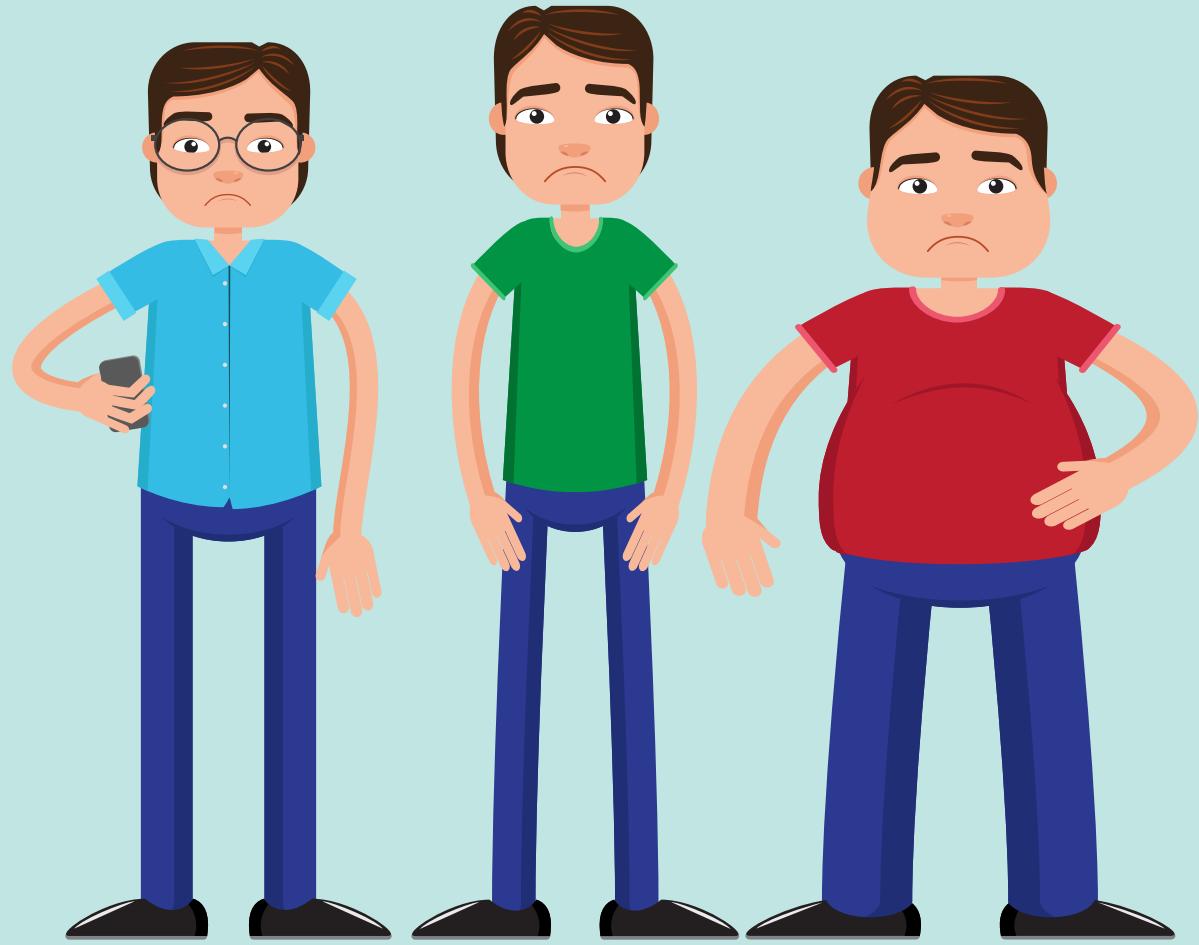
Although the mechanisms of type 1 diabetes etiology are unclear, they are thought to involve the interaction of multiple factors:

Susceptibility genes - some of which are carried by over 90% of patients with type 1 diabetes.

Autoantigens - proteins. The autoantigens activate an immune response resulting in beta cell destruction

Viruses

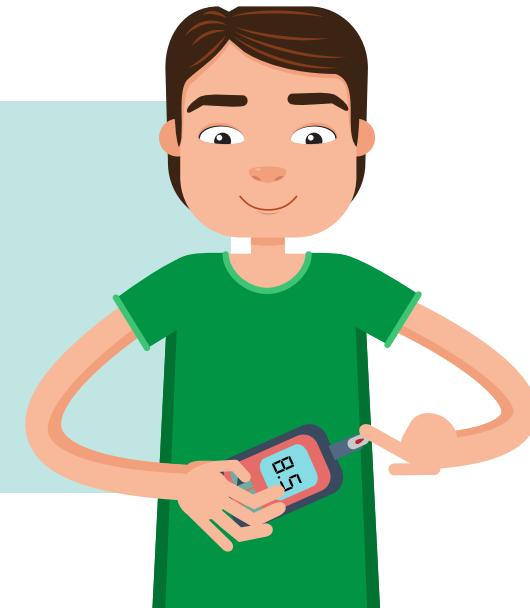
Diet - infant exposure to dairy products, high nitrates in drinking water and low vitamin D intake have also been linked to the development of type 1 diabetes.



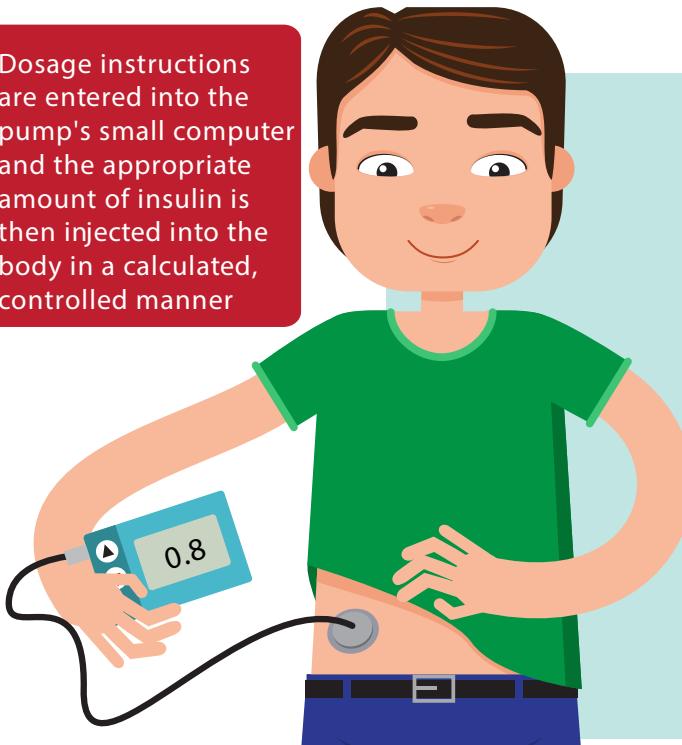
# Life with type 1 diabetes

Health care professionals usually teach people with type 1 diabetes to self-manage the condition.

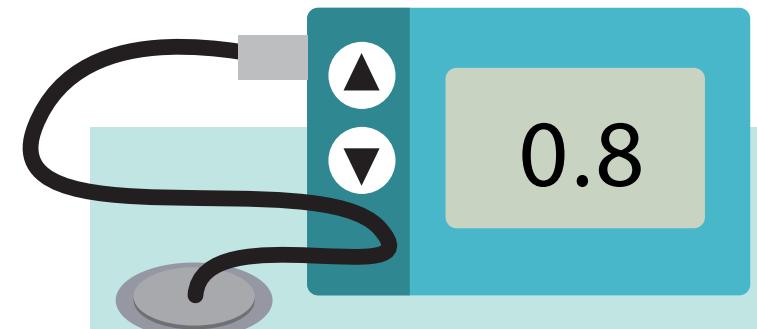
Type 1 diabetes always requires insulin treatment and an insulin pump or daily injections will be a lifelong requirement to keep blood sugar levels under control.



Dosage instructions are entered into the pump's small computer and the appropriate amount of insulin is then injected into the body in a calculated, controlled manner



After the diagnosis of type 1 diabetes, health care providers will help patients learn how to self-monitor via finger stick testing, the signs of any diabetic complications. Most patients will also be taught how to adjust their insulin doses.

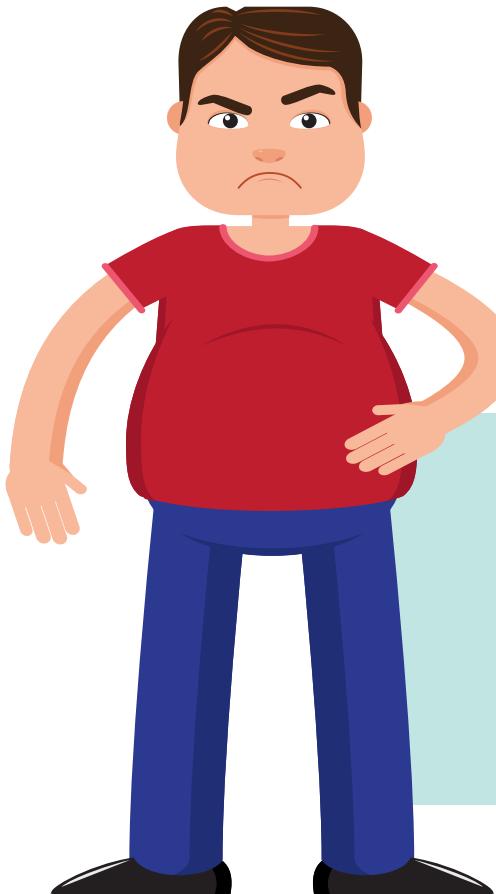


As with other forms of diabetes, nutrition and physical activity and exercise are important elements of the lifestyle management of the disease.

## Type 2 Diabetes: Causes and Symptoms

Type 2 is the most common form of diabetes, accounting for over 90% of all diabetes cases.<sup>1,2</sup>

Type 2 diabetes used to be known as adult-onset diabetes and noninsulin-dependent diabetes mellitus (NIDDM), but the disease can have an onset at any age, increasingly including childhood.

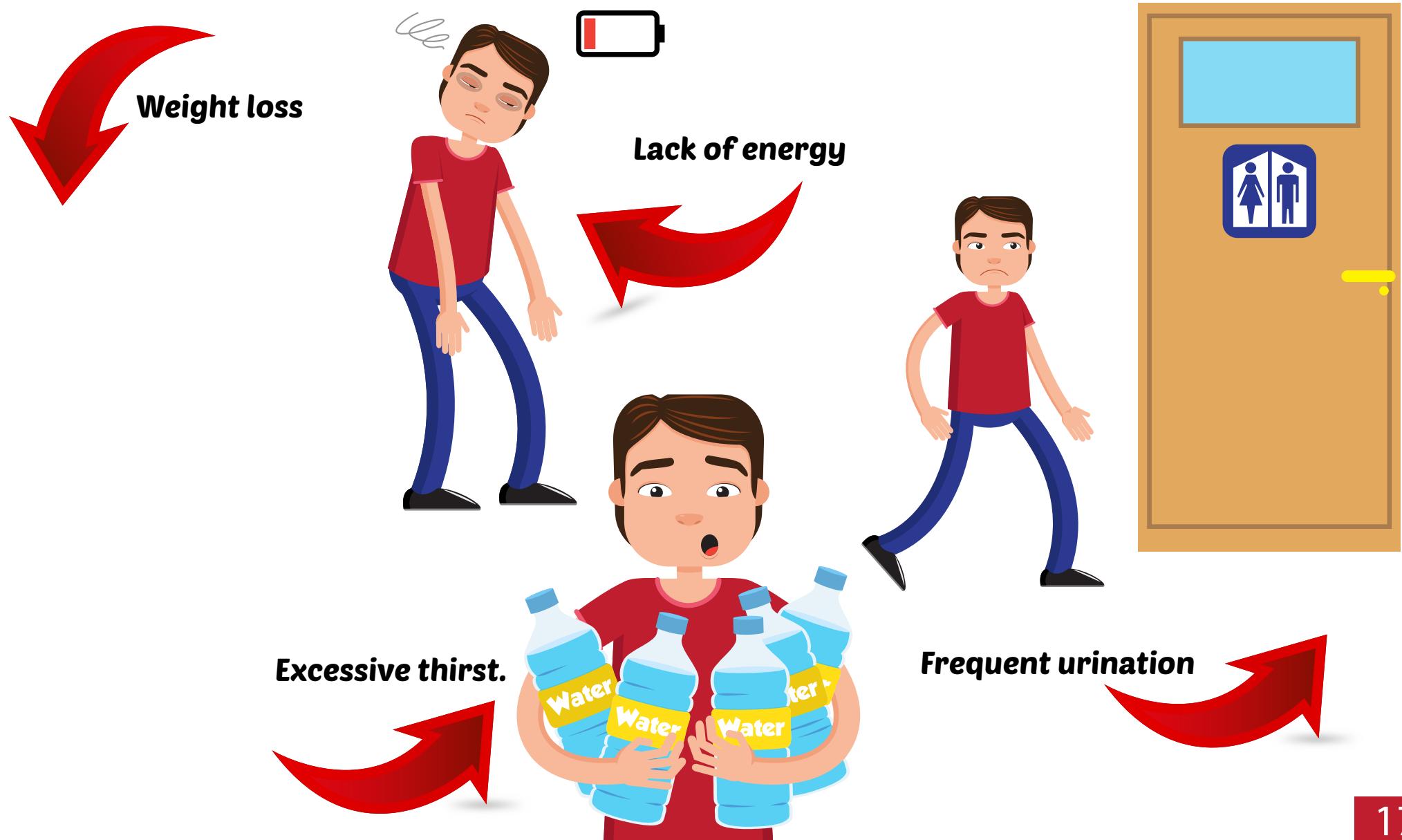


### What is type 2 diabetes?

Type 2 diabetes mellitus most commonly develops in adulthood and is more likely to occur in people who are overweight and physically inactive.

Unlike type 1 diabetes which currently cannot be prevented, many of the risk factors for type 2 diabetes can be modified. For many people, therefore, it is possible to prevent the condition.

The “International Diabetes Foundation” recommended four symptoms that signal the need for diabetes testing:



## Causes of type 2 diabetes

Insulin resistance is usually the precursor to type 2 diabetes - a condition in which more insulin than usual is needed for glucose to enter cells.<sup>3</sup> Insulin resistance in the liver results in more glucose production while resistance in peripheral tissues means glucose

The impairment stimulates the pancreas to make more insulin but eventually the pancreas is unable to make enough to prevent blood sugar levels from rising too high.

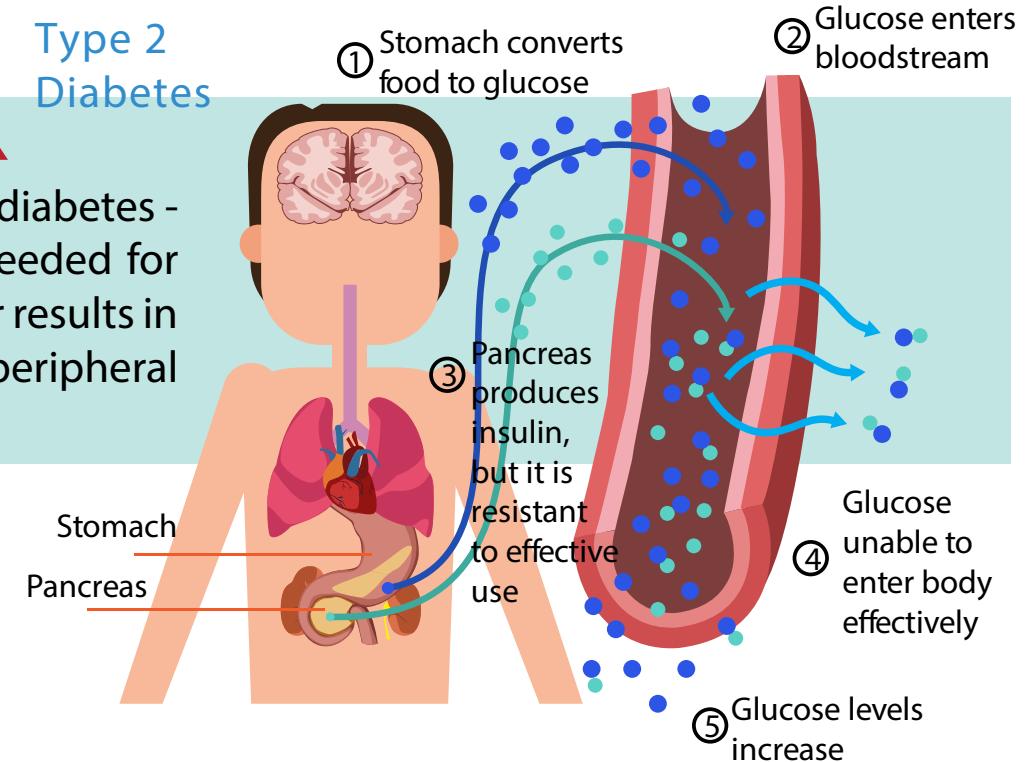
What are the risk factors for type 2 diabetes?

Genetics plays a part in type 2 diabetes - relatives of people with the disease are at a higher risk.

Obesity is the single most important risk factor for type 2 diabetes. The more overweight you are, the more resistant your body is to insulin.

Age

### Type 2 Diabetes

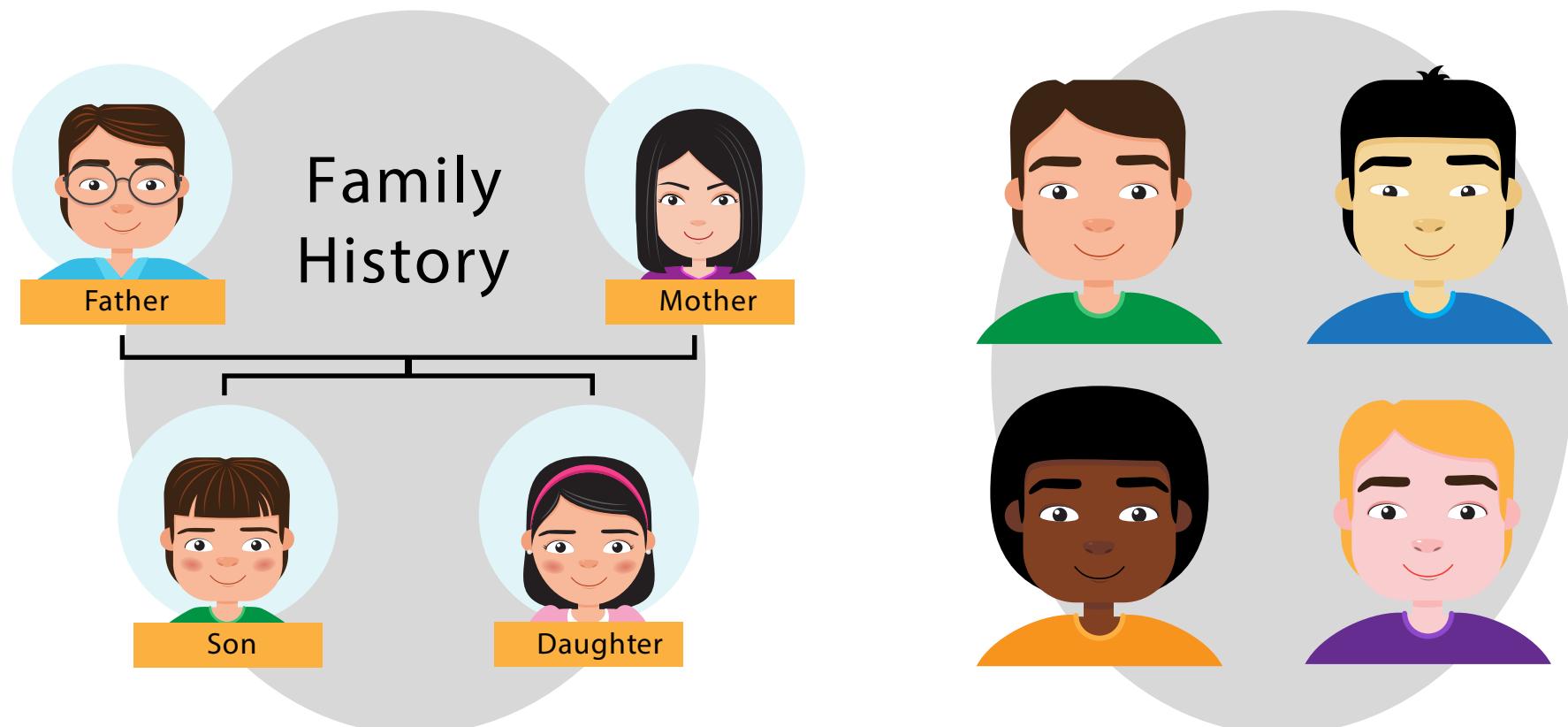


The risk for type 2 diabetes increases with age, especially after 45 years of age. Although you can't change your age, you can work on other risk factors to reduce your risk.

### **Family history**

Although you can't change your family history, it is important for you and your doctor to know if diabetes runs in your family.

### **Race**

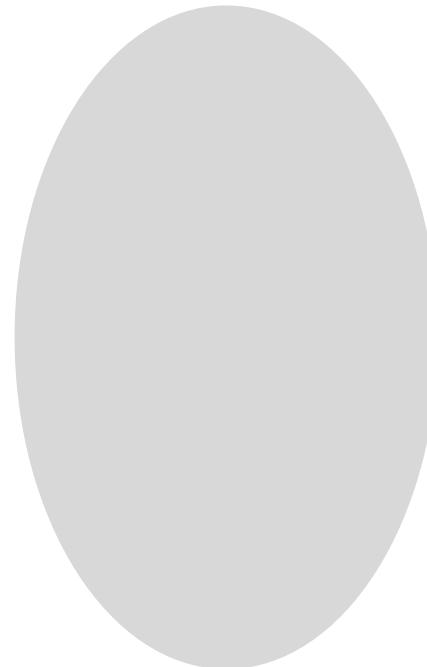
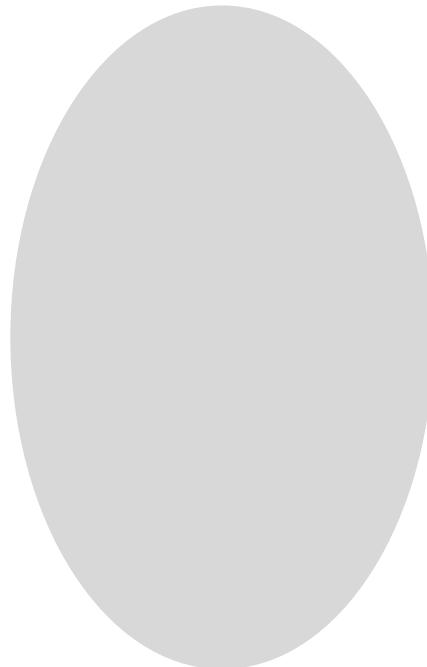


## **Exercise**

Exercising and maintaining a healthy weight can reduce your risk of diabetes. Any amount of activity is better than none, but try to exercise for 30 to 60 minutes most days of the week.

## **Diet**

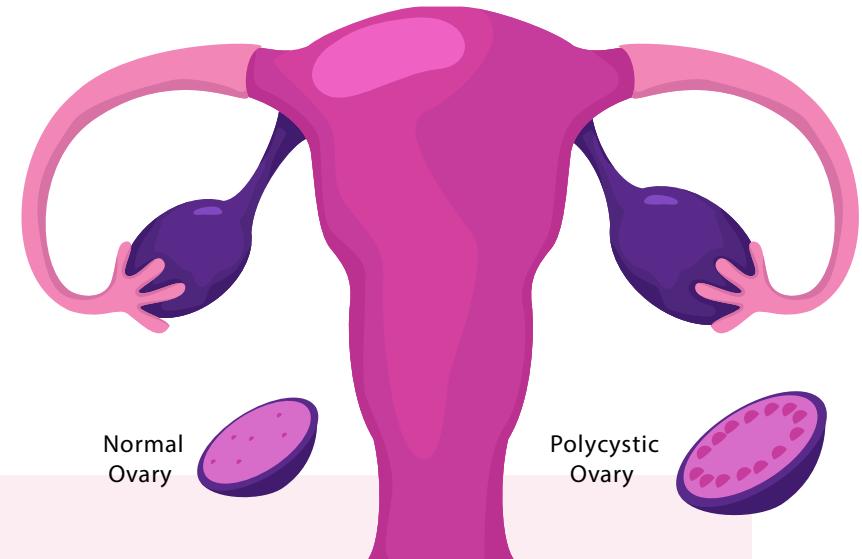
A diet high in fat, calories and cholesterol increases your risk of diabetes. In addition, a poor diet can lead to obesity (another risk factor for diabetes) and other health problems.



Once **type 2 diabetes** has been diagnosed, health care providers can help patients with a program of education and monitoring, including how to spot the signs of hypoglycemia, hyperglycemia and other diabetic complications.

## Gestational diabetes

Occurs in pregnancy and typically resolves after childbirth. People who have experienced gestational diabetes do, however, have an increased risk of developing type 2 diabetes after pregnancy.

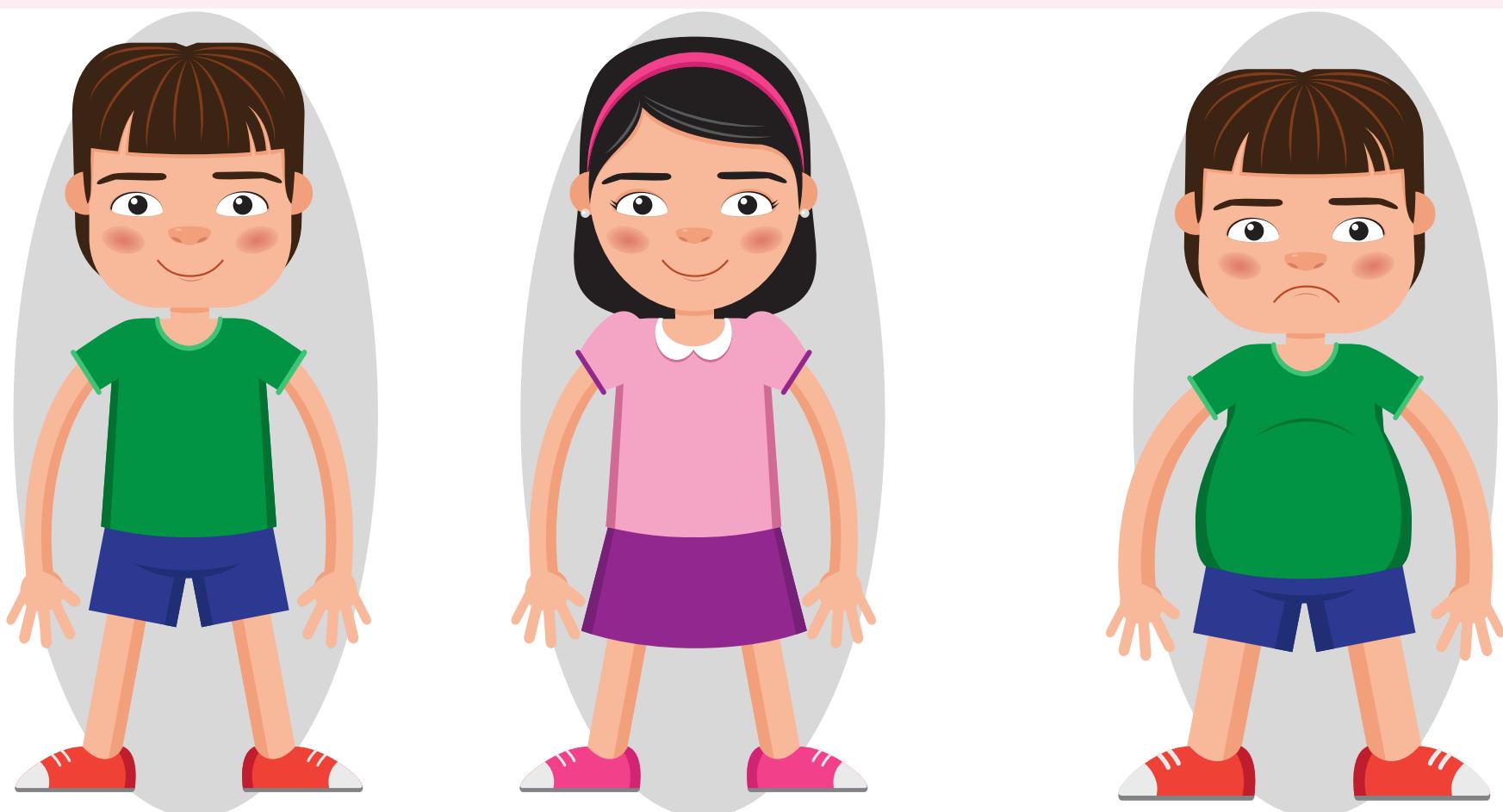


### Polycystic ovary syndrome

Polycystic ovary syndrome (PCOS) is a condition that occurs when an imbalance of hormone levels in a woman's body causes cysts to form on the ovaries. Women who have PCOS are at an increased risk of developing type 2 diabetes.

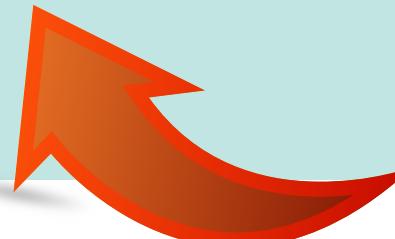
## Can children get type 2 diabetes?

Yes. In the past, doctors thought that only adults were at risk of developing type 2 diabetes. Doctors think this increase is mostly because more children are overweight or obese and are less physically active.

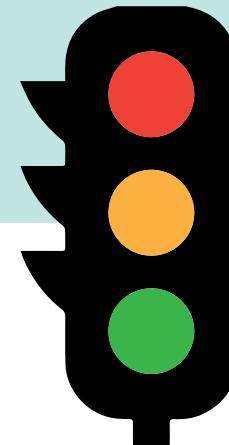


## What is pre-diabetes?

Pre-diabetes occurs when blood sugar levels are higher than they should be, but not so high that your doctor can say you have diabetes. It greatly increases the risk of developing type 2 diabetes.

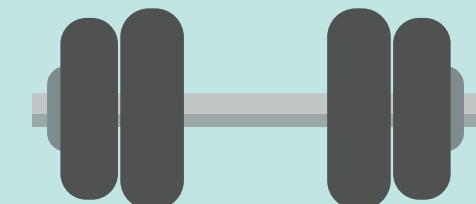


Do you know what  
Your Numbers  
mean?  
Fasting Glucose  
Ranges



Diabetes	126 or more mg/dL
Pre-Diabetes	100-125 mg/dL
Normal	99 or less mg/dL

The good news is that you can take steps to prevent or delay the onset of full-blown type 2 diabetes by making lifestyle changes, such as eating a healthy diet, reaching and maintaining a healthy weight, and exercising regularly.



## Hypoglycemia - Symptoms, Causes and Treatments



Hypoglycemia is a complication of diabetes treatment whereby blood sugar levels fall too low.

It's a condition brought on by medical intervention. Hypoglycemia is the most common complication of diabetes treatment with insulin.

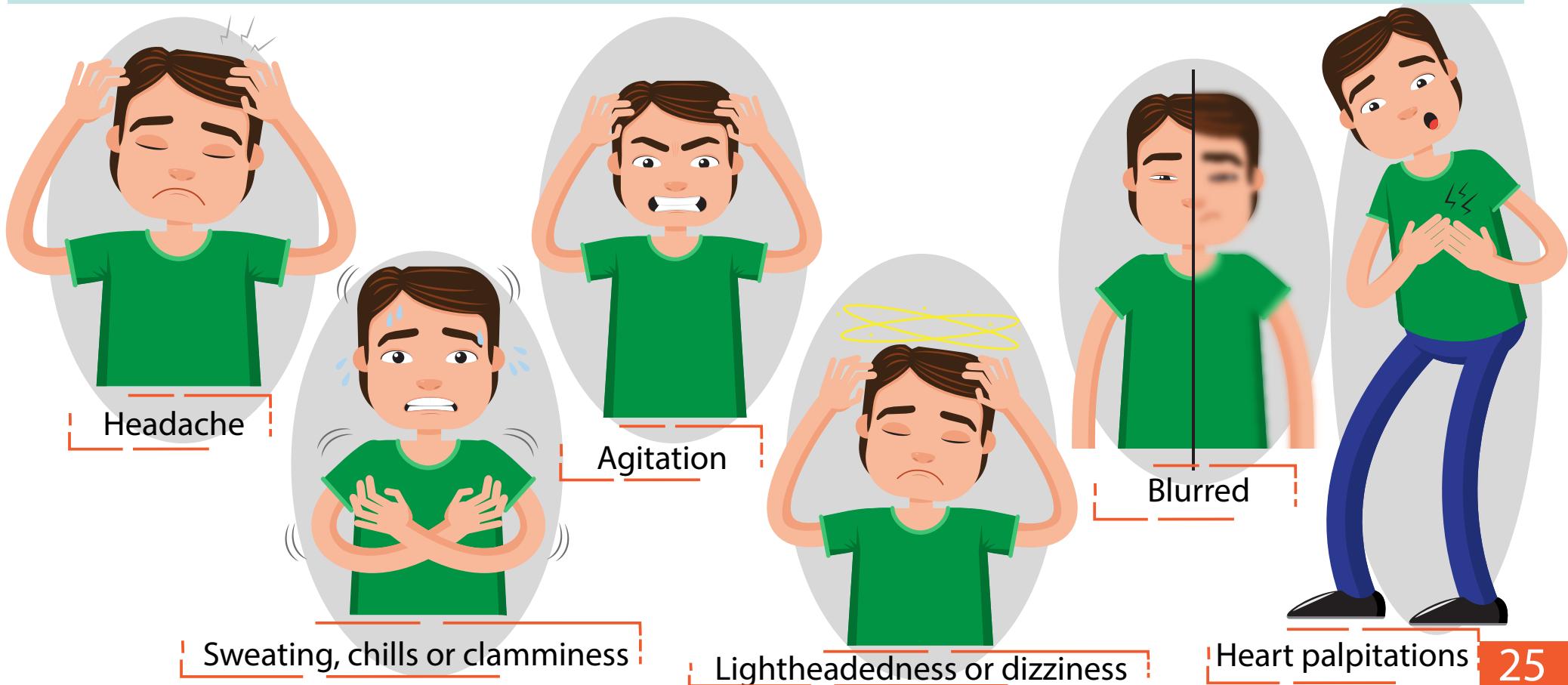
### Frequent urination

Hypoglycemia occurs when blood glucose levels fall below 4 mmol/L (72mg/dL).

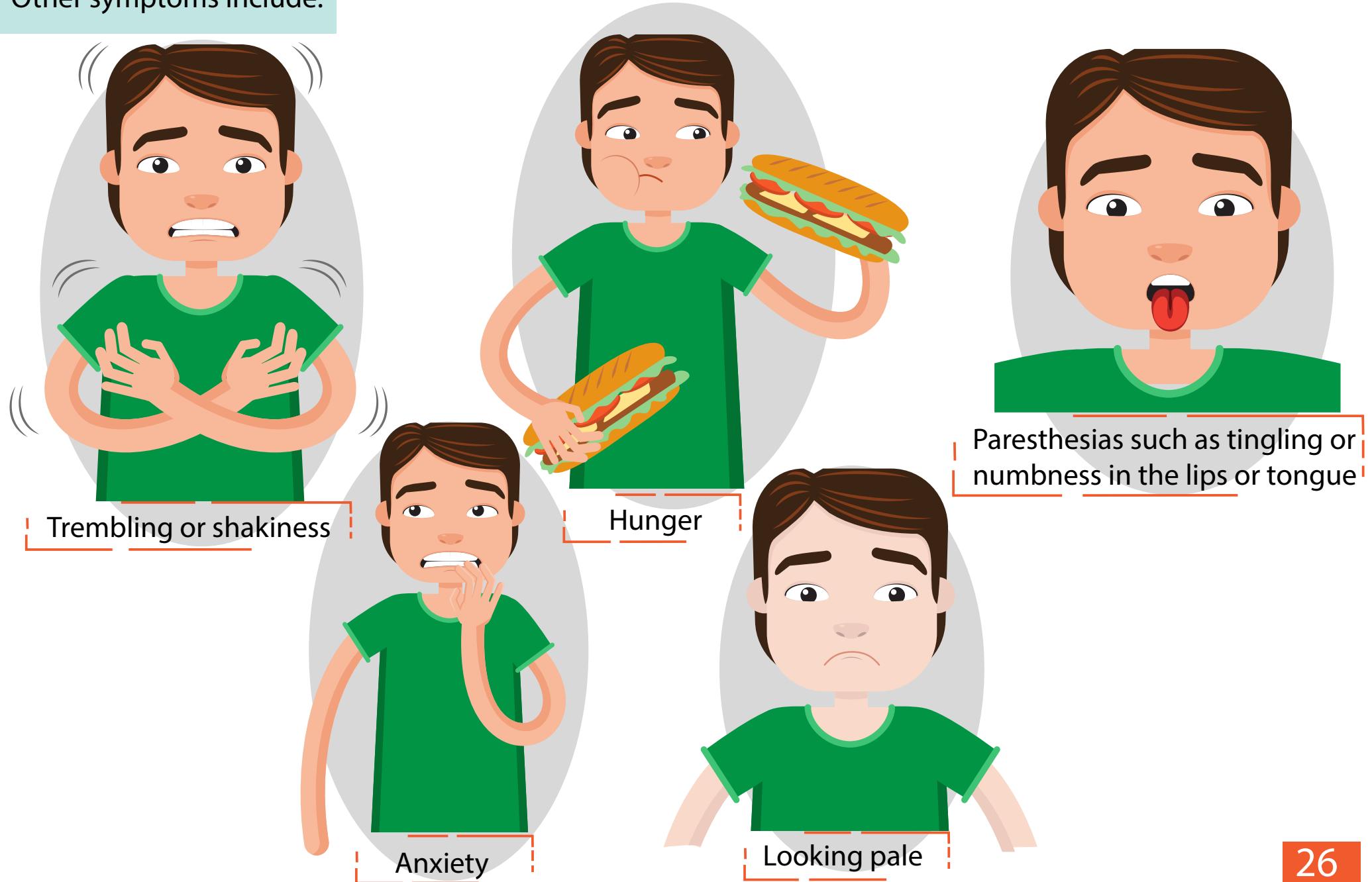


# Symptoms of hypoglycemia

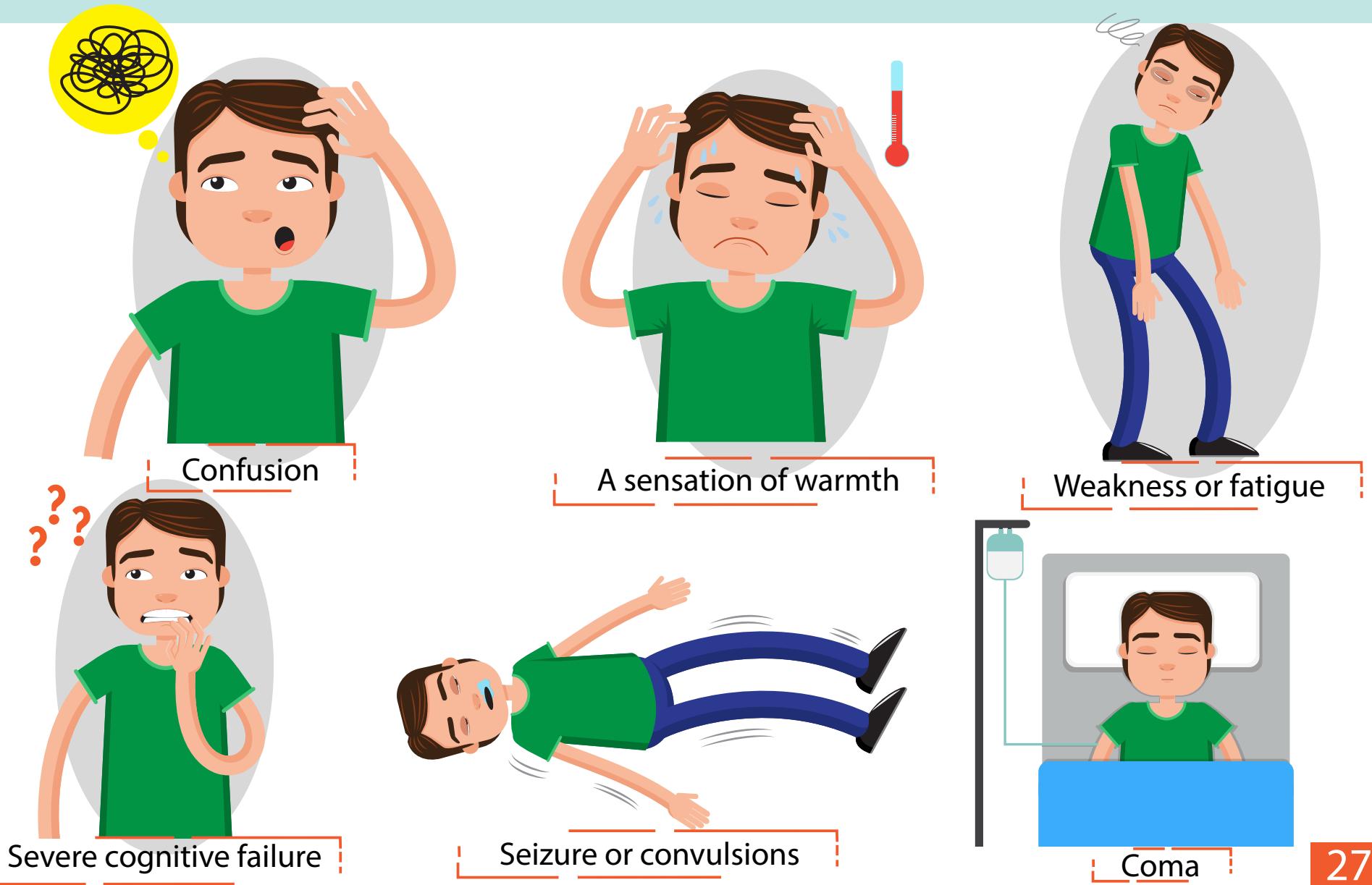
Hypoglycemia can be dangerous and its onset can be quick. As a result, it is important to learn how to recognize its symptoms.<sup>1</sup>  
Mild or moderate hypoglycemia can lead to symptoms including the following:<sup>1,2,4</sup>



Other symptoms include:



The neuroglycopenic symptoms can be the most severe and result from glucose deprivation of the brain. These symptoms include:<sup>1,3,4</sup>

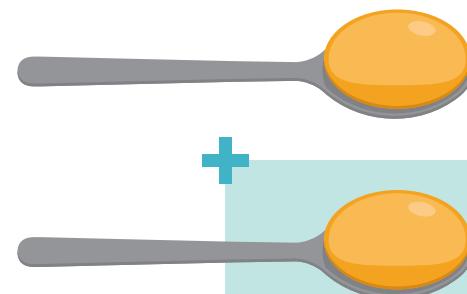
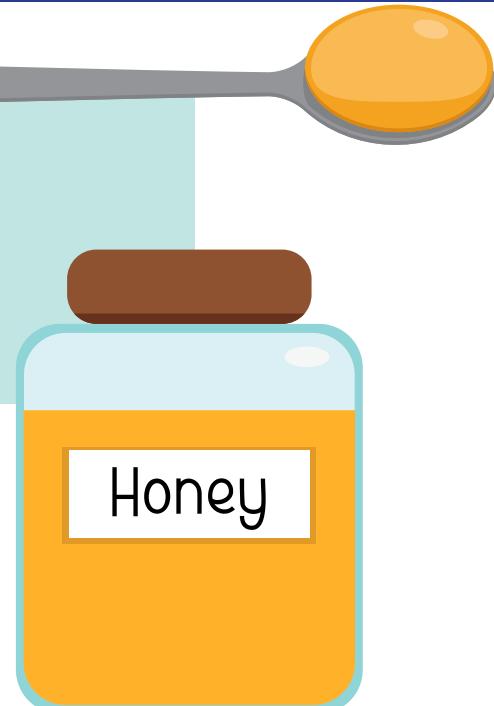


## Treatments for hypoglycemia

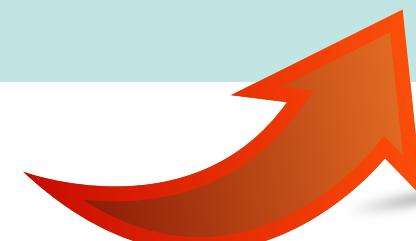
An episode of hypoglycemia can be treated quickly and effectively with 15-20 grams of glucose.

**A tablespoon of honey can be used as fast-acting for an episode of hypoglycemia.**

If glucose is not available, other fast-acting, simple carbohydrate alternatives include a tablespoon of honey, sweets such as jelly beans and 250ml of a non-diet soft drink or fruit juice.



Around 15 minutes after administering the initial treatment, the patient should check their blood glucose level if possible. If it is not over 4.4 mmol/L (80 mg/dL), another 15 grams of glucose should be taken.



In cases where there is unconsciousness or an inability to swallow, trained health care professionals can treat hypoglycemia by injecting either one milligram of glucagon (which causes the liver to release glucose) under the skin or into the muscles.



An emergency ambulance should be called for a case involving loss of consciousness or if treatment is not available. Further infusion may follow glucagon or dextrose injection.

## What is hypoglycemia unawareness?

People who have had type 1 diabetes for a long time may develop hypoglycemia unawareness.<sup>1,2</sup> The condition is more common in cases of type 1 diabetes - occurring in about 40% of cases - than it is in cases of type 2 diabetes.<sup>6</sup>

If episodes of hypoglycemia are frequently occurring, it is important to consult a doctor. Hypoglycemia may be related to the treatment regime rather than any mistakes over missed meals, excess insulin, alcohol consumption and physical activity.<sup>5</sup>



## Hyperglycemia - Symptoms, Causes and Treatments

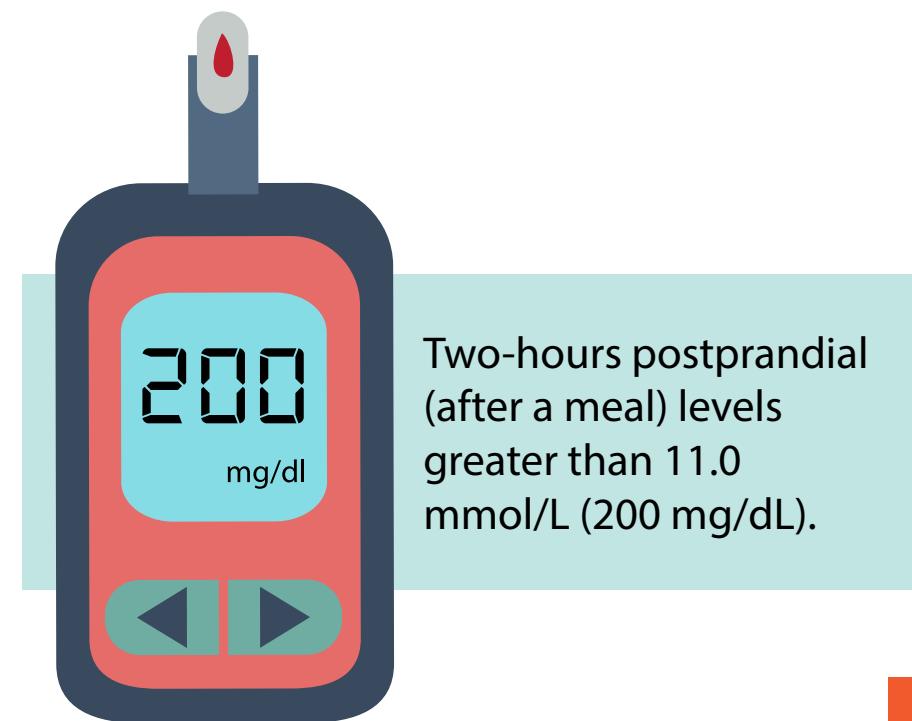
Hyperglycemia is a term referring to high blood glucose levels - the condition that often leads to a diagnosis of diabetes.

High blood glucose levels are the defining feature of diabetes, but once the disease is diagnosed, hyperglycemia is a signal of poor control over the condition.

**Hyperglycemia is defined by certain high levels of blood glucose:**1



Fasting levels greater than 7.0 mmol/L (126 mg/dL)



Two-hours postprandial (after a meal) levels greater than 11.0 mmol/L (200 mg/dL).

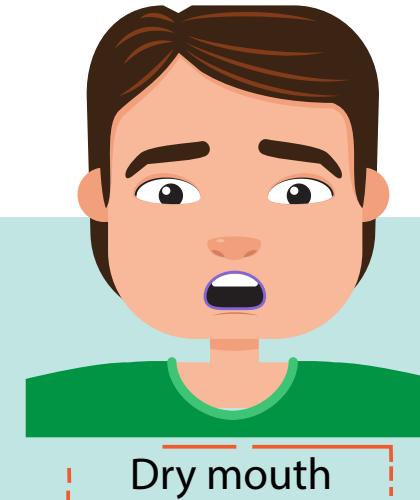
**Chronic hyperglycemia usually leads to the development of diabetic complications.2**

## Symptoms of hyperglycemia

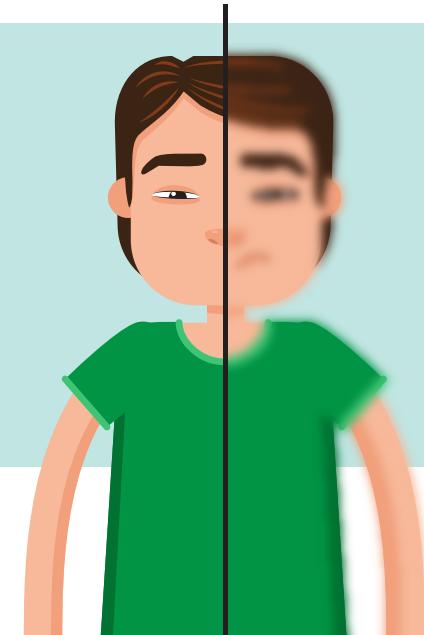
Typical signs and symptoms of hyperglycemia include:



Thirst and hunger



Recurrent infections,  
such as thrush





Tiredness

Frequent urination,  
particularly at night

Weight loss

## Causes of hyperglycemia



Eating more or  
exercising less than usual



Insufficient amount of  
insulin treatment



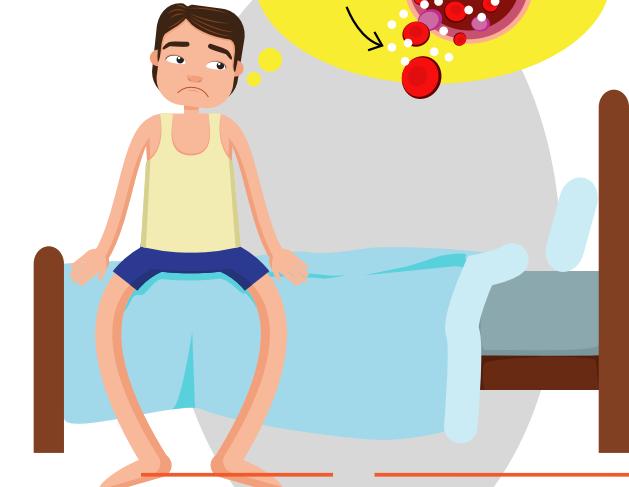
Illness such as the flu

**Insulin  
Resistance  
Type 2 Diabetes**

Insulin resistance  
in type 2 diabetes



Psychological and  
emotional stress



The "dawn phenomenon" or "dawn effect" -  
an early morning hormone surge.

## Treatment and prevention of hyperglycemia

Prevention of hyperglycemia for people with a diabetes diagnosis is a matter of good self-monitoring and management of blood glucose levels, including adherence to insulin regimes if necessary.

For someone who has not been diagnosed with diabetes, symptoms of hyperglycemia need to be reported to a doctor so that they can test for diabetes - other conditions can also lead to hyperglycemia.

Control of high blood sugar is important to prevent complications caused by chronic hyperglycemia. A doctor may need to review the treatment plan for a diabetes patient who becomes hyperglycemic and they may decide to take one of the following actions:

- Raise the insulin dose
- Recommend dietary changes
- Recommend more exercise
- Recommend closer glucose monitoring



## Hyperglycemia can lead to diabetic ketoacidosis

It is important to attend to hyperglycemia since it can lead to a dangerous complication known as ketoacidosis.

High levels of glucose in the blood mean that insufficient levels of glucose are available to cells for their energy needs. As a result, the body resorts to breaking down fat so that energy is derived from fatty acids. This breakdown produces ketones, leading to higher acidity of the blood.

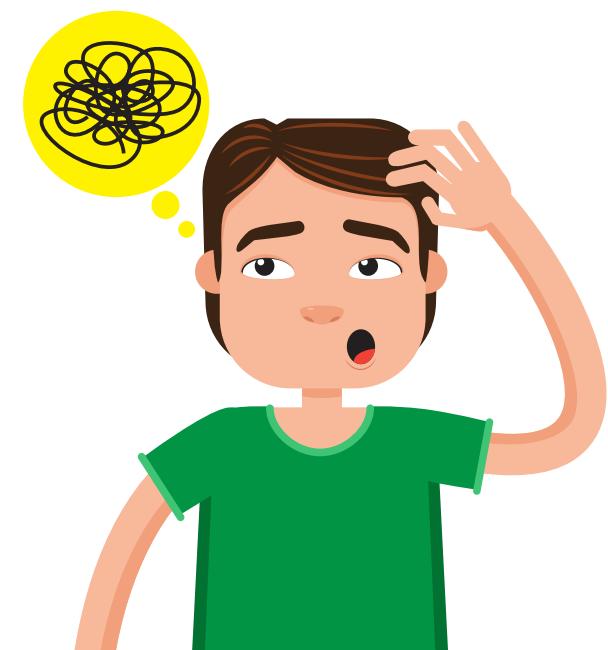
Diabetic ketoacidosis requires urgent medical attention and, alongside hyperglycemia and its symptoms, is signaled by:



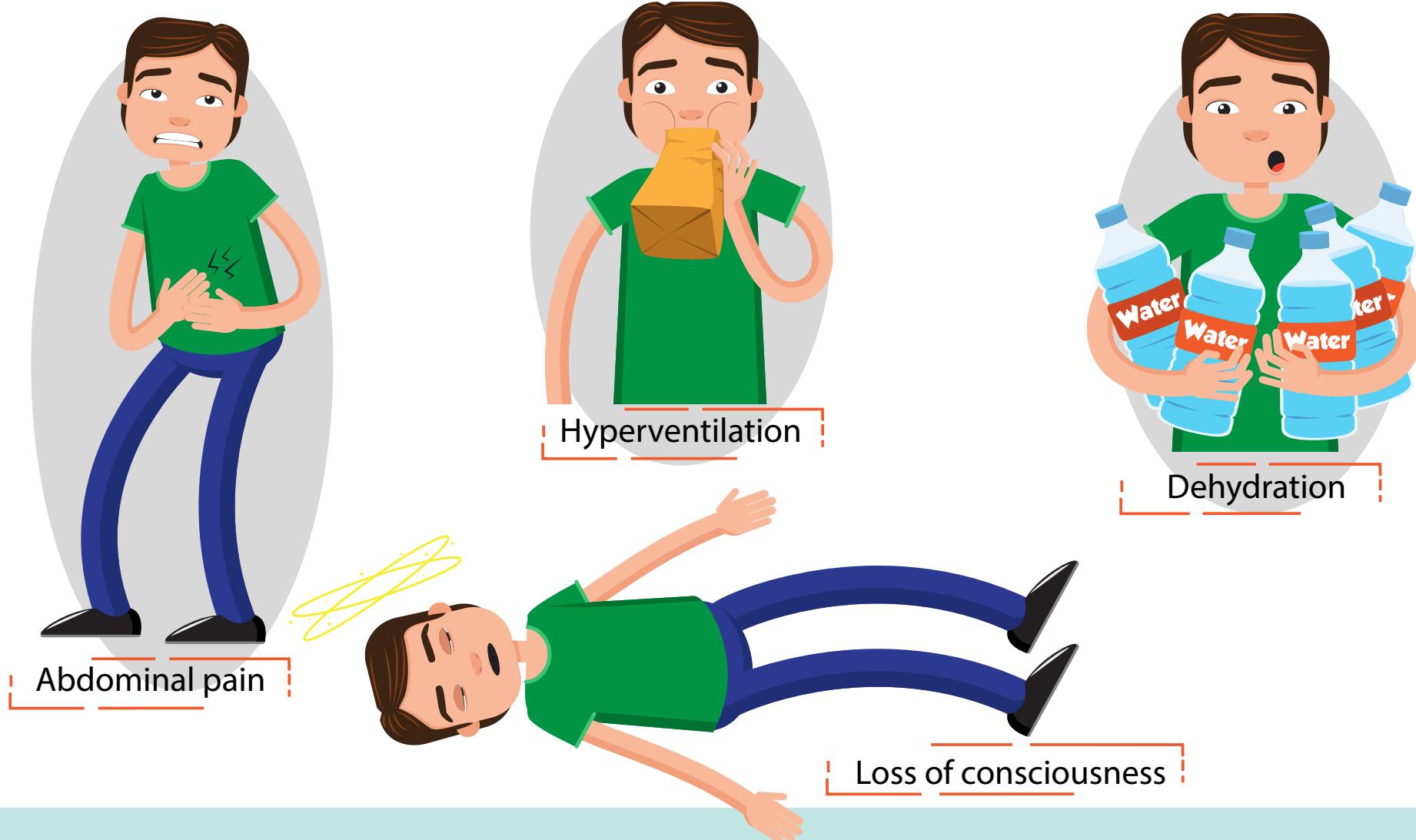
A fruity smell on the breath



Nausea or vomiting



Drowsiness or confusion



Hospital treatment of ketoacidosis includes the administering of intravenous fluids and insulin.

# Complications Caused By Diabetes

Even when diabetes is well controlled, it raises the risk of other.

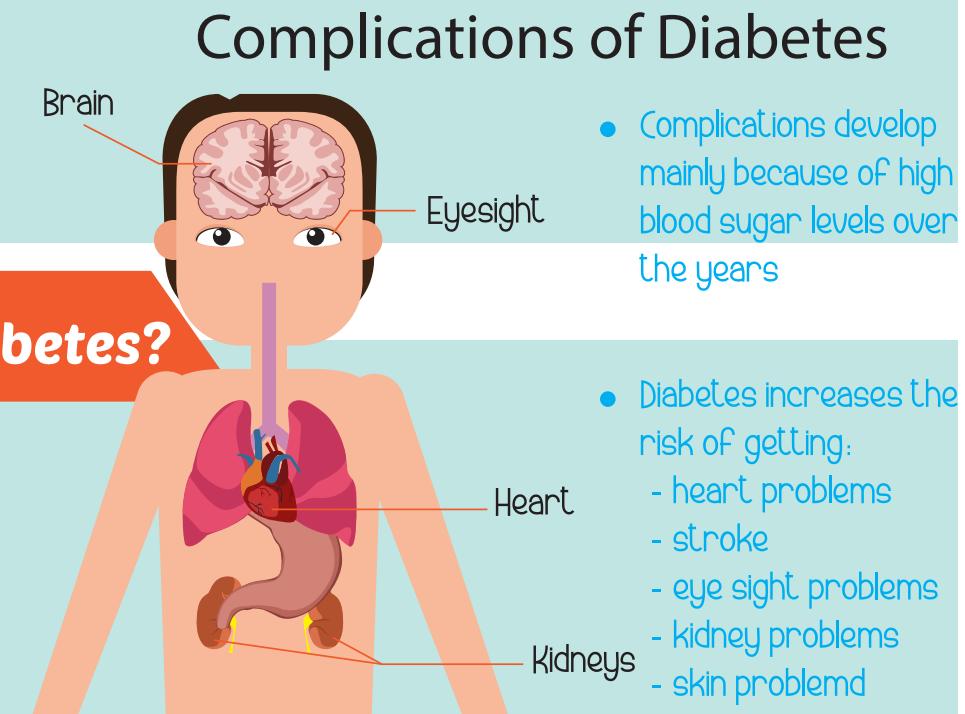
## Causes of diabetes complications

High blood glucose levels are damaging to blood vessels and can increase the likelihood of them narrowing through atherosclerosis. This damage also leads to poor supply of blood to nerves.

Poorly controlled hyperglycemia persisting for years can lead to complications affecting small blood vessels, large blood vessels or both.

## What complications are caused by diabetes?

Microvascular complications - those resulting from damage to small blood vessels - are the most common complications of diabetes and include:<sup>2</sup>



- Complications develop mainly because of high blood sugar levels over the years
- Diabetes increases the risk of getting:
  - heart problems
  - stroke
  - eye sight problems
  - kidney problems
  - skin problems

## Diabetic retinopathy

Diabetic retinopathy is an eye complication caused by disease of the tiny blood vessels supplying the retina (the light-sensitive back of the eye).

Early detection and preventive action are important. As symptoms do not appear before damage is done, anyone with diabetes - whether type 1 or type 2 - should have their eyes regularly checked by an optometrist or ophthalmologist.



People with diabetes should go for regular professional eye checks.

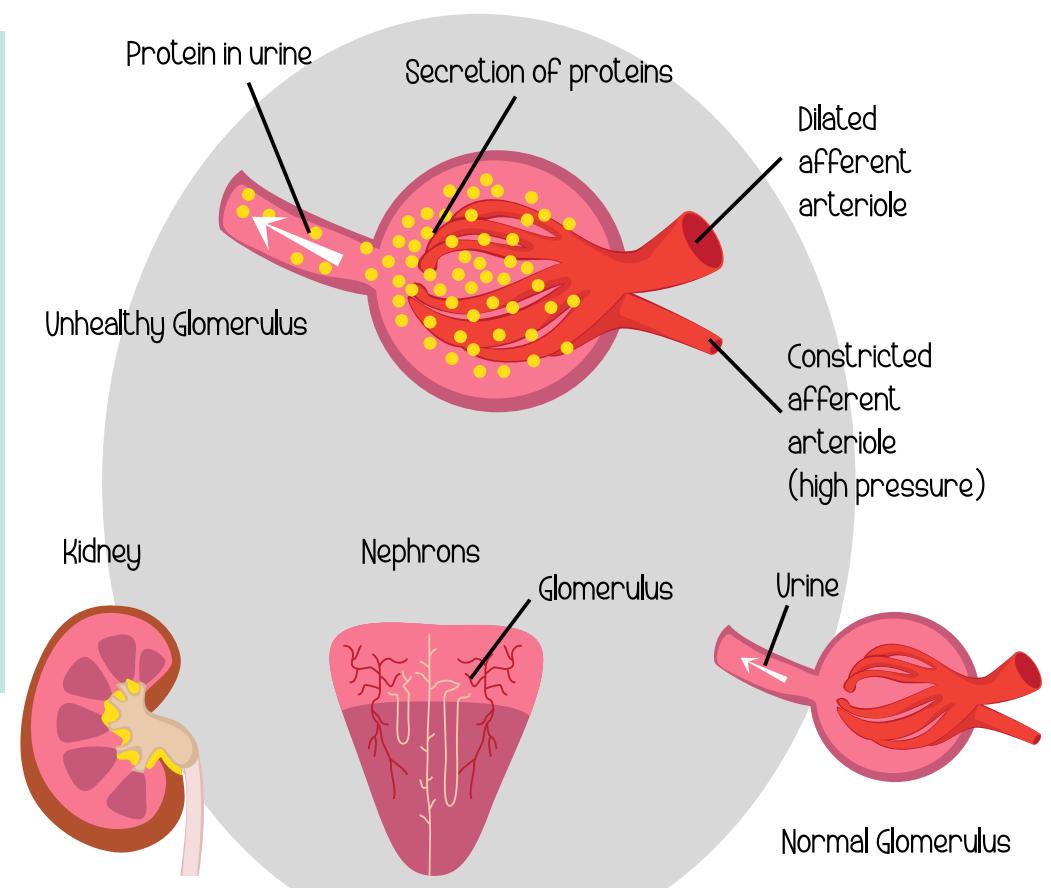


# Diabetic nephropathy

Diabetic nephropathy - kidney or renal disease - is another complication caused by damage to small blood vessels.

Diabetes is the cause of most cases of the most serious kidney disease - end-stage renal disease. Nephropathy can also appear at other stages, from renal insufficiency through to chronic renal failure.

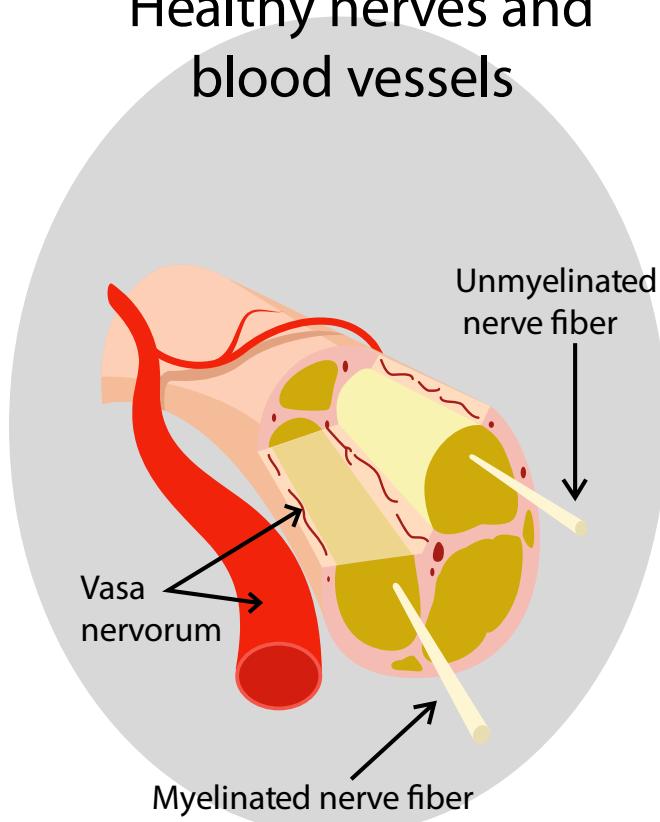
Nephropathy is diagnosed by urine test and the primary treatment - as with other diabetes complications - is tight control of blood sugar levels. In addition, blood pressure treatment with drugs may be needed.



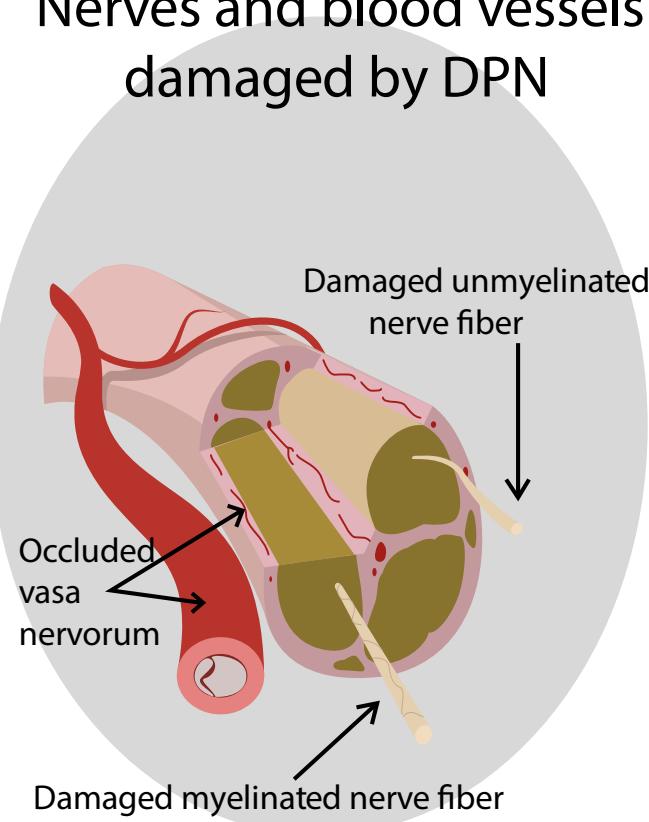
# Diabetic neuropathy

Diabetic neuropathy - a disease of nerves - is also a complication caused by damage to small blood vessels. In this case, it involves capillaries supplying nerves.

Healthy nerves and blood vessels



Nerves and blood vessels damaged by DPN



# Foot complications

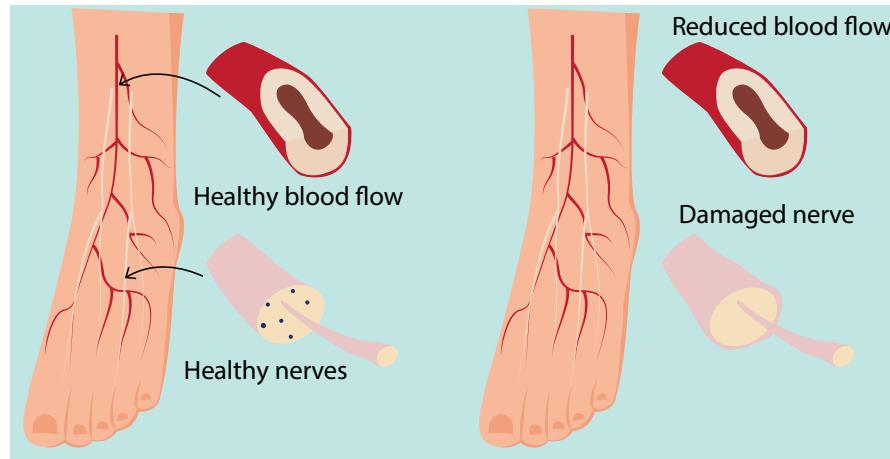
Complications affecting the foot - often referred to as "diabetic foot" - result from neuropathy, nerve damage that causes tingling sensations, burning or stinging pain, weakness or loss of feeling. The nerves become damaged due to restricted blood supply.

The phenomenon can also affect the hands, but it is the feet that are most commonly affected. If left unnoticed, this condition can lead to infection and even gangrene and potential amputation.

Nerve damage leads to skin changes, making the foot dry and prone to cracking or peeling. Poor circulation to the feet caused by vessel narrowing can also mean that any infections or wounds heal less readily.



Diabetes can cause nerve damage in the feet. Wounds can go unnoticed and fail to heal properly.



Healthy foot

Diabetes foot

Seeking medical attention for any problems is important, as is getting the feet checked by a health care professional, such as a podiatrist, at least annually. Practical measures include:

- Keeping the feet clean and dry
- Ensuring the nails are well-maintained
- Wearing socks and shoes that fit comfortably and do not rub or squeeze the feet.

## Macrovascular complications

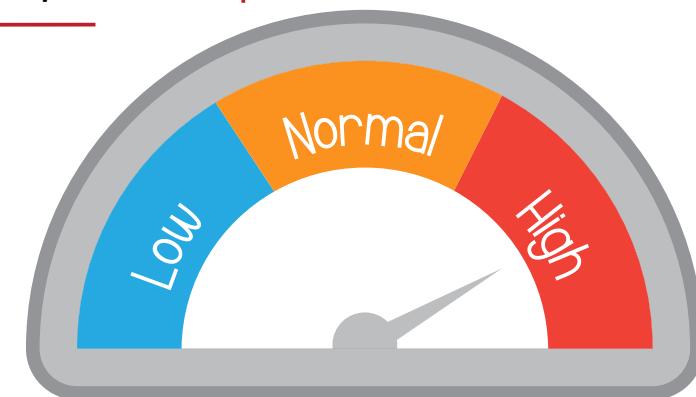
Disease of the large blood vessels caused by diabetes can lead to angina, transient ischemic attacks or stroke, heart attack and peripheral arterial disease. Macrovascular disease also contributes to the risk of the heart disease cardiomyopathy.

Screening, history and physical examination diagnose macrovascular disease, and treatment includes tight control of blood sugar levels as well as lipid- and blood pressure-lowering therapies.

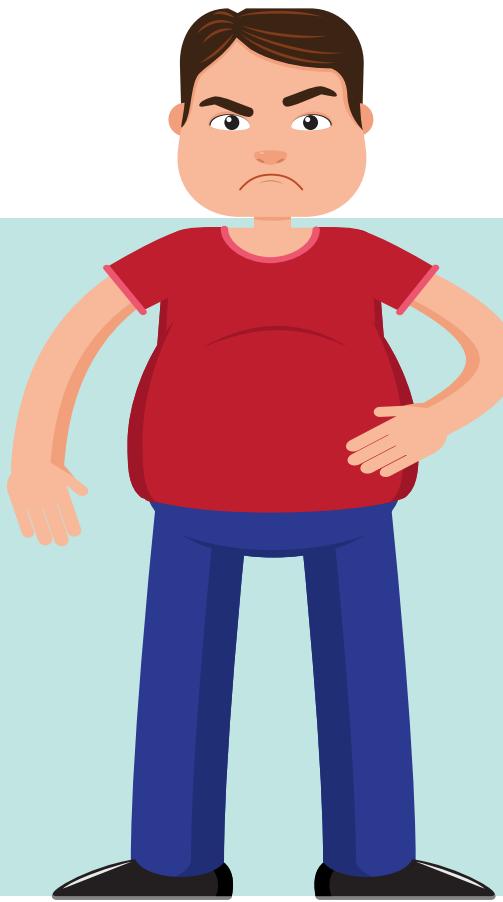
Other strategies include smoking cessation, aspirin and drugs known as ACE inhibitors.



Adults with diabetes are two-to-four times more likely to have heart disease or a stroke than those without diabetes. A number of risk factors in people with diabetes contribute to macrovascular complications:



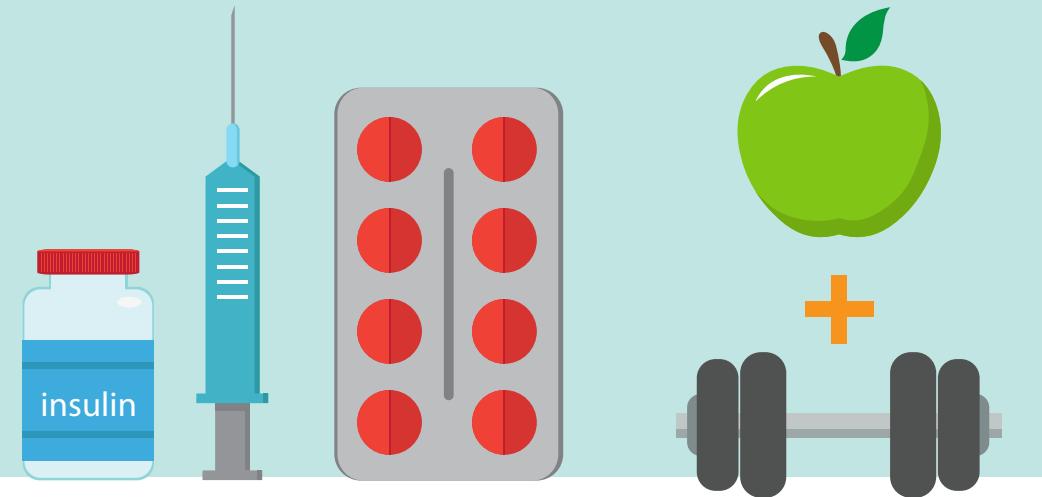
Abnormal cholesterol and high triglyceride levels



## Prevention of diabetes complications

All the potential complications of diabetes can be prevented or controlled with tight glycemic control, which means keeping HbA1C levels below 7%.<sup>2</sup>

Measures to keep control of glucose levels, in addition to drugs or insulin treatment, include exercise and diet. Additionally, keeping control of blood pressure and lipid levels helps to prevent complications of diabetes



As discussed above, close monitoring of health so that potential complications are spotted at the first opportunity is also a preventive measure, including specific checks for the eyes and feet.

## What Is Insulin?

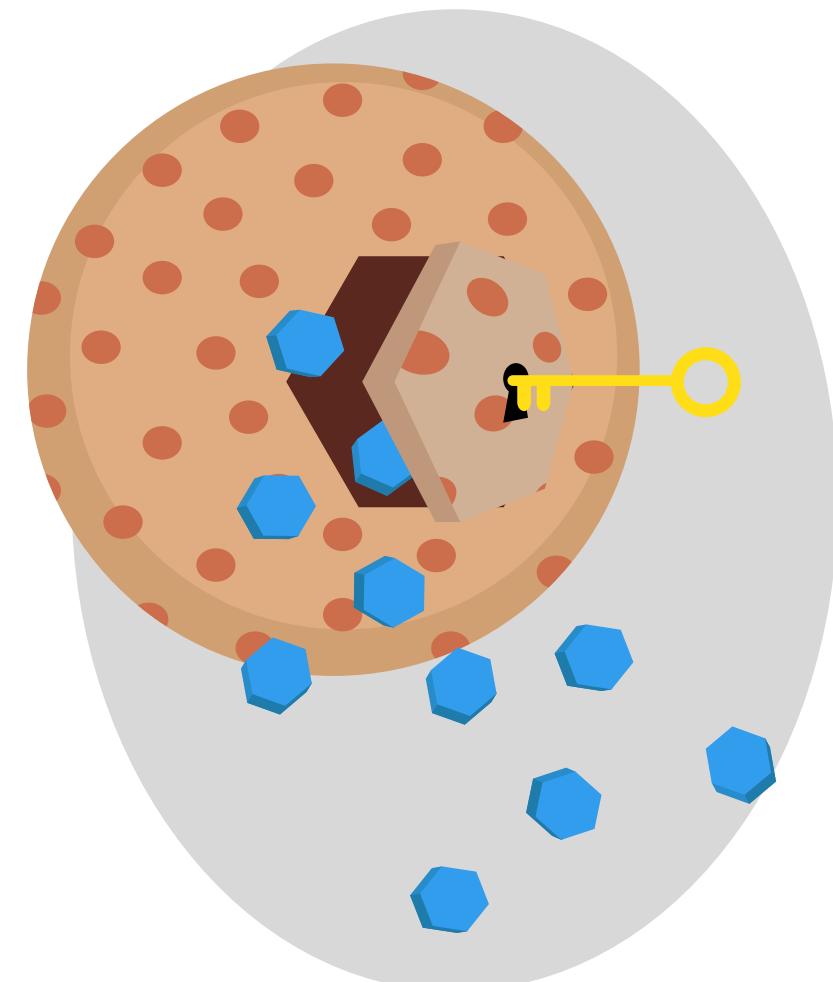
Insulin is a hormone; a chemical messenger produced in one part of the body to have an action on another. It is a protein responsible for regulating blood glucose levels as part of metabolism.

The body manufactures insulin in the pancreas, and the hormone is secreted by its beta cells, primarily in response to glucose.<sup>1</sup>

The beta cells of the pancreas are perfectly designed "fuel sensors" stimulated by glucose.<sup>2</sup> As glucose levels rise in the plasma of the blood, uptake and metabolism by the pancreas beta cells are enhanced, leading to insulin secretion.

Insulin has two modes of action on the body - an excitatory one and an inhibitory one:<sup>3</sup>

- Insulin stimulates glucose uptake and lipid synthesis
- It inhibits the breakdown of lipids, proteins and glycogen, and inhibits the glucose pathway (gluconeogenesis) and production of ketone bodies (ketogenesis).



# Treatments For Diabetes

Type 2 diabetes has a number of drug treatment options to be taken by mouth known as oral antihyperglycemic drugs or oral hypoglycemic drugs.

The lifestyle measures that are critical to type 2 diabetes management are diet and exercise, and these remain an important part of treatment when pills are added.

People with type 1 diabetes cannot use oral pills for treatment, and must instead take insulin.

## How do oral drugs lower glucose levels?

Oral antihyperglycemic drugs have three modes of action to reduce blood glucose levels:<sup>3</sup>

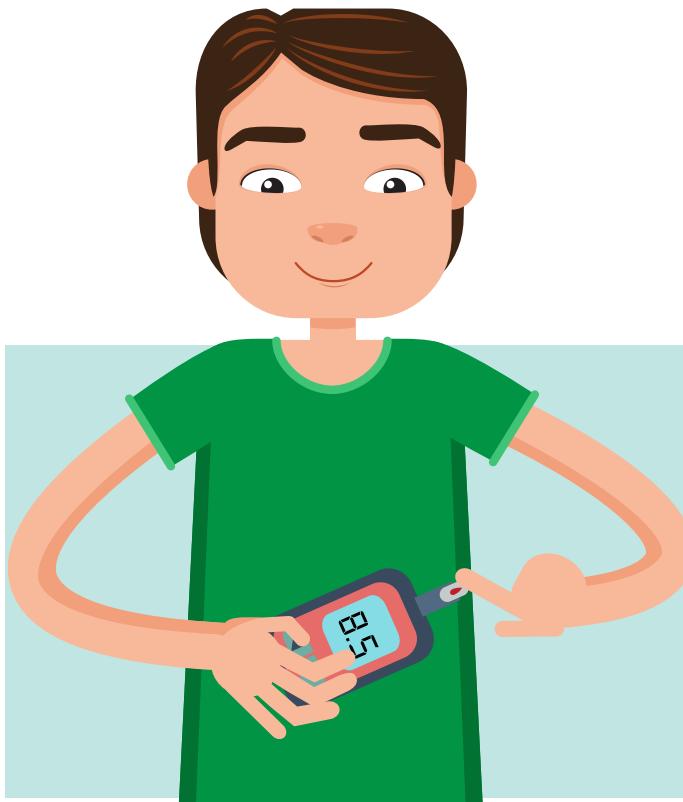
- Secretagogues enhance insulin secretion by the pancreas
- Sensitizers increase the sensitivity of the peripheral tissues to insulin
- Inhibitors impair gastrointestinal absorption of glucose.



## Diabetes: Self-Monitoring of Blood Glucose

Tight control of blood sugar levels is difficult to achieve. Levels can fall too low even with the best adherence to demanding daily self-monitoring schedules.

All patients newly diagnosed with type 1 diabetes will receive training on how to do their blood sampling and how to act on readings. Increasing numbers of people with type 2 diabetes - even those who do not need insulin treatment - are also recommended to self-monitor their blood glucose levels.



### What is blood glucose self-monitoring?

### Who should self-monitor blood glucose?

It was previously only people with insulin-treated diabetes - type 1 in particular - who would be recommended to self-monitor their blood glucose levels.<sup>8</sup>

International guidelines now state that there is enough evidence for the benefit of glycemic control to recommend self-monitoring to anyone with diabetes, including those with type 2 diabetes who do not need insulin treatment, as long as there is sufficient healthcare support.

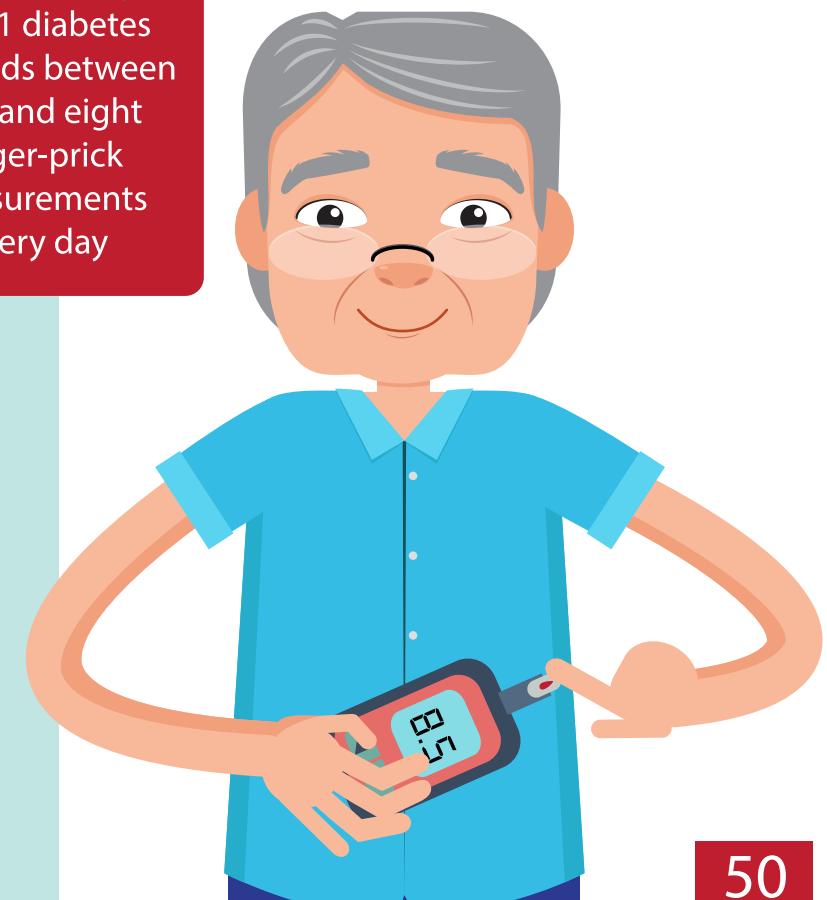
## How is a blood glucose monitor used?

A glucose meter electronically reads a small sample of blood on a test strip. The blood is usually drawn by a skin prick at the tip of a finger.

Over 20 types of glucose meter are commercially available, varying in size, the amount of blood needed and electronic memory and analysis features.

- Handle the meter and test strips with clean, dry hands
- Use the test strips specified for the meter and keep these in the original container
- Use a test strip only once and discard
- Strips can be calibrated with the meter for accuracy, and some meters require coding with each new canister of strips
- Check for expiration dates
- Keep in a cool, dry place
- Take the meter to office visits for checks by providers.

Self-monitoring of type 1 diabetes demands between four and eight finger-prick measurements every day



Practical steps are also needed in preparation of the skin prick for a blood sample. The skin site should be cleaned with warm, soapy water and dried, or an alcohol pad can be used. While the most accurate measurements are enabled by the use of the fingertips or outer palm, some meters allow the use of other sites such as the upper arms and thighs.

## When should glucose self-monitoring tests be done?

Use of nighttime fasting blood glucose (FBG) readings, taken at around 3 or 4am.

Test results from before eating can help to guide changes to meals or medicines, and those obtained 1-2 hours following a meal.

Tests at bedtime also help inform adjustments to diet or medications.<sup>2</sup>



## Real-time continuous glucose monitoring

People with type 1 diabetes typically do between four and eight finger-prick measurements each day. Real-time continuous glucose monitoring has been shown to be more effective than self blood glucose measurement in reducing HbA1c in type 1 diabetes because it provides detailed information on glucose patterns and trends.

The available continuous monitors - some of which are combined with insulin pumps - consist of an electrochemical sensor placed under the skin and replaced every 3-7 days.

## Managing Diabetes With Diet & Food Planning

Alongside exercise, a healthy diet is an important element of the lifestyle management of diabetes, as well as being preventive against the onset of type 2 diabetes.

Dietary concerns vary slightly for people with different types of diabetes. For people with type 1 diabetes, diet is about managing fluctuations in blood glucose levels while for people with type 2 diabetes, it is about losing weight and restricting calorie intake.

For people with type 1 diabetes, the timing of meals is particularly important in terms of glycemic control and in relation to the effects of insulin injection.

The following are some general dietary tips for a healthy lifestyle:<sup>2-5</sup>

Eat regularly - avoid the effects on glucose levels of skipping meals or having delayed meals because of work or long journeys (take healthy snacks with you)

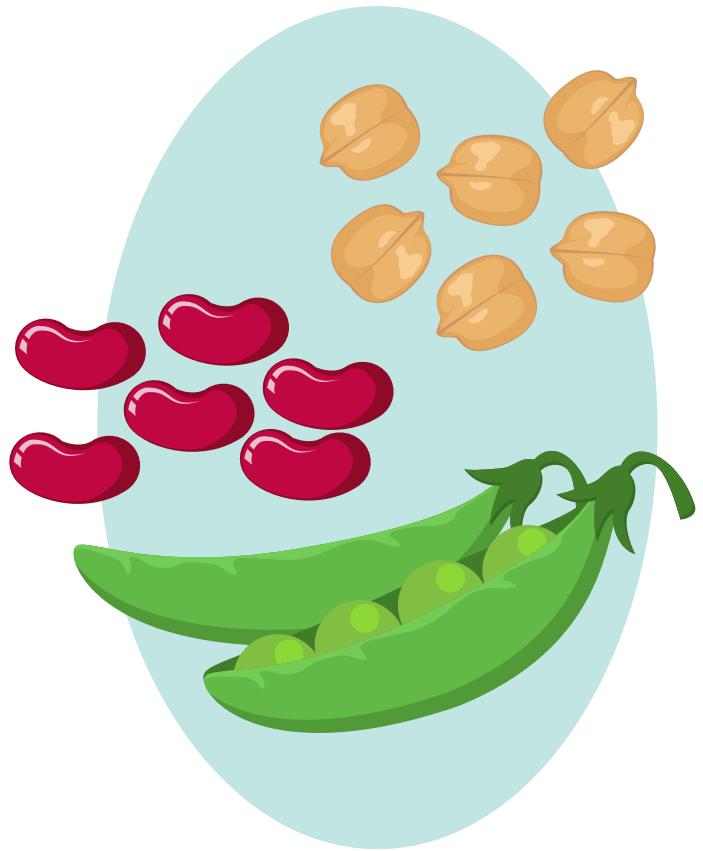




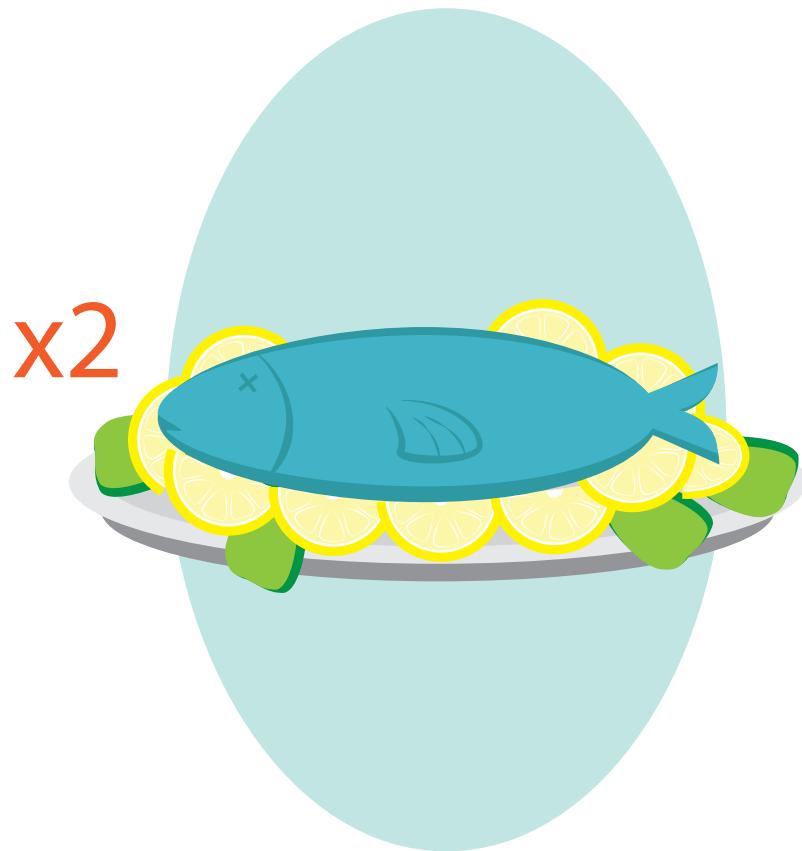
Eat vegetables and fruits , but avoid high-calorie sauces and food containing added salt or sugar



Whole grains high in fiber are recommended as a healthy source of carbohydrate



Eat pulses, a low-fat starchy source of protein and fiber, such as beans, lentils, chickpeas and garden peas



Eat fish twice a week or more, but avoid batters and frying - go for oily fish such as salmon, mackerel, sardine, trout and herring, which are rich sources of omega-3



Avoid partially hydrogenated vegetable oils and limit saturated fat and trans fat - replace them with monounsaturated and polyunsaturated fats



Cut back on sugar by avoiding added sugars in drinks and foods - have tea and coffee without sugar, avoid fruit that is canned in syrup and pay attention to food labels

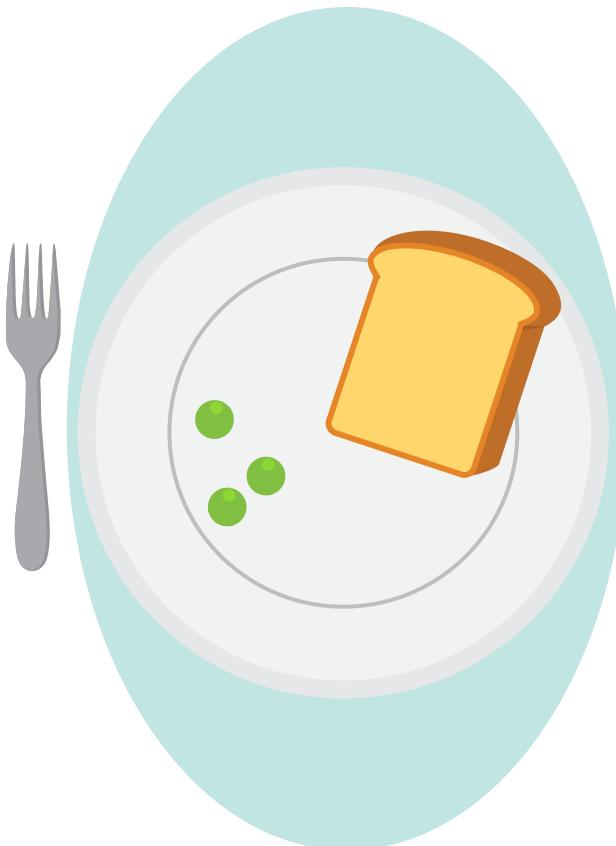


Dairy awareness helps reduce fat intake - select skim (fat-free) milk and low-fat (1%) dairy products, reduce consumption of cheese and butter and swap out creamy



Cut back on salt - prepare foods at home with little or no salt and avoid foods with high sodium such as processed foods

Cut back on portion sizes  
- be wary of amounts consumed when eating out



Be wary of "diabetic" foods - they are of no particular benefit and can be expensive

## **Managing Diabetes With Physical Activity And Exercise**

Preventing the onset of diabetes for those with prediabetes, or managing symptoms for those who already have the condition, is crucial to maintain health and prevent complications. Exercise is one proven way to help manage diabetes. Staying physically active also helps prevent diabetes-related health complications and improves overall quality of life.



## **Types of exercise for people with diabetes**

### Aerobic exercise

Also known as cardiovascular exercise, aerobic activity helps the body use insulin more effectively. It brings other benefits too, including:

- stress relief
- improved circulation
- reduced risk of heart disease
- lower blood pressure
- improved cholesterol levels
- strong bones
- weight management
- better mood

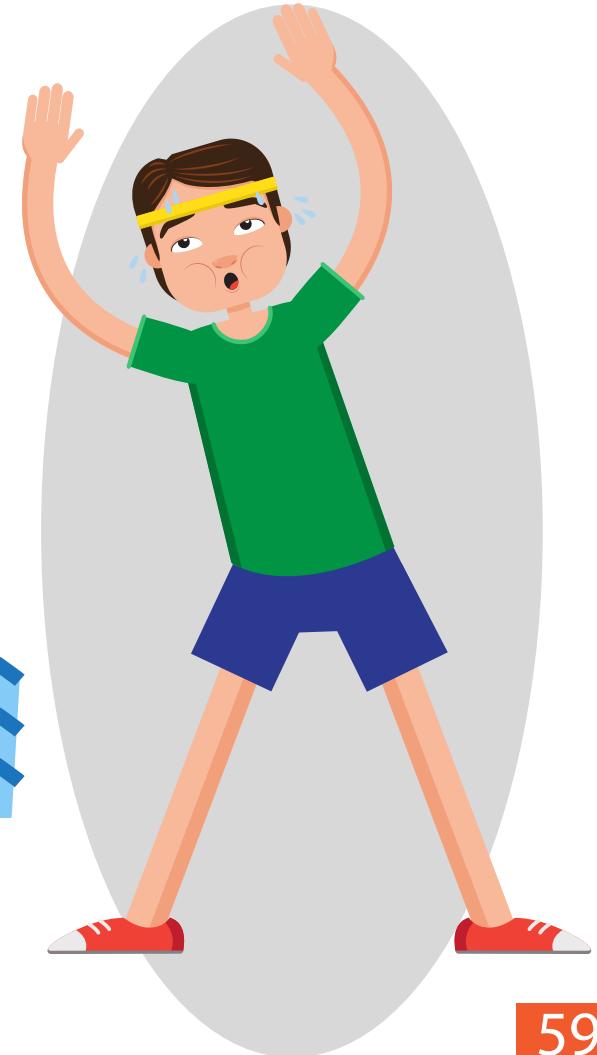


Examples of aerobic exercises include:

brisk walking or hiking



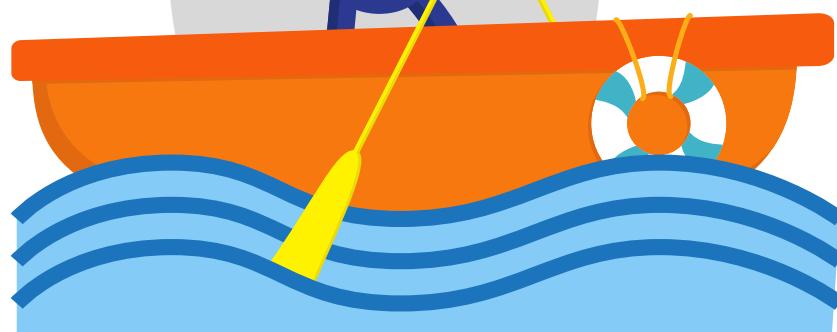
Low-impact aerobic exercise classes



swimming

Other symptoms include:

rowing



cycling



basketball







jogging



Tai Chi

## How much aerobic activity is needed?

30 minutes daily of moderate physical aerobic activity  
at least 5 times weekly

This recommendation is for adults aged 18-64. Adults with diabetes should also aim to meet this target.

Those with a busy schedule may find it helpful to do several shorter workouts totaling 30 minutes daily.

## Strength training

Strength training, or resistance training, helps lower blood sugar levels and increases insulin sensitivity.

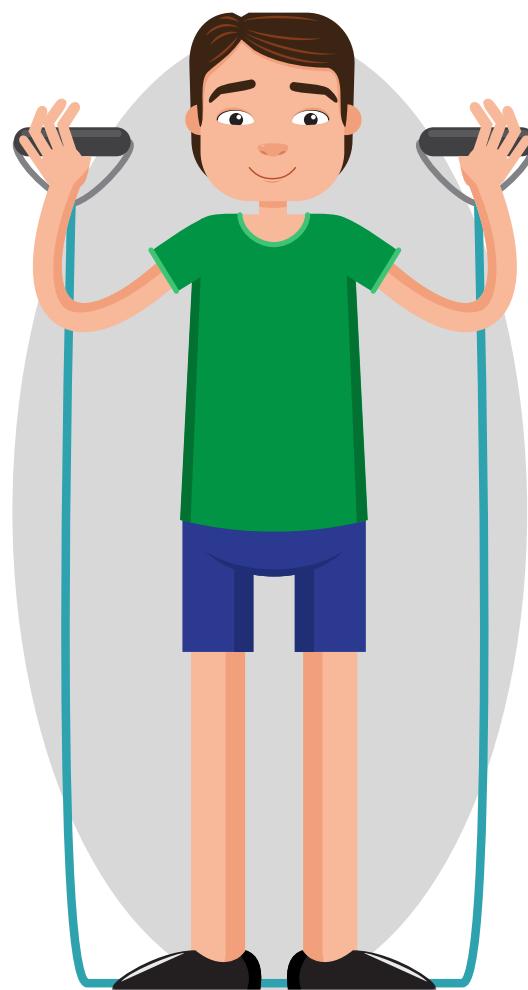
Examples of strength training include:



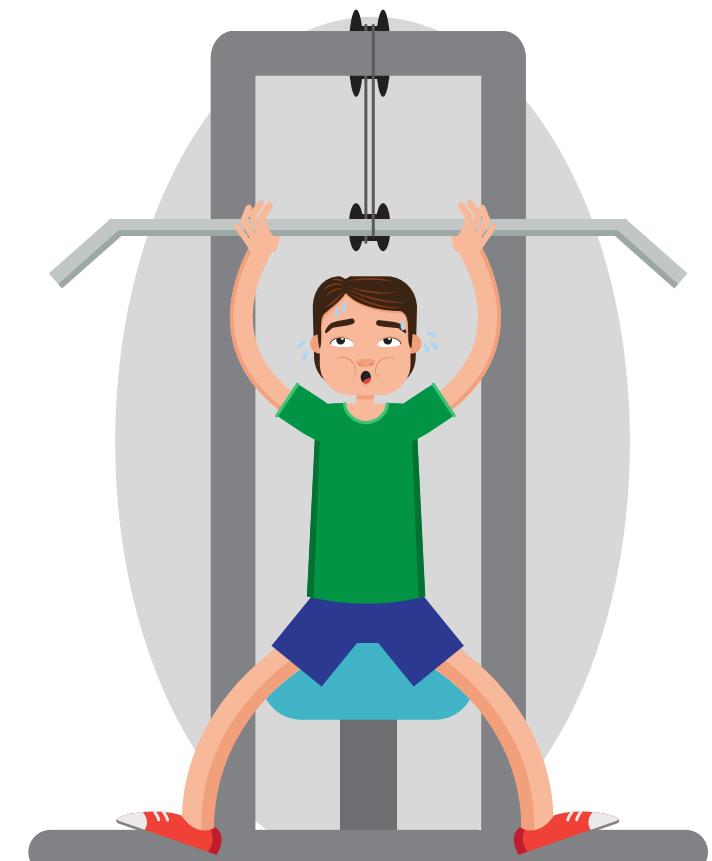
lifting free weights



lifting heavy objects,  
such as bottles of water or  
canned food



resistance bands



weight machines



exercises that use body weight such  
as sit-ups, squats, planks, and  
push-ups



strength training classes

## How much strength training is needed?

Strength training should be undertaken at least twice a week, in addition to the recommended amount of aerobic activity.

### Stretching exercises

Stretching exercises are important for everyone, including those with diabetes. Stretching:

- reduces the risk of injury from aerobic exercises or strength training
- increases flexibility
- prevents muscle soreness
- lowers stress levels



## How much strength training is needed?

It can be useful to consider incidental physical activity - everyday activities that aren't classed as exercise but involve movement.

Types of incidental physical activities include:

12



taking the stairs instead of  
the elevator



vacuuming



walking to the bus stop

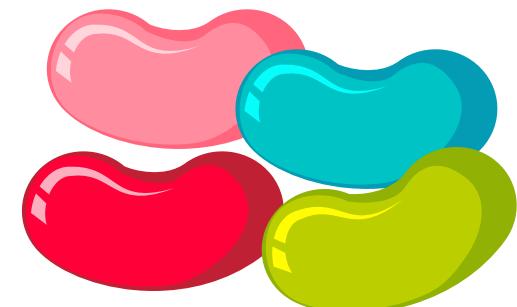


## Monitoring blood glucose levels when exercising

To exercise safely, many people with diabetes - particularly those with type 1 diabetes or those on diabetes medications - may need to check their blood glucose levels before, during, and after exercise. This indicates how well the body is responding to exercise, and may help avoid blood sugar fluctuations, which can be dangerous.

### Hypoglycemia and exercise

If hypoglycemia (low blood sugar) is experienced during or after a workout, it should be treated immediately. This involves taking at least 15-20 grams of fast-acting carbohydrate such as:



Blood glucose levels should be tested after 20 minutes, and the treatment repeated if they haven't returned to normal. Do not resume exercise until blood glucose returns to above 100 mg/dL. If hypoglycemia occurs regularly during exercise, it may be necessary to adjust medications or the exercise regimen, or to simply eat a small snack before working out.

## When to see a doctor

It is advisable to consult a doctor before beginning any new workout program.

A doctor can advise on the impact of medications on blood sugar levels during activities, and can provide a target range for blood glucose levels during workouts. They may give advice on the best time to exercise, based on the patient's individual schedule, meal plan, and medications.

A doctor may also perform a physical check-up, looking at:

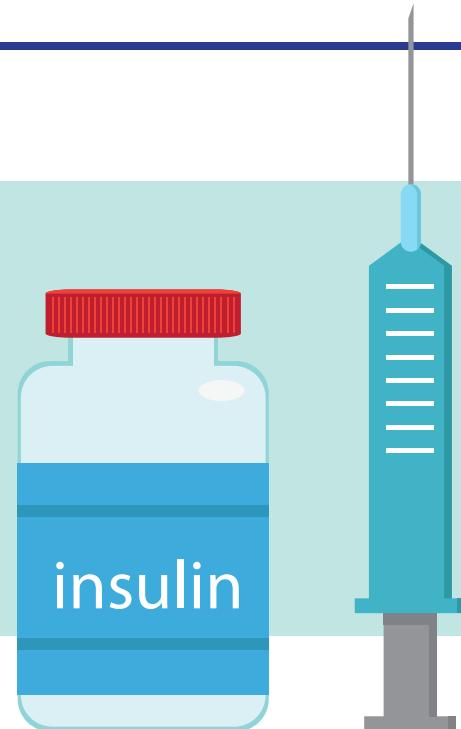
- heart health
- blood pressure
- diabetes-related complications

Depending on these complications, it may be advisable to avoid strenuous activities, or specific sports.

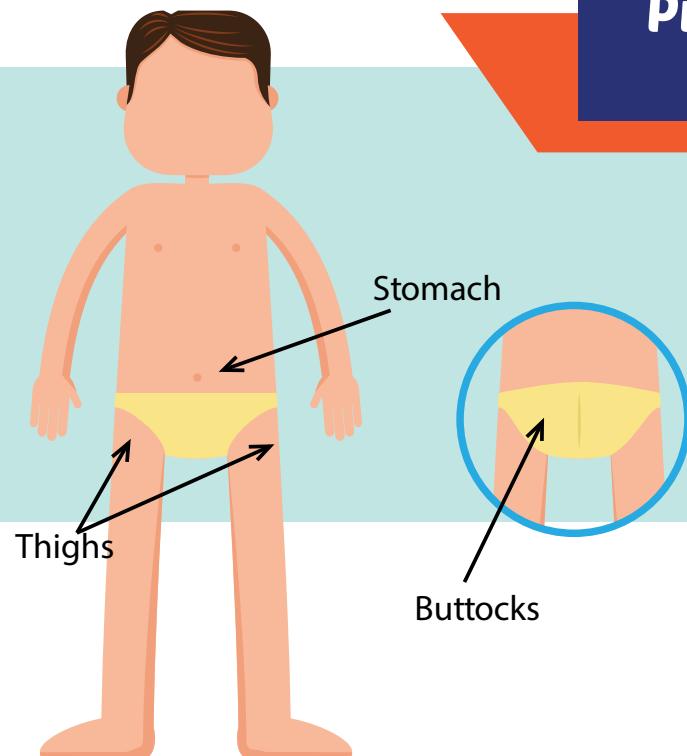


# Diabetes: Taking Insulin

Having insulin-dependent diabetes means a lifelong dependence on daily injections of insulin. In addition to people with type 1 diabetes, those with type 2 diabetes that is unresponsive to oral drugs must also take insulin.<sup>1</sup> A typical patient with type 1 diabetes may need more than 60,000 injections across their lifetime, requiring two or more injections every day.<sup>2</sup>



## Practical advice for injecting insulin



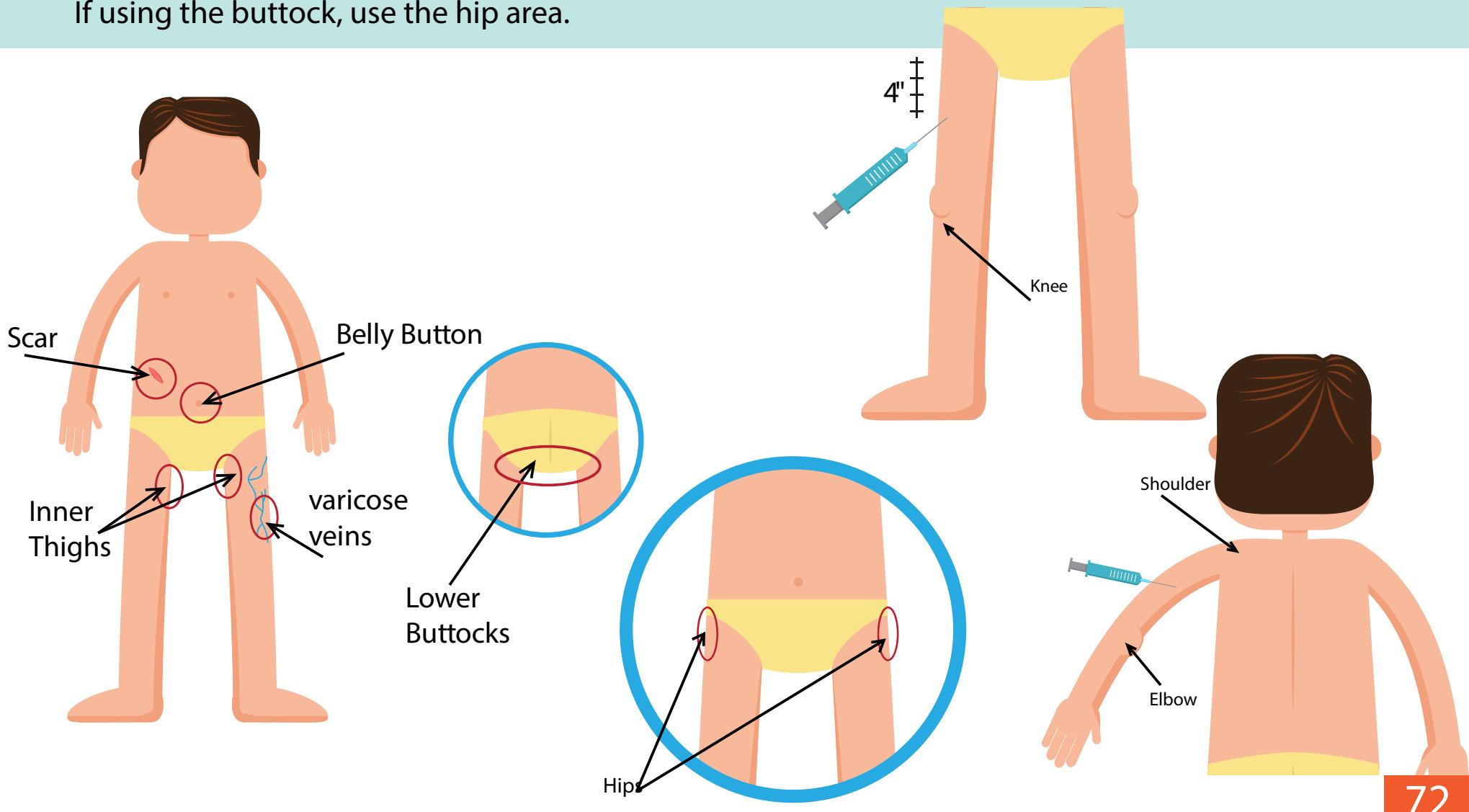
With practice and good technique, injecting insulin can become more comfortable. The needle is very small, and injection is not into a muscle or vein but under the skin. The three areas of skin most commonly used are the stomach, the buttocks and the thighs.

Avoiding the belly button, the inner thigh, the lower buttock, scars and broken blood vessels or varicose veins

If using the thigh, keep injections at least 4 inches below the top of the leg and above the knee

If using the arm, inject into the fatty area at the back, between the shoulder and elbow

If using the buttock, use the hip area.

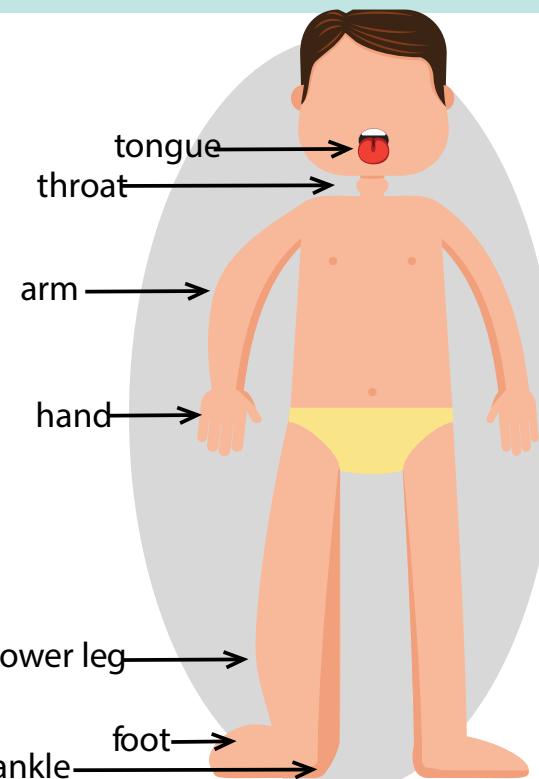


## Insulin side effects

Very rarely, a serious and life-threatening allergic reaction can be experienced after insulin injection. Serious insulin side effects and anaphylactic reactions are signaled by:



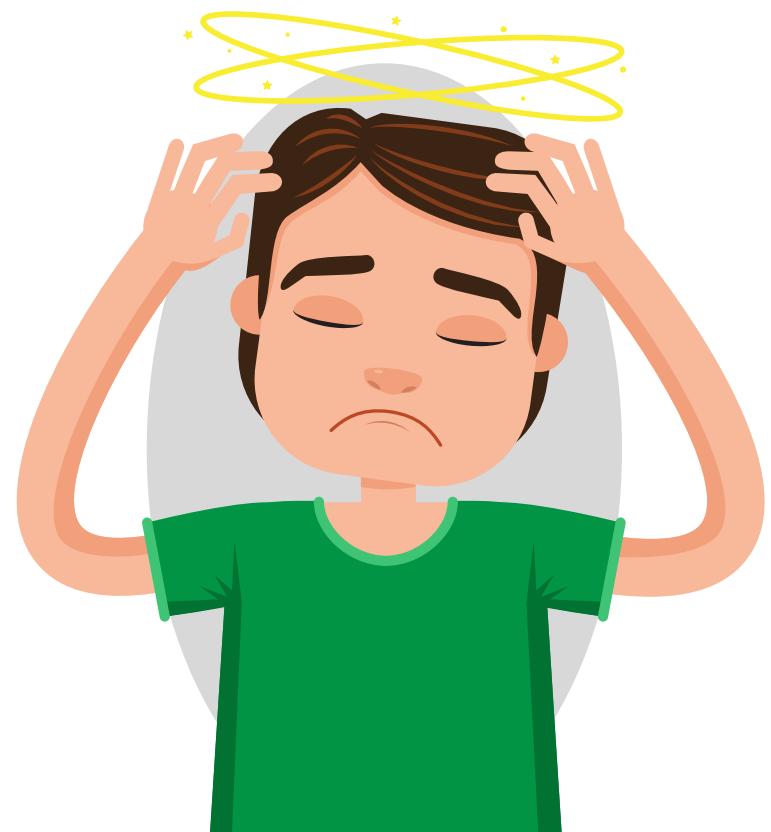
Rash or itching over  
the whole body

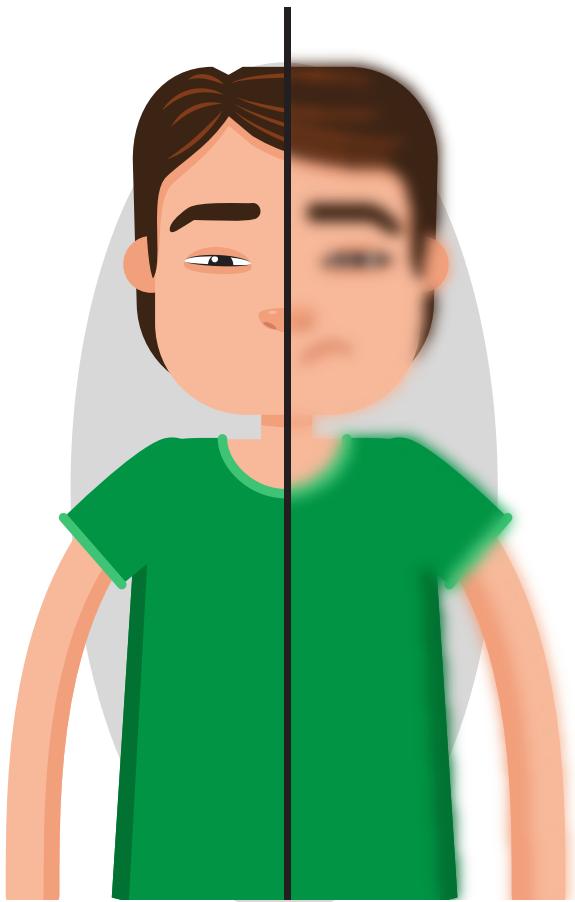


Swelling (edema) of the  
tongue, throat, arms, hands,  
feet, ankles or lower legs



Difficulty breathing or  
shortness of breath

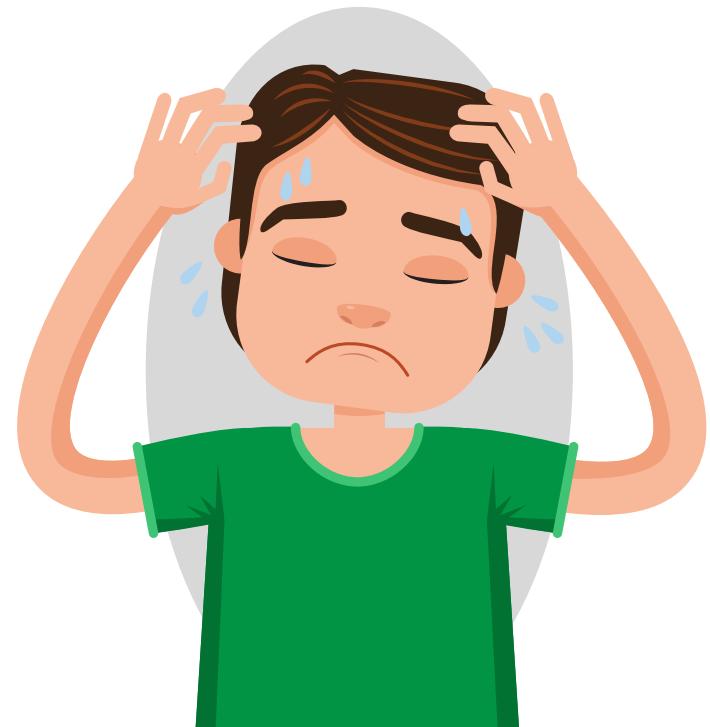




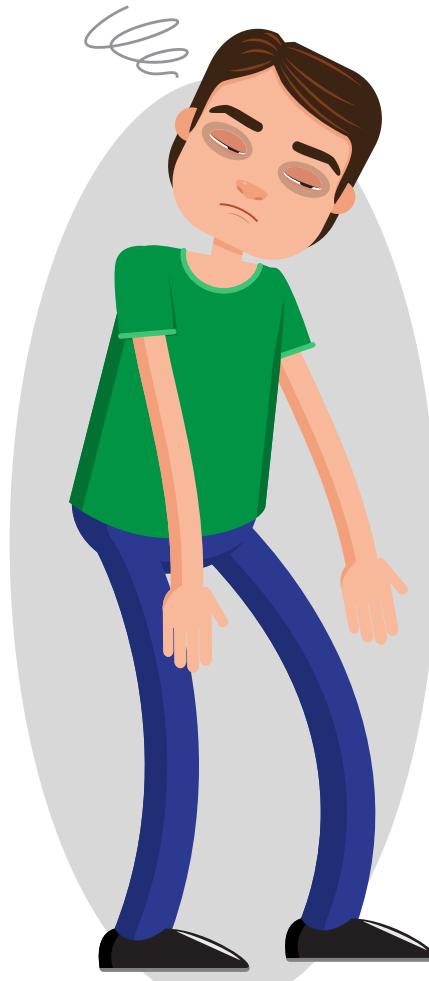
Blurred vision



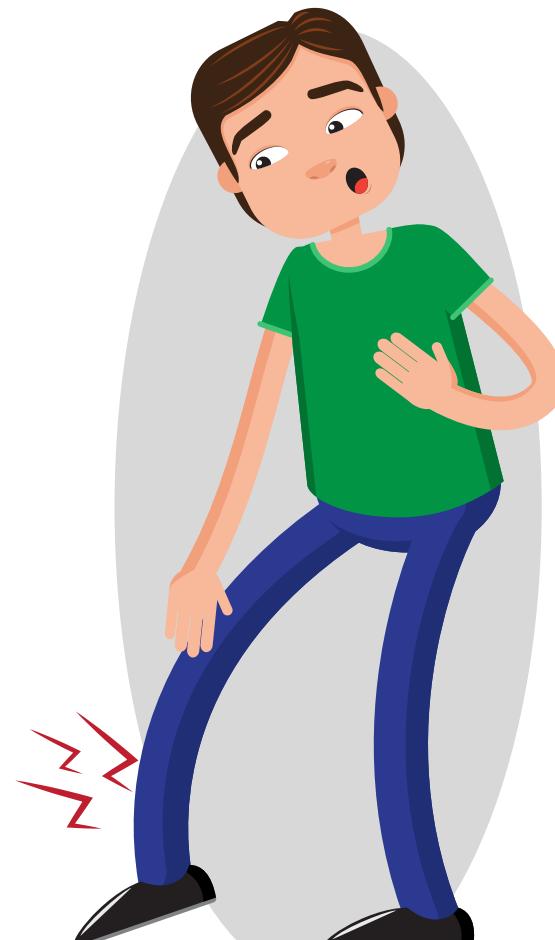
Fast heartbeat (tachycardia)  
or abnormal heartbeat rhythm



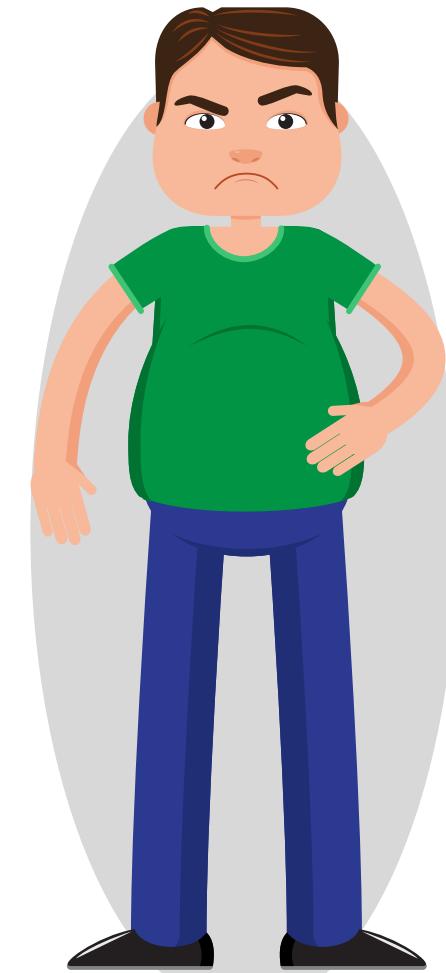
Sweating



Weakness



Muscle cramps



Significant weight

Gradually increasing insulin doses under medical supervision is used as a treatment to desensitize an individual with a severe insulin allergy.<sup>5,11</sup>

Side effects of insulin that are more common include:<sup>1,5,7</sup>

- Hypoglycemia
- Weight gain - this may happen initially when insulin therapy is started, due to correction of protein and energy metabolism.
- Lipohypertrophy - raised lumps in the skin caused by repeated injections at the same site.
- Other local effects - these are less common than lipohypertrophy and include infection, injection site abscess .

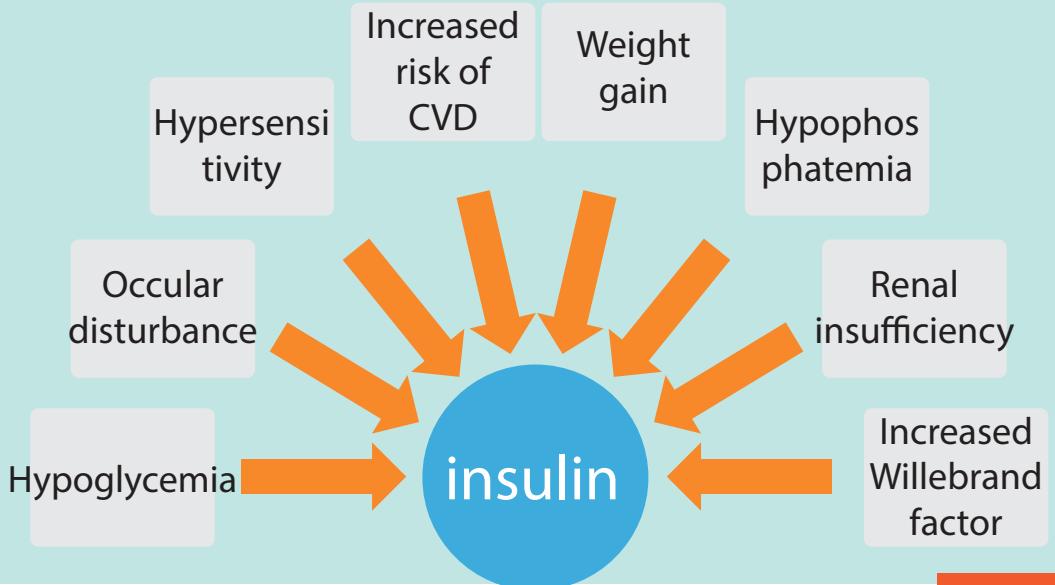
## Inhaled insulin

Human insulin inhalation powder (Afrezza) became available by prescription

Afrezza is a rapid-acting, dry-powder formulation of recombinant human insulin may be used in the treatment of adults with type 1 or type 2 diabetes. In patients with type 1 diabetes, the drug must be used in combination with long-acting insulin.

A single inhalation of Afrezza is taken at the beginning of meals.

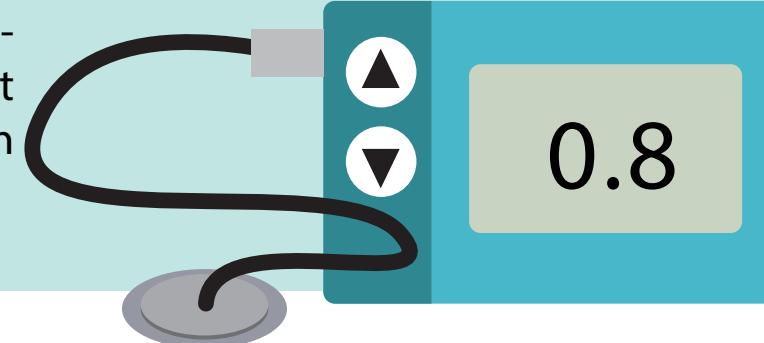
## Side Effects



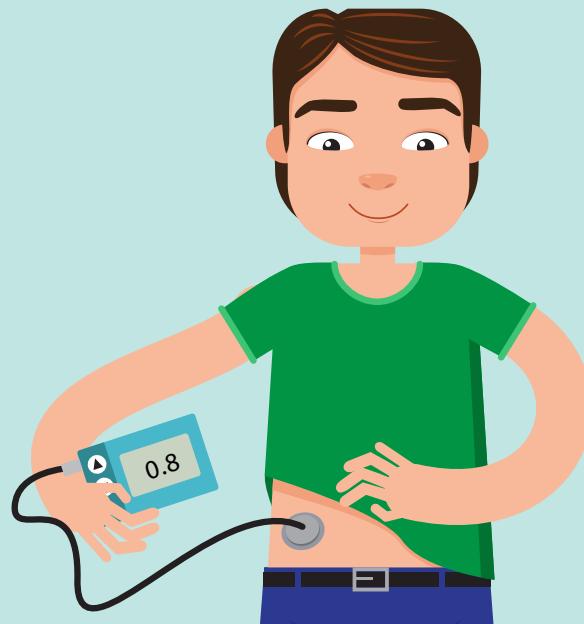
## Insulin Pumps For Controlling Diabetes

Ever since the discovery of insulin and its use in treating diabetes, medical research has struggled to find a way of delivering it that accurately mimics the normal physiological action of insulin and overcomes the burden of daily injections.

The main development in this area has been the insulin pump.



### Insulin pumps for type 1 diabetes



Insulin pumps - or continuous subcutaneous insulin infusion pumps - remove the daily need for multiple injections.

Instead, a cannula - a very thin and flexible plastic tube inserted under the skin using a needle - needs to be replaced every two or three days.

An insulin pump continuously releases insulin in small doses (the basal insulin) from its reservoir and can deliver an additional dose (a bolus) when needed. As a result, an insulin pump more closely mimics normal insulin physiology and offers greater accuracy than daily injections. Insulin pumps can also provide better glucose control and better HbA1c readings.

## Questions to Ask Your Doctor

- My mother has diabetes. Should I be tested?
- I've been diagnosed with type 2 diabetes. If I lose weight and eat better, will it go away?
- What is the best thing I can do to control my diabetes?
- Am I at risk for any complications from diabetes?
- Which glucose meter is best for me?
- Will I need to take insulin?
- Are there any other medicines I can take to help control diabetes?
- Are my children at higher risk for diabetes?
- What exercise program is right for me?
- When should I call my doctor?



# Diabetes Facts and Myths

Many presumed "facts" are thrown about in the paper press, magazines and on the internet regarding diabetes; some of them are, in fact, myths. It is important that people with diabetes, pre-diabetes, their loved ones, employers and schools have an accurate picture of the disease. Below are some diabetes myths:

- **People with diabetes should not exercise - NOT TRUE!!** Exercise is important for people with diabetes, as it is for everybody else. Exercise helps manage body weight, improves cardiovascular health, improves mood, helps blood sugar control, and relieves stress. Patients should discuss exercise with their doctor first.
- **Fat people always develop type 2 diabetes eventually -** this is not true. Being overweight or obese raises the risk of becoming diabetic, they are risk factors, but do not mean that an obese person will definitely become diabetic. Many people with type 2 diabetes were never overweight. The majority of overweight people do not develop type 2 diabetes.
- **Diabetes is a nuisance, but not serious -** two thirds of diabetes patients die prematurely from stroke or heart disease. The life expectancy of a person with diabetes is from five to ten years shorter than other people's. Diabetes is a serious disease.



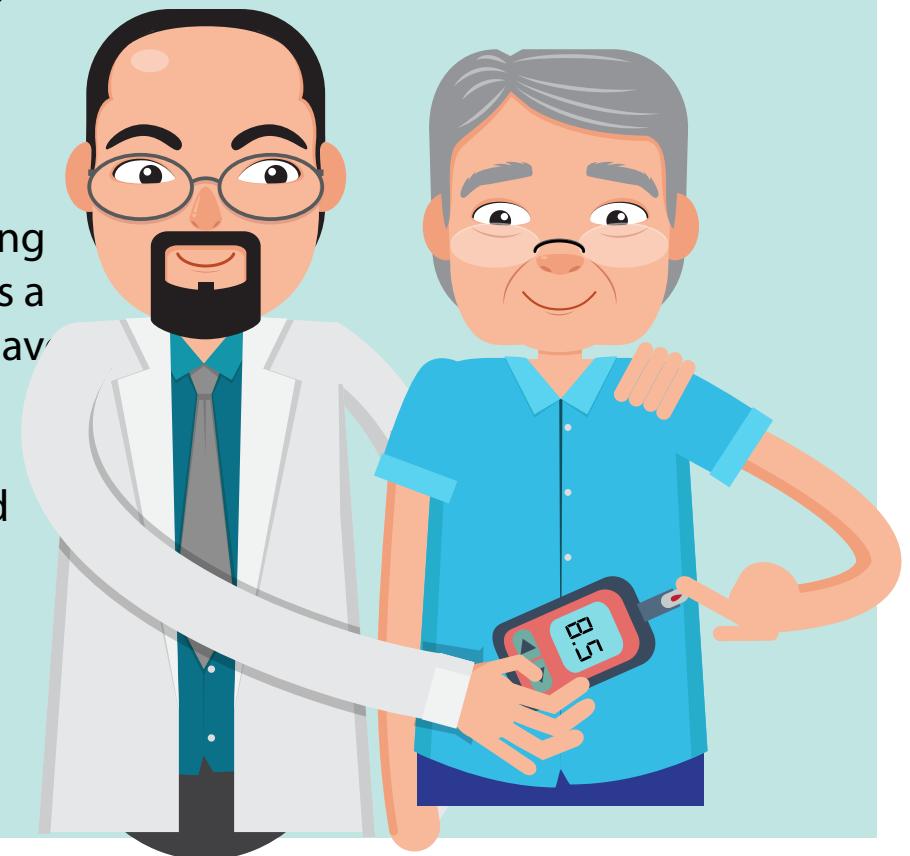
- **Children can outgrow diabetes** - this is not true. Nearly all children with diabetes have type 1; insulin-producing beta cells in the pancreas have been destroyed. These never come back. Children with type 1 diabetes will need to take insulin for the rest of their lives, unless a cure is found one day. especially if there is a history of this disease in the family.
- **Don't eat too much sugar, you will become diabetic** - this is not true. A person with diabetes type 1 developed the disease because their immune system destroyed the insulin-producing beta cells. A diet high in calories, which can make people overweight/obese, raises the risk of developing type 2 diabetes, especially if there is a history of this disease in the family.
- **I know when my blood sugar levels are high or low** - very high or low blood sugar levels may cause some symptoms, such as weakness, fatigue and extreme thirst. However, levels need to be fluctuating a lot for symptoms to be felt. The only way to be sure about your blood sugar levels is to test them regularly. Researchers from the University of Copenhagen, Denmark showed that even very slight rises in blood-glucose levels significantly raise the risk of ischemic heart disease. (Link to article)



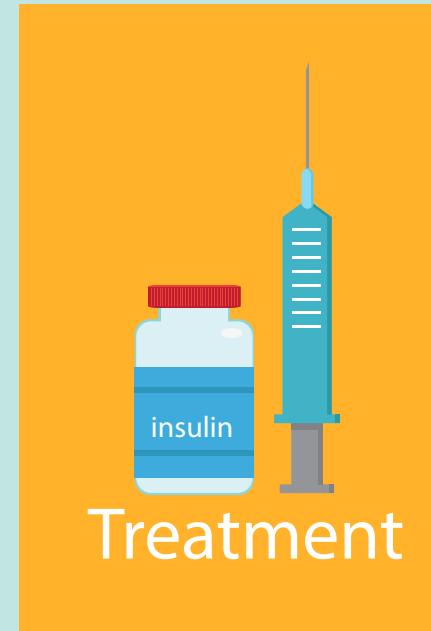
- Diabetes diets are different from other people's - the diet doctors and specialized nutritionists recommend for diabetes patients are healthy ones; healthy for everybody, including people without the disease. Meals should contain plenty of vegetables, fruit, whole grains, and they should be low in salt and sugar, and saturated or trans fat. Experts say that there is no need to buy special diabetic foods because they offer no special benefit, compared to the healthy things we can buy in most shops.
- High blood sugar levels are fine for some, while for others they are a sign of diabetes - high blood-sugar levels are never normal for anybody. Some illnesses, mental stress and steroids can cause temporary hikes in blood sugar levels in people without diabetes. Anybody with higher-than-normal blood sugar levels or sugar in their urine should be checked for diabetes by a health care professional.
- Diabetics cannot eat bread, potatoes or pasta - people with diabetes can eat starchy foods. However, they must keep an eye on the size of the portions. Whole grain starchy foods are better, as is the case for people without diabetes.



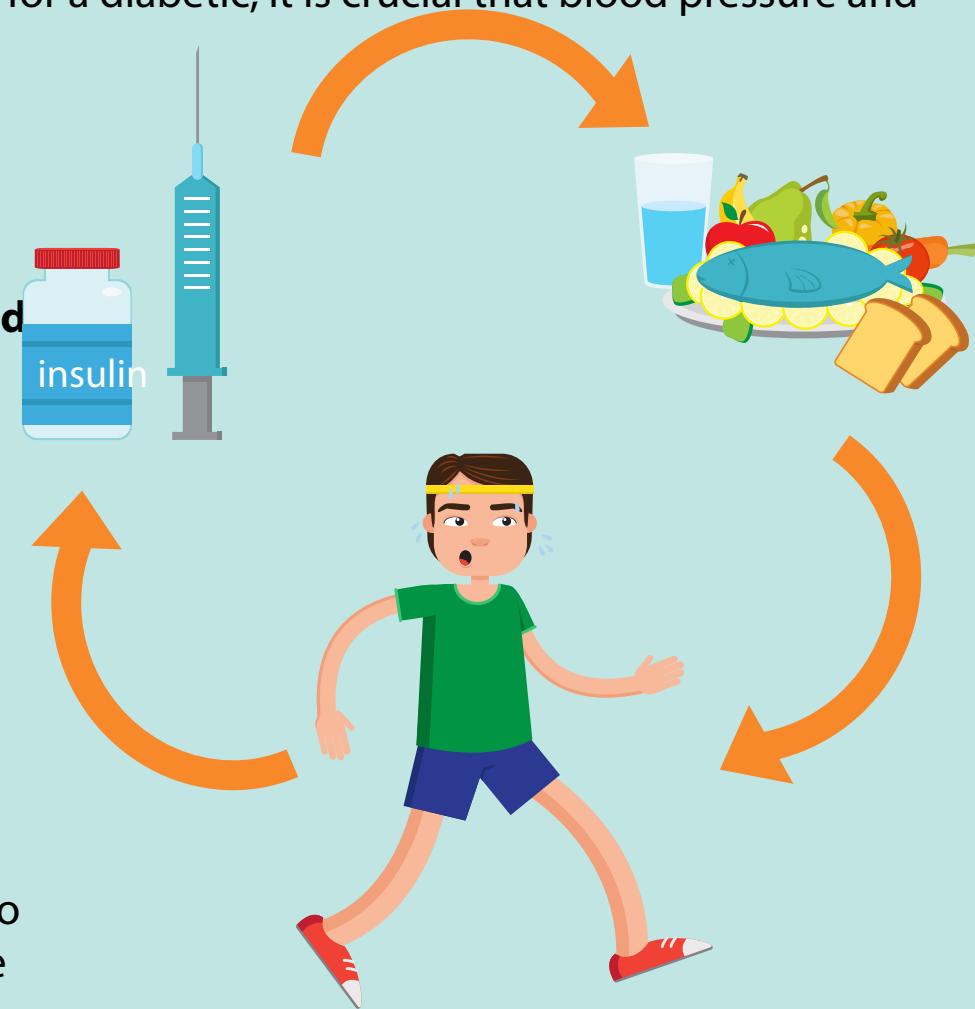
- **One person can transmit diabetes to another person** - NOT TRUE. Just like a broken leg is not infectious or contagious. A parent may pass on, through their genes to their offspring, a higher susceptibility to developing the disease.
- **Only older people develop type 2 diabetes** - things are changing. A growing number of children and teenagers are developing type 2 diabetes. Experts say that this is linked to the explosion in childhood obesity rates, poor diet, and physical inactivity.
- **Diabetes patients are more susceptible to colds and illnesses in general** - a person with diabetes with good diabetes control is no more likely to become ill with a cold or something else than other people. However, when a diabetic catches a cold, their diabetes becomes harder to control, so they have a higher risk of complications.
- Diabetes is a long-term condition that causes high blood sugar levels.



- **I have to go on insulin, this must mean my diabetes is severe** - people take insulin when diet alone or diet with oral or non-insulin injectable diabetes drugs do not provide good-enough diabetes control, that's all. Insulin helps diabetes control. It does not usually have anything to do with the severity of the disease.
  - **If you have diabetes you cannot eat chocolates or sweets** - people with diabetes can eat chocolates and sweets if they combine them with exercise or eat them as part of a healthy meal.
- In 2013 it was estimated that over 382 million people throughout the world had diabetes (Williams textbook of endocrinology).
  - Type 1 Diabetes - the body does not produce insulin. Approximately 10% of all diabetes cases are type 1.
  - Type 2 Diabetes - the body does not produce enough insulin for proper function. Approximately 90% of all cases of diabetes worldwide are of this type.
  - Gestational Diabetes - this type affects females during pregnancy.
  - If you have Type 1 and follow a healthy eating plan, do adequate exercise, and take insulin, you can live a normal life.



- Type 2 patients need to eat healthily, be physically active, and test their blood glucose. They may also need to take oral medication, and/or insulin to control blood glucose levels.
- As the risk of cardiovascular disease is much higher for a diabetic, it is crucial that blood pressure and cholesterol levels are monitored regularly.
- As smoking might have a serious effect on cardiovascular health, diabetics should stop smoking.
- **It is possible to have diabetes with only very mild symptoms or without developing any symptoms at all. Such cases can leave some people with diabetes unaware of the condition and undiagnosed. This happens in around half of people with type 2 diabetes.**
- A condition known as prediabetes that often leads to type 2 diabetes also produces no symptoms. Type 2 diabetes and its symptoms develop slowly.<sup>3</sup>
- Type 1 diabetes can go unnoticed but is less likely to do so. Some of its symptoms listed below can come on abruptly and be accompanied by nausea, vomiting or stomach pains.<sup>2-4</sup>



- The most common symptoms are related to hyperglycemia (high blood sugar levels), especially the classic symptoms of diabetes: frequent urination and thirst. Fatigue related to dehydration and eating problems can also be related to high blood sugars.<sup>5,6</sup>

## High levels of glucose (hyperglycemia)

