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Diabetes

There are two main types of diabetes - type 1 diabetes and type 2 diabetes. Type 1 usually first presents in children or in young adults. Type 2 usually first presents in people over the age of 40 years and is often (though not always) associated with being overweight. However, type 2 diabetes is increasingly being diagnosed in children and in young adults.

Both types of diabetes can cause serious complications. With regular monitoring and good control of the raised blood sugars these can be significantly reduced. In addition to the treatment from healthcare professionals, it is very important for people with diabetes to understand their condition and be able to manage their diabetes.

Types of diabetes

Diabetes mellitus (just called diabetes from now on) occurs when the level of sugar (glucose) in the blood is higher than normal. There are two main types of diabetes - type 1 diabetes and type 2 diabetes.

This leaflet refers to diabetes mellitus (now usually just known as diabetes); there is a separate condition called diabetes insipidus which is always called by its full name.

Type 1 diabetes

Type 1 diabetes usually develops quite quickly, over days or weeks, as the pancreas stops making insulin. It usually (but not always) first presents in childhood. See the separate leaflet called Type 1 Diabetes.

Type 2 diabetes

Type 2 diabetes is more common in people who are overweight. It tends to develop gradually (over weeks or months) because people with type 2 diabetes still make insulin (unlike type 1 diabetes). However, people with type 2 diabetes do not make enough insulin for the body's needs or the body is not able to use insulin properly.

Type 2 diabetes usually starts in middle-aged or elderly adults but is increasingly being seen in children and in young adults. See the separate leaflet called Type 2 Diabetes.

Gestational diabetes

As well as type 1 and type 2 diabetes, there are other types of diabetes. Pregnant women who have never had diabetes before but who have high blood glucose levels during pregnancy have gestational diabetes. Gestational diabetes affects about 4% of all pregnant women. See the separate leaflet called Diabetes and Pregnancy.

Other types of diabetes

There are also a number of less common forms of diabetes, including:

- **Secondary diabetes**: diabetes can be caused by other diseases. Examples include diseases that affect the pancreas such as cystic fibrosis and chronic pancreatitis. Diabetes can also be caused by other hormone (endocrine) diseases, such as Cushing's syndrome and acromegaly.
- Latent autoimmune diabetes of adults (LADA): a slow-onset form of type 1 diabetes that occurs in adults, often with a slower onset than the usual type 1 diabetes that starts in childhood.
- Maturity-onset diabetes of the young (MODY): this includes several forms of diabetes which are caused by genetic defects of the cells in the pancreas that make insulin.
- **Wolfram's syndrome**: another genetic cause of diabetes. It is also called DIDMOAD (because it causes diabetes insipidus, diabetes mellitus, optic atrophy and deafness).
- **Other genetic diseases that can cause diabetes**: these include Friedreich's ataxia and haemochromatosis.

A medical paper in 2018 suggested that adult-onset diabetes should be classified in a new way. This is because the level of resistance to diabetes can affect the risk of complications.

In the new model, those most resistant to insulin have a significantly higher risk of diabetic kidney disease and retinopathy (diabetes eye disease) than others. However, for now this new model is purely being used for research.

What causes diabetes?

Diabetes is a condition where there is insufficient insulin being produced by the pancreas. Insulin is a hormone that the body needs in order to move glucose into cells to be used for energy. Insulin also helps the liver to store blood sugar to be used later.

Type 1 diabetes is thought to be an auto-immune condition where the body's immune system attacks and destroys the cells in the pancreas which produce insulin. There is a genetic component to type 1 diabetes (it is more common in children who have a relative with type 1 diabetes) but there is probably an environmental factor too - in some people, an event probably "triggers" the start of the diabetes. For example there was a significant increase in diagnoses of type 1 diabetes after COVID infections, even where the child had very few symptoms from COVID.

In type 2 diabetes, the muscle, liver and fat cells in the body start to use insulin less effectively. (This is called insulin resistance.) As a result, the pancreas needs to produce more insulin for the body's use. Over time the pancreas struggles to produce enough insulin. Being overweight is one of the main causes of insulin resistance. There is also a genetic factor; it is much more common for people of some ethnicities to develop type 2 diabetes - particularly those of Afro-Caribbean, South Asian, Hispanic or Native American heritage.

What are the symptoms of diabetes?

The first symptoms of diabetes may include:

- Being very thirsty a lot of the time.
- Passing a lot of urine. (This is because blood sugar (glucose) leaks into the urine which then pulls out extra water through the kidneys.)
- Tiredness, weight loss and feeling generally unwell.

The symptoms tend to develop quite quickly, over a few days or weeks, for people with type 1 diabetes. Some children with type 1 diabetes develop the disease too quickly to spot some of these symptoms. Some children rapidly become very unwell (sometimes also with abdominal pain).

The symptoms of diabetes resolve after starting treatment for diabetes. However, the symptoms may come back if blood glucose levels are poorly controlled. Without treatment, the blood glucose level becomes very high. This can be very dangerous and even fatal if not treated quickly.

Type 2 diabetes symptoms

Type 2 diabetes develops much more slowly and symptoms may not start until someone has had type 2 diabetes for a number of years. This means that people with type 2 diabetes may already have complications of diabetes (see below) when diabetes is first diagnosed. Even though the symptoms of type 2 diabetes are often less severe, the condition is still very important to manage well.

How is diabetes diagnosed?

A doctor will diagnose diabetes in several ways, these include:

- The only way to confirm the diagnosis is to have a blood test to look at the level of glucose in the blood. If this is high then it confirms diabetes.
- A urine dipstick test can detect sugar (glucose) in a sample of urine. This may suggest the diagnosis of diabetes.
- Some people have to have two samples of blood taken and they may be asked to fast.
- A different blood test which measures a chemical called HbA1c is now also used to diagnose type 2 diabetes; it is not suitable for the diagnosis of type 1 diabetes (but is used to monitor the control of type 1 diabetes).

Read more in the separate leaflet called Tests for Blood Sugar (Glucose) and HbA1c.

How is diabetes treated?

Any person with diabetes needs to follow a healthy lifestyle with a healthy diet, maintaining an ideal body weight, taking regular exercise and not smoking.

People with type 1 diabetes always need treatment with insulin. See the separate leaflet called Insulins.

People with type 2 diabetes sometimes don't need any medication for diabetes control when the diagnosis is first made. In recent years it has become clear that, by losing weight and following a low-carbohydrate diet (or, with close medical supervision, a very low-calorie diet), many people can bring their blood sugar back to normal without medication.

However, most people with diabetes need to start taking one or more medicines if a healthy lifestyle is not enough to control blood sugar (glucose) levels. These are usually tablets but some people with type 2 diabetes need to use insulin injections if the other medicines don't adequately control the blood glucose levels. Newer treatment options include other injectable medications which are used once a week and are extremely effective at reducing blood sugars and helping with weight loss. See the separate leaflet called Type 2 Diabetes Treatment.

Treating diabetes is not just about managing blood glucose levels (although this is important). It is also essential to reduce the risk of the complications of diabetes (see below). It is therefore important to keep blood pressure and cholesterol levels in the normal range. Read more in the separate leaflet called Diabetes and High Blood Pressure.

The treatment for diabetes includes regular monitoring to diagnose and treat complications at an early stage.

When people with diabetes are unwell for any reason, even just a simple viral infection, their blood glucose control can be impacted. It is therefore very important to know what to do during an illness. Read about advice for people with diabetes when unwell, in the separate leaflet called Diabetes and Illness.

Diabetes in pregnancy

Diabetes in pregnancy is associated with possible complications for the mother and baby. Women with diabetes who become pregnant need very close monitoring and specialist treatment to make sure that the mother and baby remain well with no problems. See the separate leaflet called Diabetes and Pregnancy.

Some women develop diabetes in pregnancy, known as gestational diabetes. This usually resolves after the baby has been born. These women are at higher risk of developing type 2 diabetes later on and should have blood tests every year to monitor this.

Aims of diabetes treatment

Diabetes cannot usually be cured but it can be treated successfully. If a high blood glucose level is brought down to a normal or near-normal level, symptoms will ease. Type 2 diabetes can be reversed (and may be considered "cured") with weight loss and exercise but will recur if weight is gained.

Complications of diabetes are a risk even without any symptoms of diabetes. Studies have shown that people who have better glucose control have fewer complications (such as heart disease or eye problems) compared with those people who have poorer control of their glucose level.

Therefore, the main aims of treatment are:

- To keep blood glucose level as near normal as possible.
- To reduce any other risk factors that may increase the risk of developing complications. In particular, to stop smoking, lose weight or lower your blood pressure if needed and to keep blood lipids (cholesterol and triglyceride) low.
- To detect any complications as early as possible. Treatment can prevent or delay some complications from becoming worse.

Healthy diet and other lifestyle advice

It is important to eat a healthy diet. This diet is the same as that recommended for everyone. It is not the case that particular special foods are needed for people with diabetes. 'Diabetic foods' still raise blood glucose levels, may contain just as much fat and calories and are usually more expensive than non-diabetic foods.

It is best to eat a diet low in fat, salt and sugar and high in fibre, with plenty of fruit and vegetables.

People using insulin need to know how to balance the right amount of insulin for the amount of food that they eat. See the separate leaflet called Type 2 Diabetes Diet.

Smoking is a high risk factor for complications. If necessary, nicotine replacement therapy (nicotine gum, etc) may help to stop smoking.

Regular physical activity also reduces the risk of some complications such as heart and blood vessel disease. A minimum of 30 minutes' brisk walking at least five times a week is advised for those who are able.

Anything more vigorous is even better - for example, swimming, cycling, jogging, dancing.

The best exercise is vigorous enough to cause people to feel mildly out of breath and sweaty. It is possible to spread the activity over the day (for example, two fifteen-minute spells per day of brisk walking, cycling, dancing, etc).

Depending on age, it may be advised to take a medicine to lower the cholesterol level. This will help to lower the risk of developing some complications such as heart disease and stroke.

It is best to try to lose weight if overweight or obese. Excess weight is also a risk factor for heart and blood vessel disease. Getting to a perfect weight may be unrealistic but losing some weight will always help.

There is no need to give up alcohol completely unless wanting to. Whether people have diabetes or not, healthy guidelines in the UK generally recommend a limit of 14 units a week for both men and women (government guidelines have recently been revised for men). See the separate leaflet called Alcohol and Sensible Drinking. However, drinking alcohol when you have diabetes can make an episode of hypoglycaemia (a 'hypo') more likely.

Immunisation

People with diabetes should be immunised against flu (each autumn), COVID (whenever this is offered) and immunised against infection from pneumococcal germs (bacteria). These infections can be particularly unpleasant for people with diabetes.

Monitoring blood glucose levels

Anyone with diabetes who needs treatment with insulin should monitor their blood glucose levels. This is usually not necessary for people with type 2 diabetes who do not need insulin.

It is important to have regular checks as some complications, particularly if detected early, can be treated or prevented from becoming worse. Most GP surgeries and hospitals have special diabetes clinics.

Doctors, nurses, dieticians, specialists in foot care (podiatrists), specialists in eye health (optometrists) and other healthcare workers all play a role in giving advice and checking on progress. As well as ongoing advice on diet and lifestyle, regular checks may include:

Checking levels of blood glucose, HbA1c, cholesterol and blood pressure It is important to keep blood glucose, cholesterol and blood pressure levels as normal as possible. The HbA1c blood test helps to check blood glucose control. Ideally, the aim is to maintain HbA1c to less than 48 mmol/mol. However, this may not always be possible to achieve and the target level of HbA1c should be agreed with the diabetes clinician. For people with type 2 diabetes the aim is often to keep the HbA1c to less than 59 mmol/mol.

Checking for early signs of complications

- Eye checks - to detect problems with the retina (a possible complication of diabetes) which can often be prevented from getting worse. Increased pressure in the eye (glaucoma) is also more common in people with diabetes and can usually be treated. Read more in the separate leaflet Diabetic Retinopathy.
- Blood tests - these include checks on kidney function, and other general tests.
- Urine tests - these include testing for protein in the urine, which may indicate early kidney problems. Read more in the separate leaflet Diabetic Kidney Disease.
- Foot checks - to help to prevent foot ulcers. Read more in the separate leaflet Diabetes, Foot Care and Foot Ulcers.

- Tests for the sensation in legs to detect early nerve damage. See the separate leaflets called Diabetic Neuropathy and Diabetic Amyotrophy.

What are the possible complications of diabetes?

If blood sugar (glucose) levels are not well controlled this may cause a lack of fluid in the body (dehydration), tiredness and drowsiness. This may progress to a serious illness which can be life-threatening, especially if you have type 1 diabetes.

A very high blood glucose level sometimes develops as a result of other illnesses such as any infections. People with diabetes who use insulin injections may need to adjust the dose of insulin to keep the blood glucose levels normal. See the separate leaflet called Diabetes and Illness for more details.

For people with type 1 diabetes, high blood glucose levels can lead to acids called ketones in the bloodstream (this is called ketoacidosis). Less commonly, people with type 2 diabetes may develop a condition with very high blood glucose levels but no ketones (called hyperosmolar hyperglycaemic coma).

Either of these conditions can dangerously reduce the fluid in your body and both conditions need urgent treatment.

Too much insulin (or too high a dose of some of the diabetes tablets) can make the blood glucose level go too low (hypoglycaemia, sometimes called a 'hypo'). This can cause sweating, confusion or a feeling of being generally unwell; occasionally it can cause coma. Emergency treatment of hypoglycaemia is with sugar, sweet drinks, or a glucagon injection (a hormone which has the opposite effect to insulin) followed by a starchy snack such as a sandwich. See the separate leaflet called Hypoglycaemia (Low Blood Sugar).

Diabetes can cause other problems. Infections may take longer to get better or be harder to treat, particularly if blood glucose levels are poorly controlled.

Diabetes can also cause a lot of psychological difficulties such as depression, anxiety and eating disorders.

Routine surgical procedures (such as a joint replacement or hernia repair) will not usually be performed if diabetes control is poor. They will usually be delayed until the Hba1c is at least below 69 mmol/mol.

Long-term complications

If the blood glucose level is higher than normal, over a long period of time, it can have a damaging effect on the blood vessels.

Even a mildly raised glucose level which does not cause any symptoms in the short term can affect the blood vessels in the long term. This may lead to some of the following complications:

- Furring or 'hardening' of the arteries (atheroma) which can cause problems such as angina, heart attacks, stroke and poor circulation.
- Eye problems which can affect vision. This is due to damage to the small arteries of the retina at the back of the eye.
- Kidney damage which sometimes develops into kidney failure.
- Nerve damage.
- Foot problems. These are due to poor circulation and nerve damage.
- Male sexual difficulties (such as erectile dysfunction) and female sexual difficulties (such as a dry vagina, yeast infections and loss of sensation) are common.

The type and severity of long-term complications vary from case to case. In general, the nearer the blood glucose level is to normal, the lower the risk of developing complications. The risk of developing complications is also reduced if other risk factors (such as high blood pressure) are managed fully.

Diabetes burnout

Caring for diabetes is extremely demanding. Diabetes burnout occurs when people feel overwhelmed by their diabetes. This can lead to feeling angry, frustrated, defeated and also worried about not taking care of diabetes well enough.

Burnout can respond well to talking therapies such as cognitive behavioural therapy (CBT). There is also good support from diabetes support groups.

What is the outlook?

Although diabetes is associated with serious complications, these complications can be prevented or greatly reduced in severity. A healthy lifestyle, regular monitoring and taking medicines to keep the blood sugar (glucose), blood pressure and cholesterol levels as normal as possible are all very important.

Some people with type 2 diabetes are able to achieve 'diabetes in remission'. This means their blood glucose stays within normal levels without medication. The most successful way to achieve this is with lifestyle changes, including losing weight and either a medically supervised very low-calorie diet or a low-carbohydrate diet. You can find out more details from the separate leaflet Type 2 Diabetes.

Can diabetes be prevented?

There is currently no known way to prevent type 1 diabetes although many studies are looking into a number of different possibilities.

Type 2 diabetes can be prevented by following a healthy lifestyle, such as a healthy diet, regular exercise and not being overweight. This is very important for everyone. However, it is particularly important for people who are at increased risk, including those who have pre-diabetes (impaired glucose tolerance) or who have had gestational diabetes or who have a family history of type 2 diabetes.

Understanding glucose and insulin

After eating, various foods are broken down in the gut (intestine) into sugars. The main sugar, glucose, passes through the gut wall into your bloodstream. . Other starchy carbohydrate foods such as potato, rice or breakfast cereals digest down into significant amounts of glucose too.

To remain healthy, your blood sugar (glucose) level should not go too high. So when blood glucose level begins to rise - particularly after eating - the level of a hormone called insulin should also rise.

Insulin works on the cells of the body and makes them take in glucose from the bloodstream, thus lowering the blood glucose again. Some of the glucose is used by the cells for energy. Any glucose not used up in this way is converted into glycogen in the liver or fat in the liver or abdomen.

When the blood glucose level begins to fall (between meals or when there is no food), the level of insulin falls. Some glycogen or fat is then converted back into glucose. This is released from the cells into the bloodstream to keep the blood glucose level normal.

Over time, if there is more glucose in the system than needed for energy, this can lead to central obesity (weight carried around the abdomen) and fatty liver.

Insulin is a hormone that is made by cells called beta cells. These are part of little islands of cells (islets) within the pancreas gland. Hormones are chemicals that are released by glands into the bloodstream and work on various parts of the body.

Diabetes develops if the pancreas is not making enough insulin or if the insulin that you is made does not work properly on the body's cells:

- In type 1 diabetes, the body does not make any insulin at all.
- In type 2 diabetes, levels of insulin may be normal but the body doesn't respond properly to them. This is called insulin resistance. Over time, the body's ability to produce insulin also drops in type 2 diabetes and the blood sugar (glucose) levels therefore remain high.

Further reading

- Management of diabetes; Scottish Intercollegiate Guidelines Network - SIGN (March 2010 - updated November 2017)
- Diabetes UK
- Type 1 diabetes in adults: diagnosis and management; NICE Guidelines (August 2015 - last updated August 2022)
- Diabetes (type 1 and type 2) in children and young people: diagnosis and management; NICE Guidelines (Aug 2015 - updated May 2023)
- Diabetic foot problems: prevention and management; NICE Guidelines (August 2015 - last updated October 2019)

- Type 2 diabetes in adults: management; NICE Guidance (December 2015 - last updated June 2022)
- Stewart MW; Treatment of diabetic retinopathy: Recent advances and unresolved challenges. World J Diabetes. 2016 Aug 25;7(16):333-41. doi: 10.4239/wjd.v7.i16.333.
- Tackling the crisis: Transforming diabetes care for a better future England. Diabetes UK, 2019
- Centre for Perioperative Care; Guideline for Perioperative Care for People with Diabetes Mellitus Undergoing Elective and Emergency Surgery

Last updated by: Dr Pippa Vincent, MRCGP 29/09/2023	
Peer reviewed by: Dr Rachel Hudson, MRCGP 29/09/2023	**Next review date:** 27/09/2028