



Medicine for Managers

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Type 2 diabetes

About 4.7 million people in the UK have diabetes, 90% of whom have Type 2. The incidence of the disease has more than doubled in the last twenty years. It is a chronic disease which affects everyday life and which, if not effectively managed, can result in life-changing complications.

Glucose is a sugar which is the main source of energy for the cells which compose muscle and other tissues. It is obtained from two major sources; the diet and from the liver.

When sugar is consumed in the diet, it is absorbed into the blood stream. The pancreas manufactures **insulin**, a hormone which lowers blood sugar and facilitates its entry into cells and storage in the liver in the form of glycogen.

When the level of blood glucose falls, such as in circumstances where the individual has not eaten for some time, or where the demands for energy increase such as during exercise, the secretion of insulin from the pancreas also diminishes and the stored glycogen is converted back to glucose to keep the blood sugar levels within the normal range.

In type 2 diabetes, the process doesn't work as it should. Instead of moving the glucose into the cells, sugar builds up in the bloodstream. The body tries to correct the situation and the beta cells in the pancreas, which produce insulin,

release more insulin. Eventually the cells become impaired and cannot make enough insulin to meet the body's demands.

The exact mechanism by which the resistance to insulin occurs is unknown, although there are a variety of factors which predispose to or contribute to the disease.

The factors increasing the risk of type 2 diabetes are:

- **Age.** Risk increases with age, especially over 45, probably because people exercise less, lose muscle and gain weight.
- **Being *overweight*.** Although a principal factor, it is not invariable that only overweight people develop diabetes.
- **Fat distribution.** People who store fat in the abdomen are more vulnerable to type 2 than those who store fat elsewhere in the body. Risk increases if the waist circumference is greater than 40" in a man or 35" in a woman.

- **Lack of exercise.**
- **Family history.** An individual's risk of diabetes increases if a parent or brother or sister has the disease.
- **Race and ethnicity.** Type 2 diabetes is more common in black, some Asian and Hispanic races.

Other factors include having developed diabetes during the period of a pregnancy (gestational diabetes), in women with polycystic ovarian syndrome and in those people with blood sugar higher than normal, but not sufficiently high to be defined as diabetes. The condition is called **pre-diabetes**.

The Symptoms of type 2 Diabetes

For many people the development of type 2 diabetes is insidious.

The symptoms may be mild or troublesome and in some, they are not associated with feeling unwell.

The common symptoms include:

- Feeling thirsty all the time
- Increased need to pass urine, including at night
- Tiredness and lassitude
- Losing weight without needing to do so
- The development of thrush, especially in the mouth or genitalia
- Delayed healing of wounds

The Diagnosis of type 2 Diabetes

The standard test for diabetes and diabetic control is the glycosylated haemoglobin test. Some of the glucose in the blood binds to haemoglobin (the protein that carries oxygen in the blood) and the combination of the glucose

and the haemoglobin is called glycosylated haemoglobin or haemoglobin A1c (HbA1c). The amount of HbA1c formed is directly related to the concentration of glucose in the bloodstream.

Red blood cells live on average for about 100-120 days and, because of that, the amount of HbA1c in the blood represents the average level of glucose in the blood during the last 3-4 months. In diabetic patients, the HbA1c will be used to check whether or not the diabetes is well-controlled.

A routine screening using HbA1c every three years above the age of 45 may be recommended, particularly in someone who is overweight.

Normally the HbA1c is the test of choice to identify diabetes or pre-diabetes. Other tests may be used on occasion.

- A **random blood sugar**, irrespective of whether or not the individual has eaten, can suggest diabetes if the level is above 11.0 mmol/l, especially if symptoms such as thirst or excessive urination are present.
- A **fasting blood sugar** is taken after an overnight fast. A reading below 5.4 mmol/l is normal and between 5.5 – 6.9 mmol/l is suggestive of pre-diabetes. Two or three successive fasting blood glucose estimations above 7.0 mmol/l confirms diabetes.
- A **glucose tolerance test** was for many years the standard test and involved consuming 50 gm of glucose in a drink, followed by blood tests. A blood glucose above 11.0 mmol/l after two hours suggests diabetes.

Management of type 2 Diabetes

Following diagnosis, the main principles of management of type 2 diabetes include:

- Monitoring the disease. This will include a regular three-monthly HbA1c test together with routine examinations of the feet and the eyes every year together with tests of liver and kidney function, and blood pressure. Initial review after diagnosis will also include, perhaps not surprisingly, checking the weight, the diet and the level of activity.

Losing weight, if overweight or obese, will be very valuable because to do so will make control of the disease easier to lower the blood sugar and may also improve blood pressure.

Moving to a programme of healthy eating will also help with the weight loss. There is no specific 'diabetic diet' but principles of healthy eating include:

- ✓ Eating fewer calories
- ✓ Eating more fruit and vegetables
- ✓ Reducing saturated fats
- ✓ Eating more fibrous food
- ✓ Reducing sweets and sugar

Increasing physical activity lowers blood sugar. The activity should be graded, starting gently and gradually increasing.

A good rule of thumb is to aim for 30 minutes vigorous exercise or 60 minutes moderate exercise a week.

Exercise should be enjoyable and so it is important to choose preferred activities such as walking, running, swimming or cycling. Some may prefer such things as dancing, yoga or weightlifting. It should be incorporated into part of the normal daily routine, wherever possible.

- For some people diagnosed with type 2 diabetes, it is sufficient to lose weight, control the diet and exercise more to achieve blood sugar control. For others, healthier living is not sufficient, or they struggle with the rigours of losing weight or reducing sugary foods. In such circumstances, it may be necessary for the doctor to prescribe medication to control the blood sugar. They include:

- Metformin – lowers glucose production in the liver and improves the efficiency of the body's use of insulin
- Sulphonylurea, such as glipizide or glimepiride can encourage the body to secrete more insulin
- The glitazones, such as rosiglitazone and pioglitazone, may make the body tissue more sensitive to insulin
- The gliptins, such as sitagliptin, help reduce blood sugar levels
- GLP-1 receptor agonists, such as Byetta (exenatide), slow digestion, lower blood sugar levels and may assist in weight loss. These drugs are injected
- Insulin. In some people, lifestyle and oral medication may not be effective and insulin may be required. The insulin principally

lowers blood sugar and must be injected. Often medical advisers and may use one or more types of insulin to obtain 24-hour control.

Not surprisingly, insulin will require closer monitoring than other treatments, at least initially until the dose and type is stabilised.

These days, with efficient diagnosis, effective monitoring, attention to lifestyle and, when required, medication, many of the potential complications of type 2 diabetes can be avoided or minimised.

However, diabetes does affect major organs and the effectiveness of the control of the blood sugar does affect the risk. The disease can lead to:

- **Heart disease, stroke** and **high blood pressure**, associated with increased deposits of atherosclerosis in the arteries with consequent narrowing.
- **Neuropathy** (nerve damage). The disease can cause sensory disturbances including tingling, numbness and pain in the fingers and toes due to damage to the nerves secondary to the tiny arteries which supply them.
- **Foot problems**, such as the development of ulcers and recurrent infections
- **Kidney damage**. Can result in kidney failure and dialysis
- **Visual loss** and blindness. Diabetes may result in damage to the retinal blood vessels, the development of cataract and the risk of glaucoma, all of which

damage sight and could lead to blindness

- Sexual problems, notably **erectile failure** in men
- **Sleep apnoea** is common in patients with diabetes, often associated with being overweight
- Increased superficial bacterial infections and fungal infections such as thrush
- Protracted healing. Diabetic patients may not heal as well, resulting in ulceration and persistent infections which, at their worst, can lead to amputation

It is now 100 years since Insulin was first isolated by Frederick Banting and Charles Best, with their colleagues JJR McLeod and James Collip.

There have been huge advances but the challenge remains the inexorable rise in cases, forecast to be over five million by 2030. It can be controlled in most cases by attention to lifestyle factors, supported with medication when needed.

“I have high blood sugars, and Type 2 diabetes is not going to kill me. But I just have to eat right, and exercise, and lose weight, and watch what I eat, and I will be fine for the rest of my life – **Tom Hanks**.

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