

Module A

Principles of Diabetes

2 Basics of Diabetes

Learning aims

Be able to understand the difference between type 1 and type 2 diabetes

Be aware that type 2 diabetes (the commonest form of diabetes) is caused by a failure of insulin secretion and resistance to its actions

Be alert to the symptoms and signs of diabetes

Understand how insulin works

Diabetes

- ① Diabetes is a long-term (chronic) condition caused by the body's inability to absorb glucose (sugar) into tissues
- ① Sugar therefore tends to remain in the blood and build up to high levels
- ① It is also known as diabetes mellitus.

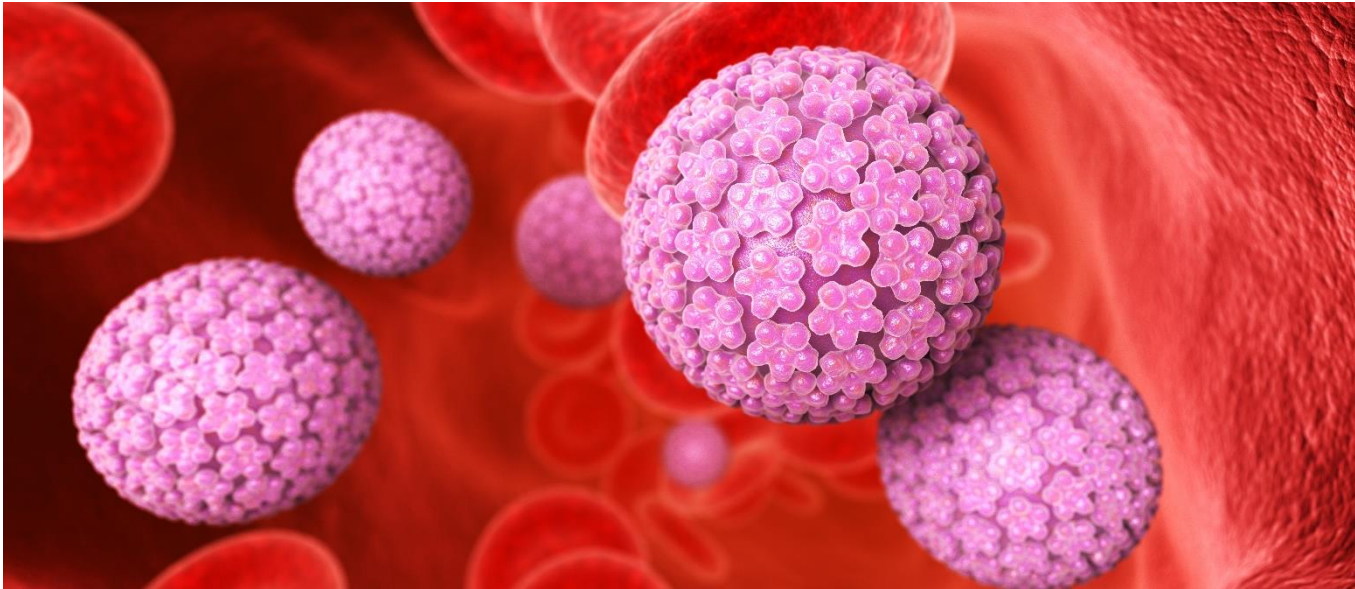


Diabetes

- ① Type 1 diabetes occurs when the body produces no insulin. It is often referred to as insulin-dependent diabetes. It usually develops before the age of 40, often during childhood.
- ① Type 2 diabetes occurs when not enough of the hormone insulin is produced by the body which makes it unable to work properly, or when the body's tissues/cells do not react to insulin. This is called insulin resistance. Type 2 diabetes is nearly ten times more common than type 1 diabetes.

Type 1 diabetes - A

- ☉ Unfortunately, at present, there is little that you can do to prevent type 1 diabetes. Type 1 diabetes appears (but is not actually proven) to result from prior exposure to viruses in people who are genetically susceptible to developing the disease.



Type 1 diabetes - B

- ① Type 1 diabetes appears to occur in genetically-susceptible individuals by a process called autoimmunity
- ① Environmental factors may also be involved
- ① The virus seems to set off a process where the body attacks itself (an autoimmune reaction), with the attack focused on cells in the pancreas called beta cells which produce insulin.



Type 1 diabetes - C

- ① This may develop over months or years.
- ① When more than 90% of the beta cells are destroyed, the remaining beta cells are unable to produce enough insulin to keep the blood glucose normal and patients often present with very high blood sugars.
- ① Without insulin, the body is unable to use glucose, so body fat is used as an alternative energy source.

Type 1 diabetes - D

- ① Fat utilisation causes ketones to be produced (ketosis), which can be identified by the odour of acetone (pear drops) on the breath.
- ① Treatment with insulin is life-saving.
- ① Type 1 diabetes (which is insulin dependent) occurs most commonly either in childhood or during adolescence, but can occur for the first time in later life.

Type 2 diabetes -A



- © Type 2 diabetes, which accounts for 90-95% of all cases of diabetes, is more common with advancing age and probably affects 6%-10% or more of people over the age of 60, with much higher prevalences in some populations

Type 2 diabetes - B

- ① It is often associated with being overweight.
- ① For genetic reasons, ethnic minority groups are at increased risk of developing type 2 diabetes.
- ① In some cases, it can occur in children who are overweight.
- ① Initially type 2 diabetes normally responds to diet changes and tablets, but in many cases, it can be progressive, and after 10 or more years, the use of insulin may be the only way of keeping blood sugar under control.

Type 2 diabetes -C

- ① In type 2 diabetes, most patients develop a gradual loss of insulin sensitivity: **that is**, their tissues and cells become resistant to the effect of insulin because of liver damage due to fat deposits.
- ① The body's ability to handle sugar declines slowly over a long period: and it may take over ten years from the start of the process for diabetes to be diagnosed.

Type 2 diabetes - D

- ① In the early stages of type 2 diabetes (pre-diabetes), insulin becomes less effective in promoting sugar uptake into cells/tissues.
- ① To compensate, the secretion of insulin from the pancreas gradually increases in an attempt to keep the blood glucose levels normal.



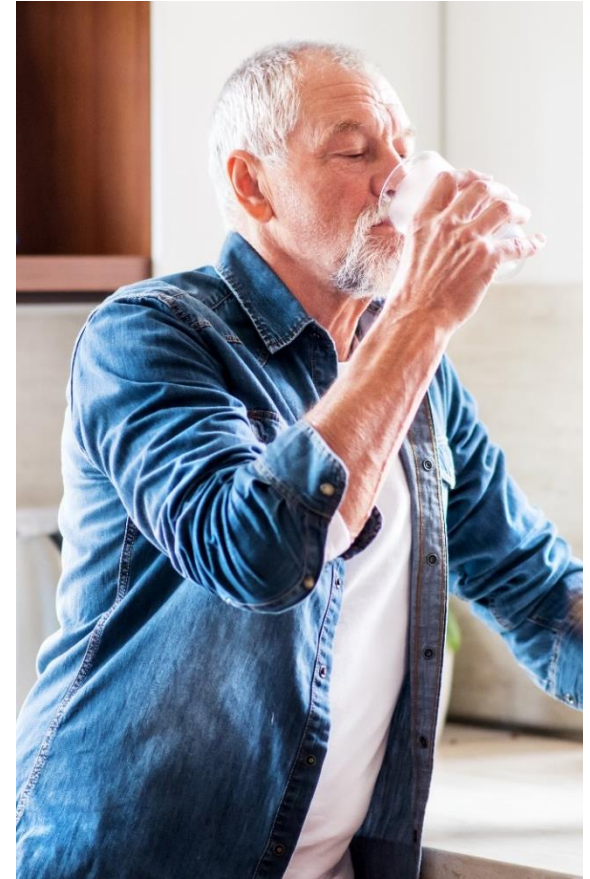
Type 2 diabetes - E

- ① Unfortunately the beta cells, which are being called upon to produce more and more insulin, eventually give up over time and become unable to respond to the increased blood glucose levels after food.
- ② When the beta cells can no longer meet the increased demand for insulin, blood glucose levels rise (hyperglycaemia) and overt diabetes develops.
- ③ It has been estimated that less than 50% of the remaining beta cells are functioning normally by the time that diabetes is diagnosed.

Diagnosis - 1

Diabetes is often diagnosed after:

- ① history of fatigue
- ① thirst
- ① frequent urination (polyuria)
- ① visual disturbances
- ① recent weight loss due to loss of sugar in the urine
- ① Unexplained fall or change in memory



Diagnosis - 2

- ① Excess sugar builds up in the blood stream and can only be eliminated from the body through the kidneys. Large amounts of fluid are needed to allow the sugar to be excreted and this leads to increasingly severe dehydration.
- ① As a result of fluid loss, people have to drink more than usual. Insulin is required to allow sugar into the cells that need it for fuel and without insulin, body organs become short of energy. This may make people feel very hungry.
- ① People often eat more at this stage, and because they cannot utilise glucose due to lack of insulin, the body uses alternative fuels that are stored in the muscles and fat.

Diagnosis - 3

- ① Fatigue is a prominent symptom, leading to tiredness and irritability. Some people may have to take a nap every day to manage this tiredness.
- ① Blurred vision is caused by fluid being drawn from the lenses of the eyes resulting in difficulty with focusing.



- ① Other warning signs are: skin infections, thrush and delayed wound healing.

Insulin resistance and type 2 diabetes

- ① Insulin resistance is a key factor in developing type 2 diabetes.
- ① Some people develop patches of dark, velvety skin in the folds and creases of their bodies, usually the armpits and neck, and this represents a manifestation of insulin resistance.
- ① This condition is called acanthosis nigricans.



Other presentations of diabetes

- ① Most people with type 2 diabetes are overweight or obese and the disease may be discovered during a hospital admission for a heart attack or stroke.
- ① Up to 50% of patients will have complications of diabetes at the time of diagnosis, which confirms that high glucose levels have been present for several years before the diagnosis is made.
- ① It is therefore important for health professionals to be alert to the presence of possible diabetes.
- ① Early detection of diabetes will help to prevent complications.

Insulin – key points

⊙ All those with type 1 diabetes need insulin for normal function and survival and this is an urgent matter.



⊙ Many people with type 2 diabetes also need insulin over the course of time.

⊙ There is progressive loss of insulin-producing beta cells and once about 90% have been destroyed, a person with type 2 diabetes will have to inject insulin.

What does insulin actually do?

- ① Insulin is a hormone produced by the pancreas. If you put your hand just above your tummy button, in the centre of the abdomen, your pancreas lies hidden behind the stomach.
- ① When we eat, sugar is absorbed into the blood stream and this stimulates secretion of insulin from the pancreas. Insulin circulates in the blood, allowing sugar to enter the cells that need glucose for energy (e.g. muscle cells).
- ① Unfortunately, in type 2 diabetes, this process is very inefficient and instead of moving sugar into the cells, the sugar builds up in the blood stream causing the symptoms of thirst and increased urination.
- ① In type 1 diabetes, there is virtually no production of insulin and people can become acutely unwell and often have to be admitted into hospital.

Other insulin actions

- ① Under normal circumstances, the body is able to sense any fall in blood glucose level and this switches off secretion of insulin from the pancreas.
- ① Of course, after an injection of insulin, this cannot happen and the insulin remains active until it has all been absorbed from under the skin.
- ① When prescribing insulin, remember that insulin will continue to reduce the blood glucose level as long as it remains at the site of injection.
- ① For example, until it has all been absorbed.

Glucagon

- ① Glucagon is another hormone produced in the pancreas by the alpha cells.
- ① This has the opposite effect of insulin and increases blood glucose levels by producing sugar from the liver from an energy store known as glycogen.
- ① Glucagon is given by an injection into muscle – an intramuscular injection (IM)
- ① Because glucagon raises glucose, it is often included as treatment for low blood sugar (hypoglycaemia)

Key Messages

KM

A resident may be admitted into care home with diabetes or diabetes develops later

KM

Classic symptoms of diabetes may be absent at the time of diagnosis – diabetes may present as a complication such as a stroke

KM

A large number of residents with type 2 diabetes may require insulin at a later stage

Questions

Q1. Diabetes is characterised by too much of the following in the blood:

- A. Glucose (sugar)
- B. Insulin
- C. Fat

Questions

Q1. Diabetes is characterised by too much what in the blood:

- A. Glucose (sugar)**
- B. Insulin
- C. Fat

Questions

Q2. Type 2 diabetes occurs when (choose the 2 right answers from the 3 below):

- A. The body produces no insulin
- B. Not enough insulin is produced by the body
- C. The body's cells do not react to insulin

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Questions

Q3. Type 2 diabetes accounts for what percentage of all cases of diabetes:

- A. 10%
- B. 30-40%
- C. 60%
- D. 90-95%

Questions

Q3. Type 2 diabetes accounts for what percentage of all cases of diabetes:

- A. 10%
- B. 30-40%
- C. 60%
- D. 90-95%**

Questions

Q4. Symptoms of untreated diabetes may include (choose the 3 correct answers from the 4 below):

- A. Confusion
- B. Thirst
- C. Frequent urination
- D. Weight gain

Questions

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- A. Confusion**
- B. Thirst**
- C. Frequent urination**
- D. Weight gain

Questions

- ☉ Q5. Choose the incorrect statement about insulin from the 4 choices below:
- ☉ A. Insulin is a hormone produced by the pancreas gland
 - ☉ B. Insulin is secreted in response to rising blood sugar levels after eating
 - ☉ C. Insulin allows sugar to enter the cells that need it for energy
 - ☉ D. In type 2 diabetes insulin builds up in the bloodstream instead of moving into the cells

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Learning completed