Medical Emergencies: Diabetes

Aims:

- To give an overview of diabetes including its aetiology, risk factors and prevalence.
- To give an overview of dental considerations that need to be taken into account when treating a patient who has diabetes.
- To outline the contents of the emergency drug kit.
- To give an outline of how to manage a patient who has hypoglycemia or hyperglycemia in the dental surgery.

Objectives: On completion of this verifiable CPD article the participant will be able to demonstrate, through completion of a questionnaire, the ability to:

- Identify the prevalence of diabetes.
- Identify the different types of diabetes.
- Identify the causes and signs, symptoms and complications of diabetes.
- Identify some dental considerations that need to be taken into account when treating a patient who has diabetes.
- Identify the drugs that are used to treat and manage diabetes.
- Know the minimum recommended contents of the emergency drug kit.
- Know how to deal with hypoglycemia and hyperglycemia in the dental practice.

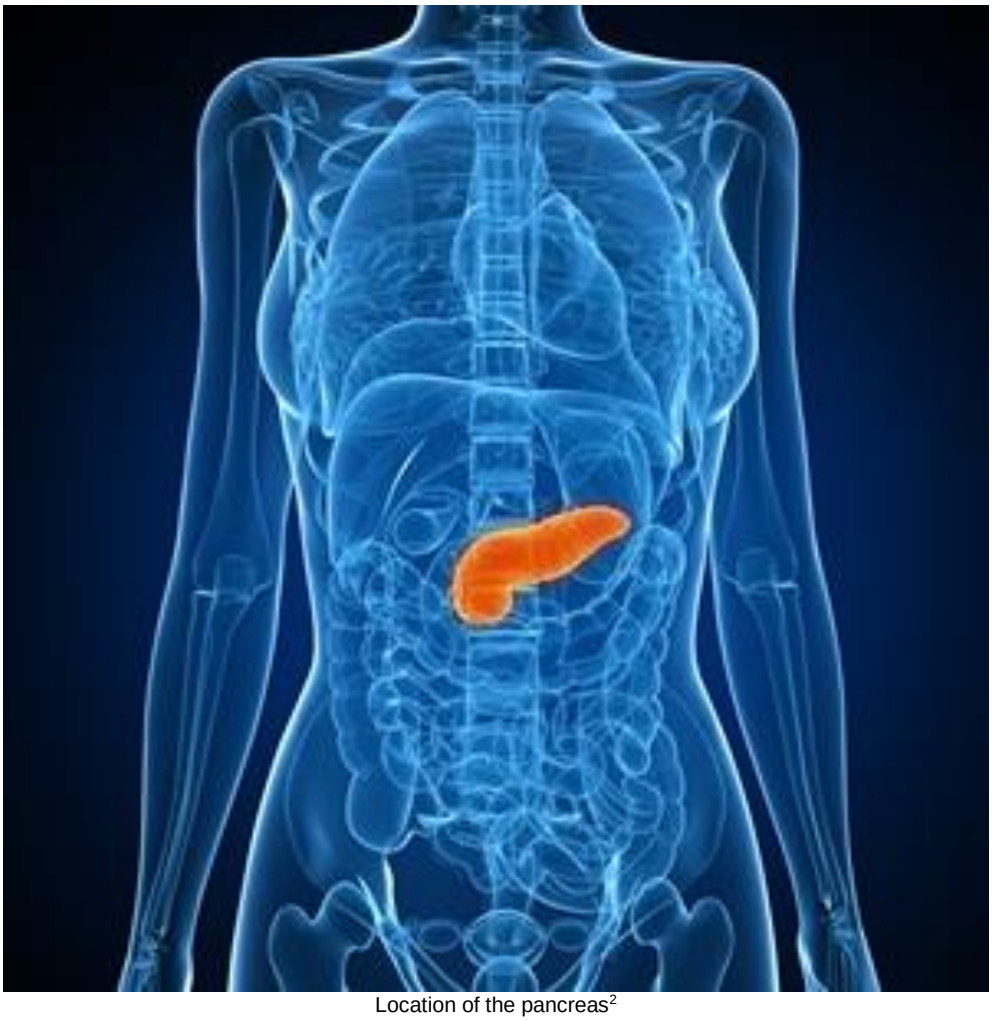
Introduction

Diabetes is a long-term (chronic) condition caused by too much glucose in the blood. The latest 2022-2023 prevalence figures, show that over 5.6 million people in the UK are living with diabetes, with the figures reported to be rising.[1] In addition, it is estimated that around 1.2 million people could be living with type 2 diabetes but have not yet been diagnosed. These UK figures are reported to have increased by over 167,822 from 2021-2022 figures[1] Around 8% of people with diabetes have type 1, and around 90% of people with diabetes have type 2. Other rarer forms of diabetes make up the remaining 2%.[1]

Although rare, medical emergencies can arise, and it is extremely important that the dental care professional can recognise the emergence of such a situation and know their role during an emergency.

This article will explain the different types of diabetes, the aetiology, risk factors and potential complications. It will also discuss medical emergencies relating to hypoglycemia and hyperglycemia.

Types of Diabetes



Location of the pancreas[2]

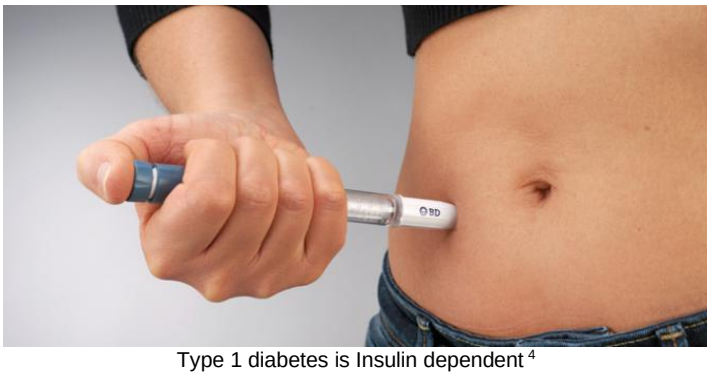
The pancreas is an organ located behind the lower part of the stomach, in front of the spine and has two important functions:

- It produces enzymes that are released into the small intestine to break down and digest food.
- It makes hormones that control blood glucose levels.[2]

The production of pancreatic hormones, including insulin, somatostatin, gastrin, and glucagon play an important role in maintaining sugar and salt balance in our bodies. Insulin helps glucose from the blood enter the cells of our bodies.[3] In diabetes, the body either does not make enough insulin or cannot use its own insulin as well as it should. This causes sugars to build up in the blood.

Approximately 90% of people with diabetes have type 2 diabetes, and approximately 8% have type 1 diabetes. Rarer types of diabetes account for approximately 2%.

Type 1



Type 1 diabetes is Insulin dependent [4]

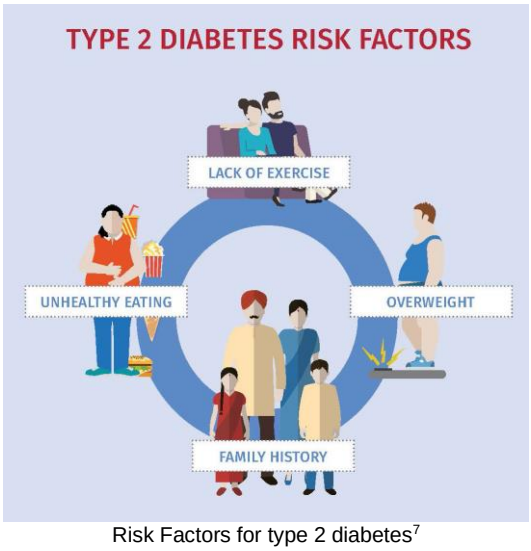
Type 1 diabetes (insulin dependent), is thought to be an autoimmune disease that causes insulin producing beta cells in the pancreas to be destroyed. Other possible causes include genetics or exposure to viruses and other environmental factors. As the beta cells are killed off, the pancreas is unable to produce enough insulin. Without insulin, the glucose is unable to enter the cells from the bloodstream, and the glucose levels in the blood rise.[5]

Daily insulin administration either by injection or an insulin pump is required in order to keep blood glucose levels under control. It typically develops as a child or a young adult.[4]

This risk of developing diabetes can depend on genetics with a 2% risk if the mother has diabetes type 1, and an 8% risk if the father has diabetes type 1. If both parents have type 1 diabetes, there is a 30% risk of a child developing it. [6]

Because type 1 diabetes causes the loss of insulin production, it therefore requires regular insulin administration either by injection or by insulin pump. There are many different types of insulin delivery mechanisms.[4] When using insulin, it is important to balance insulin doses with dietary intake and physical activity. Glucose blood testing has to be used to control diabetes.

Type 2

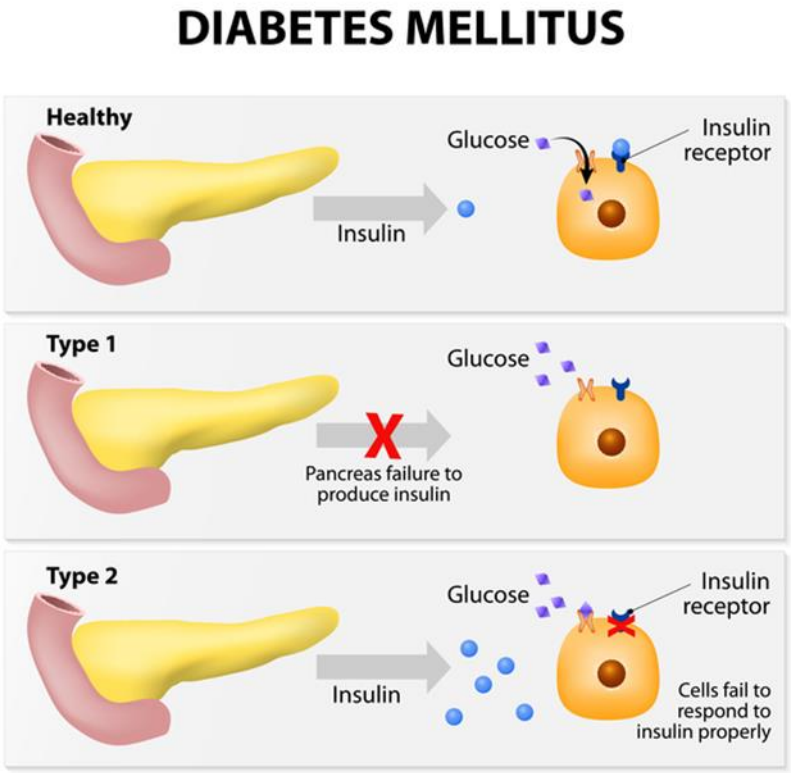


Risk Factors for type 2 diabetes[7]

Type 2 diabetes is far more common than type 1 and is where the body builds up resistance to insulin and the cells cannot use the insulin efficiently, meaning that more insulin is required to bring down the blood glucose levels. As a result, the pancreas has to produce more insulin in order to keep the blood glucose levels in the normal range. Over time, the beta cells in the pancreas become less able to respond to the blood sugar changes and this leads to an insulin shortage.[8]

Most people have some insulin resistance as they age, and type 2 diabetes is more common in middle age or later. However, inadequate exercise and excessive weight gain make it worse, which therefore increases the risk of developing type 2 diabetes.[8]

Type 2 diabetes is a progressive condition, and, in time, other forms of medication may be necessary (such as Metformin). Further development of type 2 diabetes can lead to loss of insulin producing beta cells from the pancreas which can lead to the need for insulin to be administered.[5]



Differences between normal insulin use and that in type 1 and 2 diabetes[8]

Signs and Symptoms of Diabetes

Some of the signs of diabetes are as follows:

- Increased thirst
- Frequent urination
- Unintended weight loss
- Genital itching or thrush

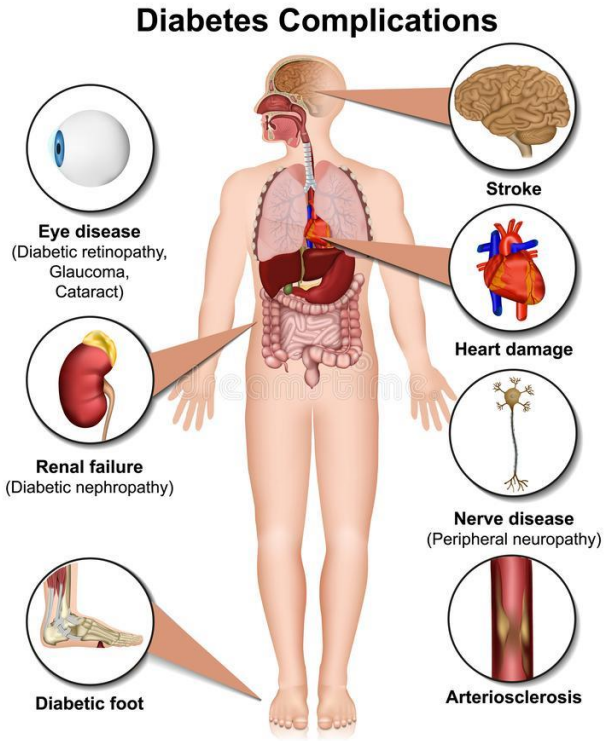
- Cuts and wounds taking longer to heal
- Irritability and other mood changes
- Fatigue and weakness
- Blurred vision[9]

To help spot the four most common symptoms of diabetes in children and young people, Diabetes UK have created the 4 Ts campaign for type 1 diabetes:[9]

Have you noticed that a child:

Toilet - Is going to the toilet more frequently
Tired- Is more tired than usual
Thirtsy- has an unquenchable thirst
Thinner- Is losing weight for no apparent reason?

Complications of Diabetes



There are both chronic and acute complications of diabetes.

Chronic complications are long term, can develop gradually, and can lead to serious damage if unchecked. They can include:

- Retinopathy (eye problems)
- Foot problems
- Heart attack and stroke
- Nephropathy (disease of the kidneys)
- Neuropathy (nerve disease)

- Periodontal disease and other oral health problems. These include tooth decay, fungal infections such as thrush, lichen planus, mouth ulcers, taste disturbances, and a dry, burning mouth
- Related conditions (such as cancer)
- Sexual problems [9]

Dental professionals can educate the patient on the increased risks associated with diabetes and the link to their oral health and advise accordingly.

Acute complications can happen at any time, and they can lead to other complications too. A diabetic medical emergency could happen in the dental practice.

Acute complications include:

- **Hypoglycemia** - Blood sugars are too low (below 4mmol/L (72mg/dl)
- **Hyperglycemia** - Blood sugars are too high (above 7.0 mmol/L (126 mg/dl) when fasting and greater than 11.0 mmol/L (200mg/dl) 2 hours after meals
- **Hyperosmolar Hyperglycemic State** - A life threatening emergency that only occurs in people with type 2 diabetes. It is caused by severe dehydration and very high blood sugars
- **Diabetic ketoacidosis** - A life threatening emergency where the lack of insulin and high blood sugars lead to a build up of ketones. It mainly affects people with type 1 diabetes but can affect some people with type 2 diabetes that are dependent on insulin. The risk of ketoacidosis is significant if the blood glucose levels rise above 15 mmol/l (270 mg/dl) [9,10]

Blood sugar levels can be monitored by the patient at home. Depending on the patient's individual circumstances, the patient may need to visit the doctor several times a year for formal testing.

Medical Emergencies Guidance and Drugs

All registrants must follow guidance on medical emergencies and training updates issued by the Resuscitation Council UK. The General Dental Council state that "A patient could collapse on any premises at any time, whether they have received treatment or not. It is therefore essential that all registrants must be trained in dealing with medical emergencies, including resuscitation, and possess up to date evidence of capability."[11]

In addition:

- There must be at least two people available to deal with potential medical emergencies when treatment is planned to take place.
- All members of staff, not just the registered team members, know their role if a patient collapses or if there is another kind of medical emergency.
- All members of staff who might be involved in dealing with a medical emergency are trained and prepared to deal with such an emergency at any time, and practise together regularly in a simulated emergency so they know exactly what to do.

The General Dental Council endorse the Resuscitation Council's guidance that clinical dental settings staffed by dentists, hygienists, and therapists, are to have an emergency drugs kit.[11]

The Care Quality Commission will consider drugs and equipment for a medical emergency when they review if the practice is safe. This relates to:

- Regulation 12 (safety of care and treatment)
- Regulation 17 (good governance)

The medicines and equipment should be in an accessible and central location known to all staff.

Contents of the drug kit

Even though, as Dental Care Professionals, we may not necessarily be the ones to actually administer the emergency drugs, practising as part of a team will allow all staff to identify roles and responsibilities in terms of getting the drug kit, phoning for an ambulance, assisting with CPR and other medical emergencies. The minimum recommended content of the drug kit is as follows:

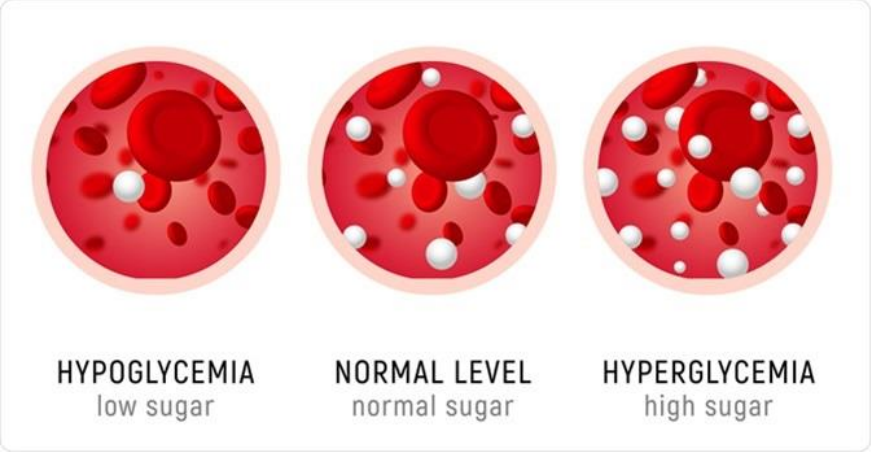
- Adrenaline/epinephrine Injection, adrenaline 1 in 1000, (adrenaline 1 mg/mL as acid tartrate), 1 mL amps
- Aspirin Dispersible Tablets 300 mg
- Glucagon Injection, glucagon (as hydrochloride), 1- unit vial (with solvent)
- Glucose (for administration by mouth)
- Glyceryl trinitrate Spray
- Midazolam Oromucosal Solution
- Oxygen
- Salbutamol Aerosol Inhalation, salbutamol 100 micrograms/ metered inhalation[12]

(a full CPD article on the emergency drug kit is available on the website)

Dealing with a Diabetic Medical Emergency

Having a complete and current medical history is a mandatory part of the patient's clinical records. Therefore, the dental team will be aware if the patient is a known diabetic and can question the patient to find out if their diabetes is controlled. It is important to ensure that patients can have their appointments in a way that does not interfere with their routine of eating or administering their medication.

As previously mentioned, two acute complications of diabetes are the potential for a patient to be hyperglycemic or hypoglycemic.



Hypo and Hyperglycemia blood sugar levels [13]

Hypoglycemia

This is the most likely diabetic emergency that will occur in the dental surgery. Hypoglycemia occurs when blood sugar levels fall too low. Very occasionally, it can also happen in people who do not have diabetes. Insulin dependent diabetic patients attending for dental treatment under local anaesthesia should inject insulin and eat meals as normal.[12] The main causes of hypoglycemia are:

- Taking too much Insulin (or other diabetic medication)
- Skipping or delaying a meal
- Eating less carbohydrate containing food than usual
- Exercise or activity- especially if it is intense or unplanned
- Binge drinking or drinking alcohol on an empty stomach

Patients can often recognise the symptoms themselves and may tell the dental team that they are about to have a “hypo”.

Symptoms include:

- Shaking / trembling
- Sweating
- Pins and needles in the lips and tongue
- Headache
- Double vision
- Palpitations
- Difficulty in concentration / vagueness
- Slurring of speech
- Aggression and confusion / Seizures
- Skin pale and clammy
- Change of behaviour
- Convulsions
- Unconsciousness[12]

Treatment

Initially **glucose** 10–20 g is given by mouth either in liquid form or as granulated sugar or sugar lumps. Approximately 10 g of glucose is available from non-diet versions of Lucozade® Energy Original 110 mL, Coca- Cola® 100 mL (although this is subject to change so labels should always be checked), 2 teaspoons of sugar or 3 sugar lumps.

GlucoGel can be given if the patient is co-operative and has an intact gag reflex. Twist off the cap and squeeze the gel into the mouth and swallow. Alternatively, GlucoGel can be squeezed inside the cheek, and the outside of the cheek then gently rubbed to aid absorption. If necessary, this may be repeated in 10–15 minutes.

Glucagon is given when the patient is uncooperative / does not have an intact gag reflex / is unable to swallow safely / has an impaired level of consciousness. Glucagon 1mg (1 unit) should be given by intramuscular (or subcutaneous) injection; a child under 8 years or of body-weight under 25 kg should be given 500 micrograms.

Once the patient regains consciousness oral glucose should be administered as above. If glucagon is ineffective or contra-indicated, the patient should be transferred urgently to hospital. The patient must also be admitted to hospital if hypoglycaemia is caused by an oral antidiabetic drug.[12]

Hyperglycemia

Hyperglycemia occurs when blood sugar levels are too high and the most likely cause of this is:

- If a patient misses a dose of diabetic medication, tablets or insulin.
- If the patient eats more carbohydrates than the patient or medication can manage
- Being mentally or emotionally stressed
- Contracting an infection[10]

The symptoms of hyperglycemia tend to develop slowly over a few days or a week. Due to this, it is more likely that the dental professional will encounter hypoglycemia in the dental surgery rather than hyperglycemia. However, in some cases, there may be no symptoms until the blood sugar level is very high.

Symptoms include:

- **Increased thirst and a dry mouth**
- **Increased urination**
- **Increased hunger**
- Weakness or feeling tir ed
- Blurred vision
- Unintentional weight loss
- Recurrent infections
- Stomach pain
- Feeling or being sick

- Breath that smells fruity[14]

(The three main symptoms are highlighted above)

Treatment

Treatment for Hyperglycemia would normally be delivered by the patients' diabetic care team and can include:

- Dietary advice – for example, avoiding foods that cause blood sugar levels to rise, such as cakes or sugary drinks.
- Drinking plenty of sugar-free fluids – this can help if dehydrated.
- Exercise more often – gentle, regular exercise such as walking can often lower blood sugar level, particularly if it helps with weight loss.
- If a patient uses insulin it may be necessary to adjust the dose – the patients care team can give them specific advice about how to do this.
- The Patient may be advised to monitor their blood sugar level more closely, or test their blood or urine for substances called ketones (associated with diabetic ketoacidosis).

Until the patient's blood sugar level is back under control, they will be advised to monitor for additional symptoms that could be a sign of a more serious condition.[16]

Conclusion

With the increase in the prevalence of diabetes, it is likely that the dental professional will come into contact with patients who have type 1 or type 2 diabetes on a regular basis. Dental professionals can advise patients on the potential oral health complications associated with diabetes and advise the patient of the importance of not letting dental appointments interfere with usual medication and eating habits. The dental team need to be aware of the acute complications of diabetes so that a medical emergency can be appropriately dealt with, should the need arise.

Personal Development Plan and Reflective Learning

This CPD is linked to the following GDC Enhanced CPD Development Outcomes:

C. Maintenance and development of knowledge and skill within your field of practice.
D. Maintenance of skills, behaviours and attitudes which maintain patient confidence in you and the dental profession and put patients' interests first.

Reflective learning is now a requirement of the GDC Enhanced Professional Development Scheme. As such, you will now be given the option to answer some reflective learning questions, before your certificate is generated. These will be:

1) What did you learn (or confirm) from the activity that was helpful or relevant to your daily work and patients?
2) Comment on any changes/updates needed in your daily work
3) How has completion of this CPD article benefitted your work as a DCP?

Examples will be provided. Please remember that you can fill this in on completion of the exam, but you can also update this at any time from your CPD log. If you take a few moments to write your reflection on completion, you will have fulfilled the Enhanced CPD requirements.

Further Reading

BNF/NICE Medical Emergencies in Dental Practice

Diabetes UK

We would like to thank Jon Andersen for his valuable input into this CPD article

Jon Andersen is the sole proprietor of ST4 Training and has personally delivered over 2000 courses to a range of organisations. Previously, Jon was a Paramedic, Operational Station Officer, Aircrew Paramedic (one of the first six in Sussex), Advanced Exercise Referral Instructor, and Phase IV Cardiac Rehabilitation Exercise Specialist. Jon delivers training in Basic Life Support, Defibrillation using an AED, Dental Medical Emergencies, Fire Safety Awareness and The Role of a Fire Marshal.

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