

Diabetes Mellitus

Diabetes mellitus is a disease that is common in the Netherlands and worldwide. There are over 1.1 million diabetics in the Netherlands¹.

Worldwide, the prevalence of diabetes mellitus among adults doubled between the years 1980 and 2014². From 1991-2010, the prevalence in the Netherlands among men doubled and among women, increased by around 50%³, while it remained relatively stable from 2011-2019. The large number of people with type 2 diabetes mellitus is partly due to lifestyle changes, in particular less physical activity and overnutrition, resulting in overweight. People with diabetes mellitus have an increased risk of developing cardiovascular disease, as well as damage to their eyes, kidneys and nerves². Reducing the number of people with type 2 diabetes mellitus is a priority of public health policy⁴. Since diabetes mellitus is known as a blood sugar disorder, the disease is often mistakenly associated with sugar consumption. In this fact sheet, Cosun Nutrition Center provides information on sugar in relation to diabetes mellitus.

What is diabetes mellitus?

Diabetes mellitus (diabetes) is a chronic metabolic disease by which the body is no longer able to control the blood glucose level. This is due to reduced production or reduced sensitivity to the hormone insulin. Insulin is needed to move blood sugar into cells². Diabetes mellitus can be diagnosed in different ways. A doctor makes the diagnosis of diabetes mellitus when the fasting plasma glucose values are greater or equal to 7.0 mmol/l on two different days. The diagnosis can also be made with one fasting plasma glucose value of ≥ 7.0 mmol/l or a random plasma glucose value of ≥ 11.1 mmol/l combined with symptoms that are characteristic of hyperglycaemia (i.e. too high blood glucose level). The Dutch reference values for normal and abnormal glucose values are shown in **Table 1**. Using the HbA1c value to detect and diagnose diabetes is not recommended in the Netherlands (see **Text box** on page 2)⁵.

With untreated diabetes, the blood glucose level is continuously too high, resulting in damage to the heart, blood vessels, eyes, kidneys and nerves². There are two main types of diabetes: type 1 and type 2. The disease can also develop during pregnancy (gestational diabetes, see text box on page 2).

Table 1. Dutch reference values for glucose values⁵.

		Venous plasma glucose (millimoles per litre)
Normal glucose values	Fasting*	< 6.1
	Non-fasting	< 7.8
Abnormal glucose values	Fasting	≥ 6.1 and < 7.0
	Non-fasting	< 7.8
Diabetes mellitus	Fasting	≥ 7.0
	Non-fasting	≥ 11.1

* A fasting glucose value means that no calories have been consumed for at least eight hours.

Type 1 diabetes mellitus

Type 1 diabetes mellitus (DM1) was formerly referred to as insulin-dependent or juvenile diabetes. The disease usually develops acutely and at a younger age. The symptoms (frequent urination, thirst, feelings of hunger, weight loss, exhaustion and vision changes) usually occur suddenly. With this autoimmune disease, the body's immune system shuts down insulin-producing cells in the pancreas, as a result of which the body produces little to no insulin. Why this happens is not known. Based on current knowledge, the disease cannot be prevented². However, apart from genetic disposition, environmental and dietary factors also appear to play a role in the development of DM1⁶. People with DM1 need to inject insulin several times a day or wear an insulin pump. The treatment of DM1 focuses on proper regulation of the blood glucose value and prevention of complications.

Type 2 diabetes mellitus

Type 2 diabetes mellitus (DM2) usually develops in adults and is the most common form of diabetes. It is estimated that 90 percent of people worldwide with diabetes have DM2⁷. The disease involves reduced sensitivity of the body to insulin and/or delayed or reduced insulin production and/or release. One theory is that insulin resistance is the result of a chronic low-grade inflammation caused by an increase in fatty tissue in which inflammatory mediators (cytokines) are formed⁸. The symptoms correspond to those of type 1, but are often less pronounced, as a result of which the disease can go undetected for years.

In many cases, DM2 can be attributed to overnutrition and a lack of physical activity². As weight increases, the risk of developing DM2 and other chronic diseases increases considerably⁹. Over 80 percent of people with DM2 are overweight¹⁰. Hereditary factors also play a role in the development of DM2¹¹.

Smokers are also at greater risk of developing DM2 because, among other things, smoking makes cells less sensitive to insulin¹².

Since the prevalence of children with overweight and obesity has increased worldwide in recent decades, DM2 often develops at an earlier age nowadays². The term 'adult-onset diabetes', as DM2 was often referred to in the past, is therefore no longer appropriate.

Haemoglobin A1c

The HbA1c level is often measured to evaluate the effectiveness of a therapeutic intervention over a period of eight to twelve weeks. This makes it possible to determine whether the current lifestyle and medication are adequate or, if values are too high, whether changes need to be made. The HbA1c level provides a good assessment of glucose regulation, but does not provide information on glucose variations. Moreover, it is a retrospective measurement. In other words, the HbA1c level has added value in combination with glucose measurements. The principle behind the HbA1c value is based on the fact that glucose in the blood can bind to haemoglobin (the protein in red blood cells that binds oxygen). The HbA1c target value is ≤ 53 mmol/mol, with individual adaptation based on age, duration of diabetes, treatment, health history and any health problems⁵.

Gestational diabetes

Gestational diabetes (diabetes gravidarum) is a form of diabetes that is usually detected during the second half of pregnancy. It occurs in around 3-5 percent of all pregnancies. Gestational diabetes can affect the growth of the unborn child, leading to an increased risk of high birth weight (foetal macrosomia). This can cause complications during childbirth. Gestational diabetes usually disappears after delivery, but women with gestational diabetes have a 50% higher risk on average of developing DM2 within five years of the pregnancy¹³.

How often does diabetes mellitus occur?

The number of people with diabetes, and especially DM2, is rising rapidly. The International Diabetes Federation (IDF) estimates that in 2019, 463 million people worldwide aged 20-79 had diabetes and expect this number to increase to around 580 million worldwide by 2030 and 700 million worldwide by 2045¹⁴. In the period 2011-2019, the number of diabetics in the Netherlands remained relatively constant³. In 2019, an estimated 1,138,000 people in the Netherlands were diagnosed with diabetes (70 per 1,000 men and 61 per 1,000 women)¹. But a certain percentage of people with diabetes are not under the treatment of a doctor, making the total number of people with diabetes likely to be higher.

Diabetes mellitus prevention

Getting enough physical activity, maintaining a healthy body weight and eating a well-balanced diet based on the dietary guidelines established by the Health Council of the Netherlands¹⁵ form the backbone of a lifestyle that reduces the risk of DM2 as much as possible. Physical activity increases sensitivity to insulin, reduces the prevalence of (post-prandial) hyperglycaemia and improves the blood lipid profile¹⁶. The exercise guidelines from the Health Council of the Netherlands for adults recommend at least 150 minutes of moderate to very intense physical activity (such as brisk walking or cycling) per week spread across different days, muscle and bone-strengthening activities at least twice a week and an avoidance of sedentary behaviour¹⁷.

As regards diet, the dietary guidelines established by the Health Council of the Netherlands apply¹⁵. A diet rich in whole grain products, fruits, vegetables, legumes and nuts, with moderate alcohol consumption and few refined grain products, red or processed meat and a minimise consumption of sugar-containing beverages (regular soft drinks and fruit juices) is associated with a relatively low risk of developing DM2 and relatively favourable risk profile for people with DM2¹⁵.

Diabetes mellitus treatment

DM2 treatment aims to keep the blood glucose level within acceptable limits and reduce the risk of complications as much as possible. A related goal that is receiving increasing attention is 'maintaining as high a quality of life for as long as possible in relation to health'⁵. Treatment may include blood glucose-lowering medication and administering insulin. If necessary, efforts can be made to reduce the risk factors for cardiovascular disease, such as blood pressure, blood lipids and smoking. Treatment also includes lifestyle recommendations aimed at increasing physical activity, achieving and maintaining a healthy body weight and a healthy diet⁵.

Diabetes mellitus and diet

In terms of diet to prevent diabetes mellitus, the dietary guidelines for diabetes issued by the Dutch Diabetes Federation (NDF) apply¹⁰. These scientifically based dietary recommendations are revised every five years and the newest guidelines were published online in 2020. The same dietary recommendations apply to people with DM1 and DM2. Since over 80 percent of people with DM2 are overweight, the emphasis for them is on achieving or maintaining a healthy weight. It should be noted that there is not one diet that is most suitable for people with diabetes mellitus. The emphasis should be on the quality of the diet, taking into account personal preferences, cultural dietary preferences and the right amount of energy. The latter is important because weight reduction occurs when total energy intake is reduced, resulting in a negative energy balance. People who are overweight and recently diagnosed with diabetes should aim for at least 5-10 percent weight reduction. The NDF recommends that people with DM2 who are overweight choose high-quality carbohydrate sources, such as whole grain products, legumes, fruits and vegetables. The consumption of refined carbohydrate sources, such as white bread, bread products with white flour, pastries and biscuits, low fibre breakfast cereals and white rice and pasta, should be limited as well as the intake of sugar-containing beverages.

In the NDF guidelines, the following diets are given as examples because they meet the above criteria: the Dutch Wheel of Five, low-carbohydrate (no more than 40 energy percentage), low-fat (less than 30 energy percentage), Mediterranean, DASH (*Dietary Approaches to Stop Hypertension*) and vegetarian/vegan. With a low-carbohydrate, low-fat and vegetarian/vegan diet, it is important to pay extra attention to consuming enough fibre, essential fatty acids, vitamins and minerals.

For women with gestational diabetes, it is important to regulate the blood glucose level, but the best dietary intervention for this is not clear¹⁰.

Diabetes mellitus and sugar intake

People with diabetes can eat sugars^{10,18}. But the NDF recommends limiting the intake of free sugars. Free sugars are sugars (monosaccharides and disaccharides) that are added by the consumer, manufacturer or cook, in addition to naturally present sugars in honey, syrups, fruit juices and fruit concentrates. Naturally present sugars in fruits, vegetables and dairy products do not fall into this category. The NDF especially advises against the consumption of sugar-containing beverages¹⁰. These include regular soft drinks and fruit juices, as well as fruit juices labelled 'unsweetened' or 'without added sugar' and milk and yogurt drinks. These drinks may also contain added or naturally present sugars. The NDF also recommends that people with DM1 and DM2 replace high-glycaemic products with low-glycaemic products to achieve a slight improvement in glucose regulation¹⁰. See the text box for more information on the glycaemic index (GI).

Conclusion

The troubling worldwide increase in DM2 is primarily the result of a lifestyle characterised by overweight and a lack of physical activity. A well-balanced diet according to the dietary guidelines established by the Health Council of the Netherlands in 2015 or those specifically for people with diabetes from the Dutch Diabetes Federation, adequate physical activity and achieving and maintaining a healthy weight are the key recommendations for preventing and treating the disease.

Glycaemic index

The glycaemic index (GI) provides an estimate of the rate at which the glucose concentration in the blood increases over two hours following the intake of 50 grams of carbohydrates. This is then expressed as a percentage compared to 50 grams of a reference (white bread or glucose). A food with a high GI (>70) produces a faster increase in the blood glucose concentration than a food with a low GI (<55). The GI depends not only on the type of carbohydrate, but also, for example, the preparation method, processing of the product and individual factors (gastrointestinal motility, insulin sensitivity, physical activity). In addition, people usually eat a meal that comprises not only carbohydrates, but also proteins and fats. This also affects the GI.

The blood glucose-increasing effect of sucrose (table sugar) is relatively low (glycaemic index = 65 compared to, for example, white rice = 89) because 50 percent of this disaccharide is fructose. With a GI of 15, fructose causes a low increase in the blood glucose concentration¹⁹.

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