

## Prevention of type 2 diabetes

See also the separate [Diabetes Education and Self-management Programmes](#), [Gestational Diabetes](#), [Metabolic Syndrome](#) (insulin resistance), and [Managing Impaired Glucose Tolerance in Primary Care](#) articles.

Although effective treatment of diabetes mellitus can reduce the incidence of its complications, type 2 diabetes is more often than not an asymptomatic condition and many people with type 2 diabetes have macrovascular and microvascular complications by the time their condition is diagnosed.

### Risk factors<sup>[1]</sup>

Factors which influence someone's risk of type 2 diabetes include being overweight, high waist circumference, increasing age, low level of physical activity and whether or not they have a previous history of gestational diabetes or a family history of type 2 diabetes.

Glycated haemoglobin (HbA1c) levels of 48 mmol/mol (6.5%) or above indicate that someone has type 2 diabetes. It has been recommended by a UK expert group that HbA1c values between 42 and 47 mmol/mol (6.0–6.4%) indicate that a person is at high risk of type 2 diabetes. There is a continuum of risk across a range of sub-diabetic HbA1c levels and people with an HbA1c below 42 mmol/mol (6.0%) may also be at risk. National Institute for Health and Care Excellence (NICE) guidance has recommended:

- Identifying people at risk of developing type 2 diabetes, using a validated risk assessment score and a blood test (fasting blood glucose or HbA1c) to confirm high risk.
- Providing those at high risk with an intensive lifestyle-change programme to prevent or delay the onset of type 2 diabetes.

A record of all risk assessment results should be kept in order to ensure appropriate follow-up and continuity of care. The rest of this article is mainly based on the recent NICE guidance.

## Risk assessment<sup>[1]</sup>

The following groups should be encouraged to have a risk assessment:

- All eligible adults aged 40 and above, except pregnant women.
- People aged 25–39 of South Asian, Chinese, African–Caribbean, black African and other high-risk black and minority ethnic groups, except pregnant women.
- Adults with conditions that increase the risk of type 2 diabetes, including those with cardiovascular disease, hypertension, obesity, stroke, polycystic ovary syndrome, a history of gestational diabetes and mental health problems.

## Risk identification

A validated self-assessment questionnaire or validated web-based tool can be used – eg, the Diabetes Risk Score on the Diabetes UK website.<sup>[2]</sup>

Primary healthcare professionals should use a validated computer-based risk assessment tool, which should use routinely available data from patients' electronic health records.

If a computer-based risk assessment tool is not available, a validated self-assessment questionnaire – eg, the Diabetes Risk Score assessment tool – should be used. This is available to health professionals on request from Diabetes UK.

A blood test (fasting plasma glucose or HbA1c) should be offered to adults with a high risk score. A blood test should also be considered for those aged 25 and over of South Asian or Chinese descent whose body mass index (BMI) is greater than 23 kg/m<sup>2</sup>. The aim is to:

- Determine the risk of progression to type 2 diabetes; a fasting plasma glucose of 5.5–6.9 mmol/L or an HbA1c level of 42–47 mmol/mol (6.0–6.4%) indicates high risk; or

- To identify possible type 2 diabetes.

## **Interventions to reduce risk**<sup>[1]</sup> <sup>[3]</sup>

### **Interventions based on risk assessment**

#### **For people at low risk (low or intermediate risk score):**

- Provide advice, including their risk factors and how they could improve their lifestyle to reduce overall risk, including available local services and facilities.
- Offer encouragement and reassurance.

#### **For people with a moderate risk, ie a high risk score but with a fasting plasma glucose less than 5.5 mmol/L or HbA1c of less than 42 mmol/mol (6.0%):**

- Identify particular risk factors and which risk factors can be modified. Advise how risk factors can be modified by changing lifestyle, including local services and facilities.

#### **For people confirmed as being at high risk, ie a high risk score and fasting plasma glucose of 5.5–6.9 mmol/L or HbA1c of 42–47 mmol/mol (6.0–6.4%):**

- Identify particular risk factors and identify which ones can be modified. Advise how risk factors can be modified by changing lifestyle.
- Offer referral to a local, evidence-based, quality-assured intensive lifestyle-change programme.

#### **For people with possible type 2 diabetes, ie fasting plasma glucose of 7.0 mmol/L or above, or HbA1c of 48 mmol/mol (6.5%) or above, but no symptoms of type 2 diabetes:**

- Carry out a second blood test. If type 2 diabetes is confirmed, start appropriate management. See the separate [Management of Type 2 Diabetes](#) article.
- If type 2 diabetes is not confirmed, offer a referral to a local, quality-assured, intensive lifestyle-change programme.

## Lifestyle

Lifestyle changes, including healthy diet, weight reduction if overweight, and increasing the level of regular physical activity. See the separate [Diabetes Diet and Exercise](#) article.

There is no firm evidence that diet alone or physical activity alone influences the risk of T2DM and especially its associated complications in people at increased risk of developing type 2 diabetes. However, diet plus physical activity reduces or delays the incidence of type 2 diabetes in people with impaired glucose tolerance.<sup>[4]</sup>

One study identified 166 patients from 14 surgeries at high risk of developing type 2 diabetes: those with impaired glucose regulation; known as pre-diabetes or non-diabetic hyperglycaemia; and with a body mass index (BMI) above 30 kg/m<sup>2</sup>. There was a take-up rate of 70%. The programme focused on improving diet quality, reducing portion size, increasing physical activity levels, as well as boosting confidence in the ability to change and a commitment to the process. The initiative led to an average fall in HbA1c of 2.84 mmol/mol after 12 months to levels regarded as normal. Blood glucose levels also returned to normal in 38% of the patients and only 3% developed type 2 diabetes after 12 months. The average weight loss amounted to 10 kg at the 12 month time point (a reduction in BMI of 3.2kg/m<sup>2</sup>).<sup>[5]</sup>

## Metformin

Use clinical judgement on whether (and when) to offer metformin to support lifestyle change for people whose HbA1c or fasting plasma glucose blood test results have deteriorated, if:

- This has happened despite their participation in an intensive lifestyle-change programme; or
- They are unable to participate in an intensive lifestyle-change programme.

Metformin does not have UK marketing authorisation for this indication and so informed consent should be obtained and documented.

Continue to offer advice on diet and physical activity along with support to achieve their lifestyle and weight-loss goals. Check the person's renal function before starting treatment and then twice-yearly (more often if they are older or if deterioration is suspected).

Start with a low dose (eg, 500 mg once daily) and then increase gradually as tolerated to 1500–2000 mg daily. If the person is intolerant of standard metformin then consider using modified-release metformin.

Prescribe metformin initially for 6–12 months. Monitor the person's fasting plasma glucose or HbA1c levels at three-monthly intervals and stop the drug if no effect is seen.

## **Orlistat**

- Use clinical judgement on whether to offer orlistat to people with a BMI of 28.0 kg/m<sup>2</sup> or more as part of an overall plan for managing obesity.
  - Take into account the person's risk and the level of weight loss and lifestyle change required to reduce this risk.
  - Advise the person to follow a low-fat diet that provides 30% of daily food energy as fat, distributed over three main meals a day. Offer information and regular support from a dietician or another appropriate healthcare professional.
  - Agree a weight-loss goal with the person and regularly review it with them.
  - Review the use of orlistat after 12 weeks. If the person has not lost at least 5% of their original body weight, use clinical judgement to decide whether to stop the orlistat. However, as with adults who have type 2 diabetes, those at high risk of the condition may lose weight more slowly than average, so less strict goals may be appropriate.
  - Use orlistat for more than 12 months (usually for weight maintenance) only after discussing the potential benefits, limitations and side-effects with the person concerned.
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## Reassessing risk<sup>[1]</sup>

Keep an up-to-date register of people's level of risk. Introduce a recall system to contact and invite people for regular review. Offer a reassessment based on the level of risk. Use clinical judgement to determine when someone might need to be reassessed more frequently, based on their combination of risk factors (eg, BMI, relevant illnesses or conditions, ethnicity and age).

For people at low risk (low or intermediate risk score): offer to reassess at least every five years. Use a validated risk assessment tool.

For people at moderate risk (a high risk score but with a fasting plasma glucose less than 5.5 mmol/L, or HbA1c less than 42 mmol/mol (6.0%): offer to reassess at least every three years.

For people at high risk (a high risk score and fasting plasma glucose of 5.5–6.9 mmol/L, or HbA1c of 42–47 mmol/mol (6.0–6.4%)), and for people without symptoms but the first blood test measured fasting plasma glucose at 7.0 mmol/L or above, or an HbA1c of 48 mmol/mol (6.5%) or greater, but whose second blood test did not confirm a diagnosis of type 2 diabetes:

- Offer a blood test at least once a year. Also offer to assess their weight or BMI.
- At least once a year, review the lifestyle changes people at high risk have made. Use the review to help reinforce their dietary and physical activity goals, as well as checking their risk factors.

## Provision of services<sup>[1]</sup>

A review on behalf of Public Health England confirmed previous research, demonstrating that diabetes prevention programmes can significantly reduce the progression to type 2 diabetes and lead to reductions in weight and glucose compared with usual care.<sup>[6]</sup>

Health and well-being boards and public health commissioners, working with clinical commissioning groups, should develop a comprehensive and co-ordinated type 2 diabetes prevention commissioning plan, based on the data collated. This should include:

- Action to raise awareness of the risks of type 2 diabetes.
- A proactive, two-stage approach (risk assessment tool and blood test) to identifying people at high risk (and those with undiagnosed type 2 diabetes).
- Evidence-based, quality-assured intensive lifestyle-change programmes.

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## Further reading

- [Diabetes UK](#)
- [Evidence-based nutrition guidelines for the prevention and management of diabetes](#); Diabetes UK (2018)
- [Wu Y, Ding Y, Tanaka Y, et al](#); Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention. *Int J Med Sci*. 2014 Sep 6;11(11):1185–200. doi: 10.7150/ijms.10001. eCollection 2014.
- [Weber MB, Hassan S, Quarells R, et al](#); Prevention of Type 2 Diabetes. *Endocrinol Metab Clin North Am*. 2021 Sep;50(3):387–400. doi: 10.1016/j.ecl.2021.05.003. Epub 2021 Jul 12.
- [Taylor R, Ramachandran A, Yancy WS Jr, et al](#); Nutritional basis of type 2 diabetes remission. *BMJ*. 2021 Jul 7;374:n1449. doi: 10.1136/bmj.n1449.

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