



# Patient

## Pre-diabetes (Impaired Glucose Tolerance)

In pre-diabetes (impaired glucose tolerance), your blood sugar (glucose) is raised beyond the normal range. Whilst this raised glucose level is not so high that you have diabetes, you are at increased risk of developing diabetes when you have pre-diabetes.

You are also at increased risk of developing conditions such as heart disease, peripheral arterial disease and stroke (cardiovascular diseases). If pre-diabetes is treated, it can help to prevent the development of diabetes and cardiovascular disease. The most effective treatment is lifestyle changes, including eating a healthy balanced diet, losing weight if you are overweight, and doing regular physical activity.

### What is pre-diabetes?

If you have pre-diabetes (impaired glucose tolerance), your blood sugar (glucose) is raised beyond the normal range but it is not so high that you have diabetes. However, if you have pre-diabetes you are at risk of developing type 2 diabetes.

Between 1 and 3 out of every 4 people with pre-diabetes will develop diabetes within ten years.

It is also thought that having pre-diabetes increases your risk of developing conditions such as heart disease, peripheral arterial disease and stroke (cardiovascular diseases). Also, people who have pre-diabetes are more likely also to have other risk factors for cardiovascular disease, including high blood pressure, raised cholesterol levels, being overweight, etc. See separate leaflets called Preventing Cardiovascular Diseases and Cardiovascular Health Risk Assessment for more details.

The World Health Organization (WHO) defines someone as having pre-diabetes if they have:

- A fasting blood glucose of less than 7 mmol/L; **and**
- A blood glucose of 7.8 mmol/L or more but less than 11.1 mmol/L after a two-hour oral glucose tolerance test.

However, the glucose tolerance test is rarely used now. The most commonly used test to identify pre-diabetes is now the HbA1c blood test. The WHO has recommended that an HbA1c blood test level of 42-47 mmol/mol (6.0-6.5%) indicates a high risk of diabetes.

### What is impaired fasting glycaemia?

The WHO has also said that someone has impaired fasting glycaemia if they have:

- A fasting blood glucose between 6.1 to 6.9 mmol/L; **and**
- A blood glucose of less than 7.8 mmol/L after a two-hour oral glucose tolerance test.

If you have impaired fasting glycaemia, you are also thought to have an increased risk of developing diabetes. Your risk of developing cardiovascular disease is also increased but this seems to be lower than if you have pre-diabetes (impaired glucose tolerance). The rest of this leaflet is about pre-diabetes.

### How common is pre-diabetes?

Many people have pre-diabetes (impaired glucose tolerance) and because there are no symptoms, they do not know that they have it. Diabetes UK estimates that around seven million people in the UK have pre-diabetes.

### What causes pre-diabetes and who develops it?

Pre-diabetes (impaired glucose tolerance) develops for the same reasons as type 2 diabetes (see above).

There are various things that can increase your risk of developing pre-diabetes. They are the same risk factors as those for type 2 diabetes. They include:

- Being overweight or obese (most people with pre-diabetes are overweight or obese).

- Having a family history of diabetes. This refers to a close family member with diabetes - a mother, father, brother or sister.
- Doing little physical activity.
- Having other risk factors for cardiovascular disease such as high blood pressure or high cholesterol levels.
- If a woman has polycystic ovary syndrome and is also overweight.
- If you developed diabetes during pregnancy (called gestational diabetes).

### **What are the symptoms of pre-diabetes and how is it diagnosed?**

People with pre-diabetes (impaired glucose tolerance) usually have no symptoms. You are often found to have pre-diabetes after blood tests taken for another reason show that you have a raised blood sugar (glucose) level. Sometimes, your doctor may suggest that a screening blood test should be taken to check your blood glucose because they are worried that you may have some risk factors for pre-diabetes or diabetes. For example, if you have high cholesterol levels, are overweight or have high blood pressure, or if you have had a heart attack or stroke, your doctor may suggest that you have a blood test to check your blood glucose. Pre-diabetes is now most often diagnosed using a blood test called HbA1c. See separate leaflet called Tests for Blood Sugar (Glucose) and HbA1c for more details. An HbA1c value of 48 mmol/mol (6.5%) or above is recommended as the blood level for diagnosing diabetes. People with an HbA1c level of 42-47 mmol/mol (6.0-6.5%) are often said to have pre-diabetes because they are at increased risk of diabetes and cardiovascular disease.

Another test to diagnose pre-diabetes is the glucose tolerance test but this is much less often used now. Read more about the glucose tolerance test.

### **How is pre-diabetes treated?**

There is increasing evidence that if pre-diabetes (impaired glucose tolerance) is treated, the progression to diabetes can be prevented. Also, it may be possible to prevent cardiovascular disease from developing. So, it is important to know if you have pre-diabetes and to treat it in order to reduce your risk of developing diabetes and cardiovascular disease. Treatments that have been suggested include lifestyle changes and treatments with medicines.

It is also very important to have a regular blood test to recheck your blood sugar (glucose) level in case you develop diabetes. The frequency of the blood test will vary but you should discuss this with your doctor. A blood glucose test at least once each year is usually recommended.

### **Lifestyle changes**

Lifestyle changes have been found to be the most effective way to stop pre-diabetes from developing into diabetes. Losing weight if you are overweight, and increasing your levels of physical activity, can help to reduce insulin resistance and therefore make the insulin that is produced more effective at controlling your blood glucose levels.

If you have pre-diabetes, you should:

- **Eat a healthy balanced diet.** Your practice nurse and/or a dietician will give details on how to eat a healthy diet. The diet is the same as recommended for everyone. The idea that you need special foods if you have pre-diabetes or diabetes is a myth. Basically, you should aim to eat a diet low in fat, high in fibre and with plenty of starchy foods, fruit and vegetables. See separate leaflet called Healthy Eating.
- **Lose weight if you are overweight.** Getting to a perfect weight is unrealistic for many people. However, if you are overweight or obese then losing some weight will help to reduce your blood glucose level (and have other health benefits too). See separate leaflet called Weight Reduction - How to Lose Weight.
- **Do some physical activity regularly.** If you are able, a minimum of 30 minutes of physical activity at least five times a week is advised. For example, walking, swimming, cycling, jogging, dancing. Ideally you should do an activity that makes you at least mildly out of breath and mildly sweaty. You can spread the activity over the day. (For example, two 15-minute spells of brisk walking, cycling, dancing, etc per day.) Regular physical activity also reduces your risk of having a heart attack or stroke. Always check with your doctor that it is safe to start exercising if you have been inactive for a long period. See separate leaflet called Physical Activity For Health.

There are also other lifestyle changes that you can make to reduce your cardiovascular disease risk. These include:

- Stopping smoking if you are a smoker.

- Ensuring that you stick to the recommended alcohol intake. See separate leaflet called Recommended Safe Limits of Alcohol for more details.

Make sure that your blood pressure stays within the normal range. Have your blood pressure checked regularly with your practice nurse.

Also, discuss with your doctor or practice nurse if you need a cholesterol check and/or treatment to lower your cholesterol level.

### Treatments with medicines

A number of medical trials have looked at the use of various treatments with medicines for people with pre-diabetes to see if they can help to prevent diabetes and cardiovascular disease. Medicines that have been trialled include metformin, acarbose, a group of medicines called angiotensin-converting enzyme (ACE) inhibitors and another group of medicines called angiotensin-II receptor antagonists (also known as angiotensin receptor blockers).

Lifestyle changes (as indicated above) are the most important thing if you are found to have pre-diabetes. However, the National Institute for Health and Care Excellence (NICE) has recommended that metformin should be used if a lifestyle-change programme isn't successful or isn't possible because of a disability or medical reasons. A medicine called orlistat may also be recommended to help lose weight and therefore reduce the risk of developing diabetes.

### What follow-up is needed if you have pre-diabetes?

If you are found to have pre-diabetes (impaired glucose tolerance), it is important that you be followed up regularly by your doctor. This will usually mean a blood test to check your fasting blood sugar (glucose) level at least once a year. This is to make sure that you have not developed diabetes. Your doctor is also likely to keep a check on any other risk factors that you may have for cardiovascular disease. So, they may monitor your weight and your blood pressure and also suggest a blood test to check your cholesterol and triglyceride levels.

In the meantime, if you develop any symptoms of diabetes, you should visit your doctor sooner. Symptoms include excess thirst, passing large amounts of urine, tiredness, weight loss and feeling generally unwell. Symptoms tend to develop quite slowly, over weeks or months.

### Can pre-diabetes be prevented?

The same things that can help prevent type 2 diabetes can help prevent pre-diabetes (impaired glucose tolerance). These include:

- Eating a healthy balanced diet.
- Losing weight if you are overweight.
- Doing some physical activity regularly.

### Further reading & references

- [Type 2 diabetes: prevention in people at high risk](#); NICE Public Health Guidance (July 2012)
- [Ford ES, Zhao G, Li C](#); Pre-diabetes and the risk for cardiovascular disease: a systematic review of the evidence. *J Am Coll Cardiol.* 2010 Mar 30;55(13):1310-7.
- [Perreault L, Pan Q, Mather KJ, et al](#); Effect of regression from prediabetes to normal glucose regulation on long-term reduction in diabetes risk: results from the Diabetes Prevention Program Outcomes Study. *Lancet.* 2012 Jun 16;379(9833):2243-51. doi: 10.1016/S0140-6736(12)60525-X. Epub 2012 Jun 9.
- [Type 2 Diabetes Know Your Risk](#); Diabetes UK
- [Position Statement - Early identification of people with, and at high risk of Type 2 diabetes and interventions for those at high risk](#); Diabetes UK, Nov 2015

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Author:  
Dr Colin Tidy  
Document ID:

Peer Reviewer:  
Prof Cathy Jackson  
Last Checked:

Next Review:

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