

## DRUGS USED TO TREAT SYMPTOMS OF NEUROPATHY

Symptom	Cause	Treatments available
Erectile dysfunction	Damage to nerves to penis	Sildenafil (Viagra), tadalafil (Cialis), vardenafil (Levitra), Caverject injections
Excessive sweating	Damage to nerves to sweat glands	Oxybutynin
Heartburn	Reflux of acid into oesophagus	Antacids Omeprazole, lansoprazole
Regurgitation of food	Stomach not emptying properly	Domperidone, metoclopramide
Diarrhoea	Disordered gut motility, overgrowth of bacteria in gut	Codeine phosphate Short course of antibiotic (e.g. tetracycline)
Constipation	Loss of sensation in lower bowel	Standard laxatives, e.g. lactulose, senna
Painful symptoms e.g. shooting pains, pins and needles	Hypersensitivity of nerves carrying pain sensation	Duloxetine, amitriptyline, pregabalin, gabapentin
Frequent urination	Bladder irritability	A number of preparations including oxybutynin, solifenacin, tolterodine
Difficulty passing urine	Loss of bladder sensation	Bethanechol chloride; catheterisation
Fainting, light-headedness	Low blood pressure	Fludrocortisone

## SULFONYLUREA IN USE IN 2014

Name	Dose – taken with meals	Notes
Glibenclamide	2.5–20mg once a day	Very long acting, not suitable for older people
Glipizide	2.5–10mg once or twice a day	
Gliclazide	40–160mg once or twice a day	
Glimepiride	1–6mg once a day	
Tolbutamide	250mg–500mg, one to three times a day	Short-acting, suitable for older people or those who are physically active

### THE THREE STAGES OF DIABETES REVERSAL

	Partial	Complete	Prolonged
Fasting glucose (mmol/l)	<7	<5.6	<5.6
HbA1c (mmol/mol)	<48 (6.5%)	<42 (6.0%)	<42 (6.0%)
Duration (years)	1	1	5

## EXAMPLES OF MEALS OF DIFFERENT CARBOHYDRATE CONTENT

Grams Carbohydrate	Breakfast	Lunch	Dinner	Snack
10 or less	<ol style="list-style-type: none"> <li>1. 1 whole grapefruit with or without sweetener</li> <li>2. Natural yoghurt (60g) with strawberries (80g)</li> <li>3. 2 egg omelette with mushrooms, peppers</li> </ol>	<ol style="list-style-type: none"> <li>1. Mackerel salad with beetroot and horseradish</li> <li>2. Vegetable soup (no potatoes)</li> <li>3. Chicken salad</li> </ol>	<ol style="list-style-type: none"> <li>1. Tuna steak with steamed vegetables</li> <li>2. Vegetable and bean stew.</li> <li>3. Prawn stir fry with pineapple pieces</li> </ol>	<ol style="list-style-type: none"> <li>1. Apple</li> <li>2. Plain popcorn (20g)</li> <li>3. Almonds (30g)</li> </ol>
20	<ol style="list-style-type: none"> <li>1. 4 small breakfast pancakes with bacon and cherry tomatoes</li> <li>2. Scrambled egg on 1 slice thick toast</li> <li>3. Branflakes (20g) with milk</li> </ol>	<ol style="list-style-type: none"> <li>1. Small slice quiche (100g) with salad</li> <li>2. Smoked salmon on ½ bagel</li> <li>3. 3 Ryvita with low-fat cream cheese</li> </ol>	<ol style="list-style-type: none"> <li>1. Shepherd's pie (200g) with vegetables</li> <li>2. Chilli con carne with nachos (20g)</li> <li>3. Steak with grilled field mushroom and new potatoes (100g)</li> </ol>	<ol style="list-style-type: none"> <li>1. Medium banana</li> <li>2. Houmous and vegetable sticks</li> <li>3. Cereal bar</li> </ol>
30	<ol style="list-style-type: none"> <li>1. All Bran (40g) with milk</li> <li>2. 2 slices medium toast with peanut butter</li> <li>3. Eggs benedict</li> </ol>	<ol style="list-style-type: none"> <li>1. Tomato soup (1 tin)</li> <li>2. Medium wholegrain roll with sliced turkey and salad</li> <li>3. 3 bean wrap</li> </ol>	<ol style="list-style-type: none"> <li>1. Lasagne (225g) with salad</li> <li>2. Chicken stir fry with egg noodles (80g)</li> <li>3. Baked salmon with small jacket potato and vegetables</li> </ol>	<ol style="list-style-type: none"> <li>1. Coffee &amp; walnut cake (50g)</li> <li>2. Hot cross bun</li> <li>3. 2 scoops vanilla ice cream</li> </ol>
40	<ol style="list-style-type: none"> <li>1. Breakfast pancakes</li> <li>2. 2 Oatibix with milk</li> <li>3. No added sugar muesli (50g) with milk</li> </ol>	<ol style="list-style-type: none"> <li>1. Ham salad sandwich</li> <li>2. Cous cous salad</li> <li>3. 1 tin of mushroom soup with 2 medium slices wholegrain bread</li> </ol>	<ol style="list-style-type: none"> <li>1. Mushroom risotto (240g)</li> <li>2. Chicken &amp; broccoli pasta (340g)</li> <li>3. Beef stew with 2 small dumplings</li> </ol>	<ol style="list-style-type: none"> <li>1. Malt loaf (60g)</li> <li>2. Mince pie (60g)</li> <li>3. Dates (60g)</li> </ol>
50	<ol style="list-style-type: none"> <li>1. 2 slices thick toast with jam</li> <li>2. Large bowl porridge made with milk (350g)</li> <li>3. Croissant with marmalade and glass orange juice</li> </ol>	<ol style="list-style-type: none"> <li>1. Baked beans on toast</li> <li>2. 6 pieces of sushi</li> <li>3. Pasta salad</li> </ol>	<ol style="list-style-type: none"> <li>1. 2 slices deep-pan pizza</li> <li>2. Lentil curry with brown rice (95g)</li> <li>3. Tuna pasta bake (350g)</li> </ol>	<ol style="list-style-type: none"> <li>1. Flapjack (80g)</li> <li>2. Large hot-chocolate drink</li> <li>3. Medium-sized Easter egg (100g)</li> </ol>

## GI AND GL OF COMMON CARBOHYDRATE FOODS

Food type	Glycaemic Index (GI)	Glycaemic Load (GL)
<b>BREAD</b>		
Baguette	95	15
White bread – wheat	70	10
Rye bread – wholemeal	58	8
<b>PASTA/RICE</b>		
Brown rice	55	18
Basmati rice	58	22
White rice	64	23
Pasta – durum wheat	44	21
Pasta – wholewheat	37	16
<b>SWEET FOODS</b>		
Digestive biscuit	59	10
Doughnut	76	17
Scone	92	7
Ice cream	61	8
Mars bar	65	26
<b>BEVERAGES</b>		
Orange juice	50	13
Coca cola	53	14
Tomato juice	38	4
<b>BREAKFAST CEREALS</b>		
All Bran	42	8
Cornflakes	81	21
Muesli	40-66	12

Food type	Glycaemic Index (GI)	Glycaemic Load (GL)
<b>FRUIT</b>		
Apple	38	6
Banana	52	12
Grapes	46	8
Peach	42	5
Pear	38	4
Figs (dried)	61	16
Sultanas	60	25
Strawberries	40	1
<b>LEGUMES</b>		
Baked beans	48	7
Butter beans	31	6
Chick peas	28	8
Kidney beans	28	7
Green lentils	30	5
<b>VEGETABLES</b>		
Peas	48	3
Parsnips	97	12
Baked potato	85	26
Boiled potato	50	12
Mashed potato	74	15
Chips	75	17
Carrots – raw	16	1
Carrots – cooked	58	3
Beetroot	64	5

Type of drink with standard serving size (% alcohol by volume)	Grams of carbohydrate	Units of alcohol
Vodka: 25ml single measure (40%)	0	1
Gin, rum: 50ml double (40%) with slimline mixer	0	2
Cognac: 50ml double measure (40%)	0	2
Pilsner beer: 330ml bottle (5%)	0	2
White wine: 175ml regular glass (12.5%)	5	2
Red wine: 250ml large glass (15%)	5	4
Port, sherry, vermouth: 50ml glass (15–20%)	5	1
Beer: 1 pint (3–4%)	10	2
Lager: 330ml bottle (5%)	10	2
Liqueur: (Baileys Irish Cream, Tia Maria) 50ml	15	1
Stout (Guinness): 1 pint (4%)	15	2
Cider: 1 pint (5%)	20	2½
Bacardi Breezer, Smirnoff Ice: 275ml bottle (5%)	25 – 30	1½
Double Vodka Red Bull	25	2
Vintage cider: 500ml bottle (8%)	40	4
Low-alcohol beer: 330ml bottle (less than 1%)	20	trace
Low-alcohol wine: 175ml glass (less than 1%)	20	trace
Cola, lemonade, fruit juice: 150ml as mixer	15	0
Red Bull: 200ml can	25	0
J20: 330ml bottle	35	0
Mineral water, soda water, slimline or diet drinks	0	0

## DRUGS AVAILABLE TO TREAT DIABETES (IN 2014)

Class of drug	Drug name	Brand name
Biguanide	Metformin	Glucophage
DPP4 inhibitor ('Gliptin')	Alogliptin Linagliptin Saxagliptin Sitagliptin Vildagliptin	Nesina Trajenta Onglyza Januvia Galvus
GLP1-analogue	Exenatide  Liraglutide Lixisenatide	Byetta Bydureon  Victoza Lyxumia
Meglitinide	Nateglinide Repaglinide	Starlix Prandin
Sulfonylurea	Glibenclamide Glimepiride Gliclazide Glipizide Tolbutamide	Daonil Amaryl Diamicron Glucotrol Orinase
SGLT2 inhibitor	Canagliflozin Dapagliflozin	Invokana Forxiga
Thiazolidinedione ('Glitazone')	Pioglitazone	Actos
Alpha-glucosidase inhibitor	Acarbose	Glucobay

**SUGGESTED APPROACHES TO THE USE OF  
MEDICATION IN TYPE 2 DIABETES**

Treatment stage	Drug class	Examples of drug and dose	Notes
1	Lifestyle change		
2	Metformin	Start 500mg once daily, increase gradually to 1g twice daily	If unable to tolerate, try slow-release preparation and/or move to stage 3. Stop during severe illness or if GFR < 30 <sup>s</sup>
3a (If BMI <30, or in BMI>30 if unwilling to use injections) OR	Gliptin	Saxagliptin 5mg* Sitagliptin 100mg**	Add to metformin *2.5mg if GFR <30 **25mg if GFR <30
3b (If BMI > 30)  OR	GLP1 analogue	Exenatide (Byetta) 5mcg twice daily, increasing to 10mcg after 4 weeks Liraglutide (Victoza) 0.6mg once daily increasing to 1.2mg after 2 weeks	Add to metformin

Treatment stage	Drug class	Examples of drug and dose	Notes
3c (if gliptin or GLP1 analogue not suitable or tolerated)	SGLT2 inhibitor	Canagliflozin 100mg, increasing to 300mg once daily Dapagliflozin 10mg daily	Add to metformin
4a (If HbA1c <80 or unwilling to take injections) OR	Sulfonylurea	Glipizide 5mg once daily increasing if necessary to 10mg twice daily. Gliclazide 80mg, increasing to 160mg twice daily	Add to metformin, consider stopping other treatments if no evidence of benefit
4b (If HbA1c >80 or if sulfonylurea ineffective)	Basal insulin	Humulin I, Lantus or Levemir, 10 units once daily, increasing according to blood glucose response	Add to metformin; consider stopping other treatments if no evidence of benefit
5	Mealtime insulin	Humalog or Novorapid, 1-3u per 10g carbohydrate in meals	

*<sup>s</sup>GFR = glomerular filtration rate, a measure of kidney function, assessed by a blood test. The value roughly equates to the percentage of kidney function remaining.*

*Treatment should progress from stage 1 to 5 in a stepwise fashion as described in the text.*

## EXAMPLES OF SICK DAY RULES

Tablet	Dose	Taken for	If I become unwell
Metformin	500mg twice a day	Diabetes	Stop if I have diarrhoea and vomiting
Gliclazide	40mg daily	Diabetes	Check blood sugar levels, may need to increase dose to 80mg (check with doctor)
Ramipril	5mg daily	High blood pressure	Stop if I have diarrhoea and vomiting
Prednisolone	30mg for 5 days	Exacerbation of bronchitis	Increase gliclazide to 80mg twice a day (check with doctor)

<b>Class of drug</b>	<b>Examples</b>	<b>Possible side effects</b>	<b>Notes</b>
<b>ACE inhibitor</b>	Ramipril Perindopril Lisinopril	Cough May worsen kidney function	Kidney function should be checked periodically  Should be stopped during acute illness or dehydration (e.g. diarrhoea and vomiting)
<b>ARB</b>	Candesartan Irbesartan losartan	May worsen kidney function	
<b>Thiazide diuretic</b>	Bendroflumethazide Chlorthalidone	Low sodium level	
<b>Calcium-channel blocker</b>	Amlodipine Felodipine Nifedipine	Ankle swelling	
<b>Alpha-blocker</b>	Doxazosin	Ankle swelling Dizziness on standing	
<b>Beta-blocker</b>	Bisoprolol Carvedilol Atenolol	Slow pulse	

## INFORMATION FOR FRIENDS OR RELATIVES

If you live with, or care for, someone with diabetes, then you will be aware of the many demands that the condition places on that person, and probably on you as well. The aim of this book is to help people with type 2 diabetes take control of their condition more effectively in order to reverse the disease processes that cause diabetes. Now that statement may come as a surprise to you, as it was previously believed that once you had type 2 diabetes you had it for life.

This has now been shown to be untrue.

Rather, it appears that diabetes results from excess fat accumulating in the liver and the pancreas, and that by making changes to the diet this fat can be reduced, thus reversing the disease. In many cases this enables the person with diabetes to control the condition with less medication, and in some cases, the diabetes disappears altogether.

The main problem in type 2 diabetes is that the body cannot use insulin properly. This leads to the pancreas producing extra insulin, resulting in the levels of insulin in the blood rising too high. As insulin is the main 'fat hormone' this leads to more fat being laid down in the internal organs, which makes the problem even worse.

It is known that losing weight and getting more active can help reduce insulin levels. Therefore, the key changes that need to be made are to the diet and to activity levels. Specifically, it is important to reduce the amount of carbohydrate (sugar and starch) in the diet. This is because all carbohydrates cause the level of glucose (sugar) in the blood to rise, and also cause the release of insulin into the bloodstream. Reducing carbohydrates therefore helps directly by keeping the blood glucose level stable, and avoids high insulin levels. Over time, as insulin levels reduce, it will result in the loss of fat from the liver. Insulin can again work more efficiently in controlling sugar levels, which in turn means the body does not release so much of it into the bloodstream, and so on, leading to a virtuous circle of positive health benefits.

So what does this mean on a day-to-day basis? Put simply, it means reducing the amount of bread, potatoes, rice, pasta, cereals and sweet foods and drinks (including fruit juice and some fruit) in the diet. So the person with diabetes is going to be helped by having only very small portions of these foods, and will benefit from having some meals with none of these foods in them at all. I realise this may be very different from what you were told in the past – that people with diabetes should eat starchy carbohydrates with every meal. Quite simply that approach has not worked, whereas more and more people, including many that I have treated, have found that restricting carbohydrates really does work.

Note that I am saying, 'restrict carbohydrates'. I certainly do not suggest stopping them altogether. However, a breakfast based on eggs or plain yoghurt is better than cereals. A salad or soup with or without a small piece of bread is better than sandwiches or a baguette for lunch. And for other meals, keeping the starchy food (potato, pasta or rice) to a small portion of the plate and using lots of leafy vegetables will certainly help.

The other change that will help is increasing physical activity. This does not necessarily mean going to the gym regularly, but can consist of trying to use the car less, and walking or using public transport more. It can mean going for a walk every day, and, importantly, avoiding sitting down continuously for long periods of time (e.g. in front of the television or at a computer). Even getting up and walking around for a few minutes every hour or so will help.

I have noticed that people seem to do very well when their partner or a close friend supports them, especially when they join in making some of the same changes. In many cases their own health improves as well and that can't be a bad thing! I am sure that the person who asked you to read this will be very grateful for your help in supporting them in making these changes. If you are interested, you will find more detailed information in chapters 6 to 12.

**My goal is:** \_\_\_\_\_

**In order to do this I will aim to:**

The Change	How important is it for me to do it? (0–10 scale)	How confident am I that I can do it? (0–10 scale)	Sum of both scores

**My goal is: to reduce my blood glucose levels**

**In order to do this I will aim to:**

<b>Change</b>	<b>How important is it for me to do it? (0–10 scale)</b>	<b>How confident am I that I can do it? (0–10 scale)</b>	<b>Sum of both scores</b>
Stop drinking fruit juice	10	10	20
Walk round the block five times a week	10	7	17
Go to the gym	7	3	10
Walk to work	7	6	13
Stop eating breakfast cereals	8	6	14
Eat less bread	9	8	17
Eat more vegetables	9	8	17

<b>Change</b>	<b>How will I achieve this?</b>	<b>When will I start</b>
Stop drinking fruit juice	Stop buying it; tell everyone I no longer drink it	Today
Walk round the block five times a week	Go after evening meal	Next week
Eat more vegetables	Buy frozen green beans, and fresh carrots	Today

# USEFUL WEBSITES

## **Diabetes.co.uk**

Diabetes.co.uk is the UK's largest and fastest-growing community website and forum for people with diabetes:

Get support at [www.diabetes.co.uk/forum](http://www.diabetes.co.uk/forum)

Like us on Facebook [www.facebook.com/Diabetes.co.uk](http://www.facebook.com/Diabetes.co.uk)

Sign up for FREE Newsletter [www.diabetes.co.uk/welcome](http://www.diabetes.co.uk/welcome)

Buy diabetes products and accessories online [www.diabetes.co.uk/shop](http://www.diabetes.co.uk/shop)

## **Diabetes Support Forum UK**

The diabetes-support.org.uk forum is open to ALL people who want to discuss diabetes, and everyone is very welcome, but our focus is mainly on the UK NHS system.

[www.diabetes-support.org.uk](http://www.diabetes-support.org.uk)

## **International Diabetes Federation**

The global advocate for people with diabetes. The mission of IDF is to promote diabetes care, prevention and a cure worldwide.

[www.idf.org](http://www.idf.org)

## **Diabetes UK**

The UK's leading diabetes charity. They care for, connect with and campaign on behalf of all people affected by and at risk of diabetes in local communities across the UK.

[www.diabetes.org.uk](http://www.diabetes.org.uk)

## **NHS Choices**

Information from the National Health Service on conditions, treatments, local services and healthy living.

[www.nhs.uk/Conditions/Diabetes/Pages/Diabetes.aspx](http://www.nhs.uk/Conditions/Diabetes/Pages/Diabetes.aspx)

## **Public Library of Science**

Non-profit organization of scientists committed to making the world's scientific and medical literature freely accessible to scientists and to the public.

[www.plos.org](http://www.plos.org)

## **Diabetes Community**

An international community for people with diabetes.

[www.diabetescommunity.com](http://www.diabetescommunity.com)

## **Glycaemic index**

[www.glycemicindex.com](http://www.glycemicindex.com)

## **Carbs and Cals**

Make carb and calorie counting easy to understand and accessible to everyone.

[www.carbsandcals.com](http://www.carbsandcals.com)

## **Carbohydrate counting programme**

Developed by the Bournemouth Diabetes and Endocrine Centre – mainly for people on insulin.

[www.bdec-e-learning.com](http://www.bdec-e-learning.com)

## **The NHS Diabetic Eye Screening Programme (NDESP)**

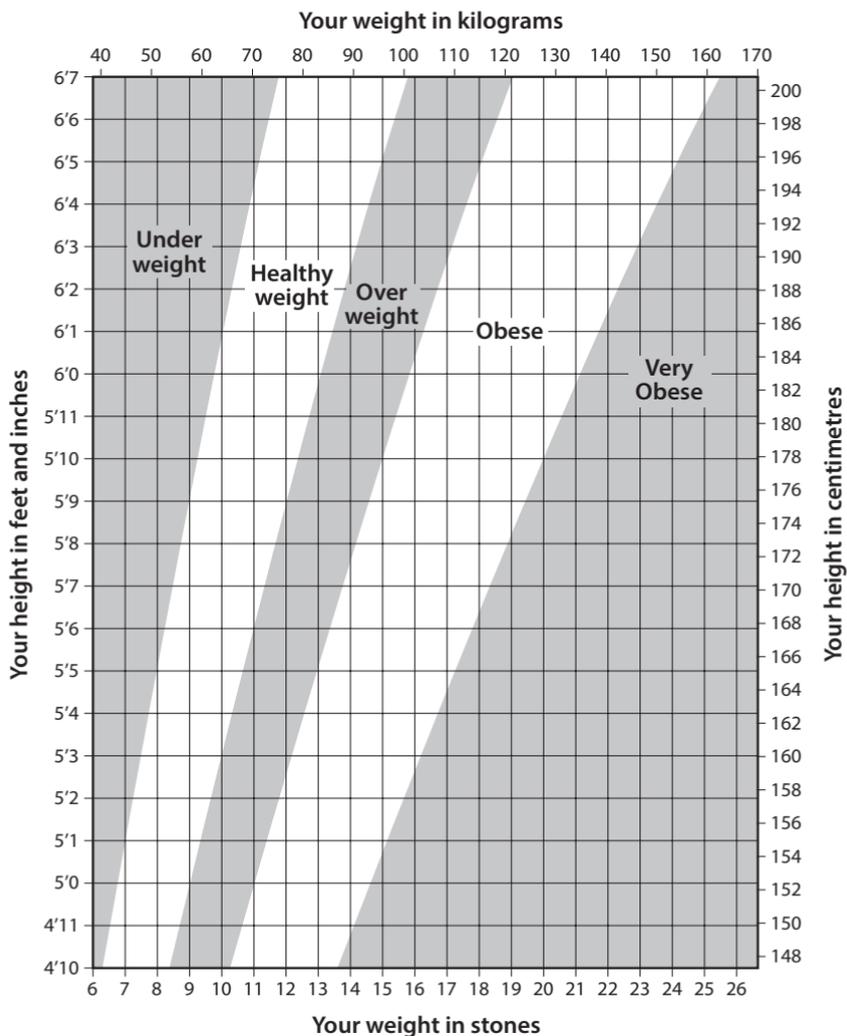
The NHS Diabetic Eye Screening Programme (NDESP) aims to reduce the risk of sight loss among people with diabetes by the early detection and treatment, if needed, of sight-threatening retinopathy.

[diabeticeye.screening.nhs.uk](http://diabeticeye.screening.nhs.uk)

## **Patient Education programmes**

[www.nhs.uk/Livewell/Diabetes/Pages/Diabeteseducation.aspx](http://www.nhs.uk/Livewell/Diabetes/Pages/Diabeteseducation.aspx)

# BODY MASS INDEX GUIDANCE CHART





# GLOSSARY

**ACE inhibitors:** ACE inhibitors are a medication mainly used to lower blood pressure and the resulting strain on the heart and kidneys. ACE stands for angiotensin converting enzyme. Angiotensin is a chemical that can make blood vessels narrower to raise blood pressure.

**Albuminuria:** Damaged kidneys may start to leak protein into the urine. Albumin is a small, abundant protein in the blood that passes through the kidney filter into the urine more easily than other proteins. In people newly diagnosed with type 2 diabetes the kidneys may already show signs of small amounts of protein leakage called microalbuminuria. This may be because of diabetes or from other diseases seen in conjunction with diabetes such as high blood pressure. Protein in the urine increases the risk of developing kidney disease. It also means that the person is at a particularly high risk of the development of cardiovascular disease.

**Alpha cells:** Alpha cells are found in the islets of Langerhans in the pancreas. They produce and release glucagon.

**Angiotensin II receptor antagonists:** A class of drugs that work in a similar way to ACE inhibitors to reduce blood pressure. Angiotensin II receptor antagonists, also called angiotensin receptor blockers (ARBs), work by blocking the formation of angiotensin II, a substance that makes blood vessels narrower.

**Antibodies:** Proteins produced in the body that protect it from foreign substances such as bacteria or viruses.

**Beta cells:** Beta cells are found in the islets of Langerhans in the pancreas. They produce and release insulin.

**Blood pressure:** Blood pressure is the amount of force that is exerted by blood on the blood vessels. It is measured in millimetres of mercury (written as mm Hg). When blood pressure is taken the measurement is given as two numbers, for example 120/80mm Hg. The first number is called the systolic pressure and is the measure of pressure in the arteries when the heart beats and pushes more blood into the arteries. The second number, called the diastolic pressure, is the pressure in the arteries when the heart rests between beats. The ideal blood pressure for people with diabetes is less than 140/80.

**Carbohydrate:** A carbohydrate is a large organic molecule consisting of carbon (C), hydrogen (H) and oxygen (O) atoms. The term is most common in biochemistry, where it is synonymous with saccharide (sugar). The lighter versions of the molecules (monosaccharides and disaccharides) are commonly referred to as sugars. Carbohydrates perform numerous roles in living organisms including the storage of energy (e.g. starch and glycogen) and in an informal context, the term carbohydrate often means any food that is particularly rich in the complex carbohydrate starch (such as cereals, bread and pasta) or simple carbohydrates such as table sugar.

**Cardiovascular disease (CVD):** Cardiovascular diseases are defined as diseases and injuries of the circulatory system: the heart, the blood vessels of the heart and the system of blood vessels throughout the body and to (and in) the brain. Stroke is the result of a blood flow problem within, or leading to, the brain and is considered a form of CVD.

**Cholesterol:** A waxy substance made by the liver that is an essential part of cell walls and nerves. Cholesterol plays an important role in body functions such as digestion and hormone production. In addition to being produced by the body cholesterol comes from animal foods that we eat. Too much cholesterol in the blood causes an increase in particles called LDL ('bad' cholesterol), which increases the build-up of plaque in the artery walls and leads to atherosclerosis.

**Diabetes complications:** Diabetes complications are chronic conditions caused by diabetes. They include retinopathy (eye disease), nephropathy (kidney disease), neuropathy (nerve disease), cardiovascular disease (disease of the circulatory system), foot ulceration and amputation.

**Diabetes mellitus (DM):** Diabetes mellitus is a chronic condition that arises when the pancreas does not produce enough insulin or when the body cannot effectively use the insulin produced. There are two basic forms of diabetes: type 1 and type 2. People with type 1 diabetes do not produce enough insulin. People with type 2 diabetes produce insulin but cannot use it effectively.

**Diabetic foot:** A foot that exhibits any pathology that results directly from diabetes or complications of diabetes.

**Diabetic ketoacidosis (DKA):** DKA happens when there is not enough insulin and cells become starved for sugars. An alternative source of energy called ketones becomes activated. The system creates a build-up of acids and can lead to coma and even death.

**Epidemiology:** The study of the occurrence and distribution of health-related states or events in specific populations, including the study of the determinants influencing such states, and the applications of this knowledge to the control of health problems.

**Fats:** Substances that help the body utilise some vitamins and help keep the skin healthy. They are also the main way the body stores energy. In food there are many types of fats: saturated, unsaturated, polyunsaturated, monounsaturated and trans fats.

**Fructose:** A type of sugar found in many fruits and vegetables and in honey.

**Gestational diabetes mellitus (GDM):** Diabetes first diagnosed during pregnancy which resolves after childbirth.

**Glucagon:** A hormone secreted by the pancreas; stimulates increases in blood sugar levels in the blood (thus opposing the action of insulin).

**Glucose:** Also called dextrose. The main sugar the body produces from proteins, fats and carbohydrates. Glucose is the major source of energy for living cells and is carried to each cell through the bloodstream. However, the cells cannot use glucose without the help of insulin.

**Glycaemic index (GI):** Glycaemic index is a measure of how quickly blood glucose rises after eating a particular type of food. Glucose has a glycaemic index of 100. The effects that different foods have on blood glucose levels vary considerably. The glycaemic index estimates how much each gram of available carbohydrate (total carbohydrate minus fibre) in a food raises a person's blood glucose level following consumption of the food, relative to consumption of pure glucose.

**Glycogen:** Glycogen is a long molecule of linked-together glucose units (polysaccharides) that acts as a form of energy storage in animals. This polysaccharide structure represents the main storage form of glucose in the body and is analogous to starch, the energy storage molecule found in plants.

In humans, glycogen is made and stored primarily in the cells of the liver and the muscles, and functions as the secondary long-term energy storage. Muscle glycogen is converted into glucose by muscle cells, and liver glycogen converts to glucose for use throughout the body. As an energy reserve, it can be quickly drawn upon to meet a sudden need for glucose.

**Glycosylated haemoglobin (HbA1c):** See below.

**HbA1c (glycated haemoglobin test):** Haemoglobin is a protein in red blood cells that comprises globin and iron-containing haem, which transports oxygen from the lungs to the tissues of the body. Glycosylated haemoglobin is haemoglobin to which glucose is chemically bound. It is tested to monitor long-term control of diabetes. The level of glycosylated haemoglobin is increased in the red blood cells of persons with poorly controlled diabetes.

**Hormone:** A chemical substance secreted by an endocrine gland or group of endocrine cells that acts to control or regulate specific physiological processes, including growth, metabolism, and reproduction. Most hormones are secreted by endocrine cells in one part of the body and then transported by the blood to their target site of action in another part, though some hormones act only in the region in which they are secreted.

**Hyperglycaemia:** A raised level of glucose in the blood, a sign that diabetes is out of control. It occurs when the body does not have enough insulin or cannot use the insulin it does have to turn glucose into energy. Signs of hyperglycaemia are of excessive thirst, dry mouth and a need to urinate often.

**Hypertension:** Abnormally high blood pressure, especially in the arteries. Often referred to as high blood pressure. High blood pressure increases the risk for heart attack and stroke.

**Hypoglycaemia:** Too low a level of glucose in the blood. This occurs when a person with diabetes has injected too much insulin, eaten too little food or has exercised without extra food. A person with hypoglycaemia may feel nervous, shaky, weak, sweaty and have a headache, blurred vision and hunger.

**Impaired fasting glucose (IFG):** Impaired fasting glucose is a category of higher than normal blood glucose, but below the diagnostic threshold for diabetes after fasting (typically after an overnight fast). People with IFG are at an increased risk of developing diabetes.

**Impaired glucose tolerance (IGT):** Impaired glucose tolerance (IGT) is a category of higher than normal blood glucose but below the diagnostic threshold for diabetes, after ingesting a standard amount of glucose in an oral glucose tolerance test. People with IGT are at an increased risk of developing diabetes.

**Impotence:** Also called erectile dysfunction and is a persistent inability of the penis to become erect or stay erect. Some men may become impotent after having diabetes for a long time because nerves and blood vessels to the penis become damaged.

**Incidence:** It indicates how often a disease occurs. More precisely, it corresponds to the number of new cases of a disease among certain groups of people for a certain period of time.

**Insulin:** A hormone whose main action is to enable the body cells to absorb glucose from the blood and use it as energy. Insulin is produced by the beta cells of the islets of Langerhans in the pancreas.

**Insulin resistance:** Insulin resistance (IR) is the condition in which cells fail to respond to the normal actions of the hormone insulin. The body produces insulin, but the cells in the body become resistant to insulin and are unable to use it as effectively, leading to hyperglycaemia. Beta cells in the pancreas subsequently increase their production of insulin.

**Islets of Langerhans:** Named after the German anatomist, Paul Langerhans, who discovered them in 1869, these clusters of cells are located in the pancreas and contain its endocrine (hormone-producing) cells. They make up approximately 2 per cent of the pancreas.

**Nephropathy:** Damage to small blood vessels in the kidney in a person with diabetes, leading to impaired kidney function.

**Neuropathy:** Damage to nerves due to diabetes, causing a variety of symptoms including numbness or tingling in the feet and erectile dysfunction.

**Obesity:** The term used to describe excess body fat. It is defined in terms of an individual's weight and height or his/her body mass index (BMI). A BMI over 30 is classified as being obese. Obesity makes your body less sensitive to insulin's action and extra body fat is thought to be a risk factor for diabetes.

**Pancreas:** The pancreas is a glandular organ situated behind the lower part of the stomach and contains endocrine cells that produce the critical hormones insulin and glucagon and also has a digestive role.

**Protein:** Proteins are one of three main types of food and are made of amino acids, which are called the building blocks of the cells. All cells need protein to grow and to repair themselves. Protein is found in many foods such as meat, fish, poultry, eggs, legumes, and dairy products.

**Randomised controlled trials:** These are trials designed to test whether a treatment is effective. Study subjects are split into groups. One group is given the treatment being tested while another group (called the comparison or control group) is given an alternative treatment, which could be a different type of drug or a dummy treatment (a placebo). The results are then compared.

**Renal:** Relating to the kidneys.

**Retina:** Part of the back lining of the eye that senses light and is fed by many small blood vessels that can be damaged by diabetes.

**Retinopathy:** Retinopathy is a disease of the retina of the eye, which may cause visual impairment or blindness.

**Starch:** Starch is a carbohydrate consisting of a large number of glucose units joined together. A polysaccharide, it is produced by most green plants as an energy store. It is the most common carbohydrate in human diets and is contained in large amounts in such staple foods as potatoes, wheat, maize (corn) and rice.

**Stroke:** A sudden loss of function in part of the brain as a result of the interruption of its blood supply by a blocked or burst artery.

**Sulfonylureas:** A type of medication that helps lower the level of sugar in the blood by stimulating the pancreas to produce more insulin.

**Triglyceride:** Fats carried in the blood and derived from the foods we eat. Most of the fats we eat, including butter, margarines and oils, are in triglyceride form. An excess of triglycerides is stored in fat cells throughout the body. The body needs insulin to remove this type of fat from the blood.

**Type 1 diabetes:** Type 1 diabetes mellitus develops most frequently in children and adolescents. About 10 per cent of people with diabetes have type 1 diabetes. The symptoms of type 1 diabetes vary in intensity and include excessive thirst, excessive passing of urine, weight loss and lack of energy. Insulin is a life-sustaining medication for people with type 1 diabetes and they require daily injections for survival.

**Type 2 diabetes:** Type 2 diabetes mellitus is much more common than type 1 diabetes and occurs mainly in adults, although it is now seen increasingly in children and adolescents. The symptoms of type 2 diabetes are usually less marked than in type 1 diabetes. Some people with type 2, however, have no early symptoms and are only diagnosed several years after the onset of the condition when various diabetic complications are already present. Recent scientific research has shown that fat deposited in the liver and pancreas may be impairing the functions of these organs and causing type 2 diabetes. Reversal (partial or complete) of the condition is now thought possible through a combination of calorie restriction and increased physical activity.