by Jane Diggle

What and why

- Dietary interventions are effective for improving glycaemic control, supporting weight loss and lowering cardiovascular risk. There is insufficient evidence to support any specific dietary intervention.
- One size does not fit all when it comes to diets and dietary advice.
- Supporting people to make small, manageable changes is likely to be more successful than attempts to radically alter diet.
- Dictating to a person what food to eat rarely helps, but helping them to understand what constitutes a healthy diet in the context of having diabetes is essential.

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What dietary advice do current guidelines recommend for people with type 2 diabetes?

According to NICE (NG 28)[1], dietary advice should be an integral and ongoing part of every diabetes management plan. The approach should be individualised and sensitive to the person's needs, culture, beliefs and willingness to make lifestyle changes. Its recommendations for adults with type 2 diabetes are the same as for the general population: high-fibre, low-glycaemic-index sources of carbohydrate in the diet (such as fruit, vegetables, wholegrains and pulses); the inclusion of low-fat dairy products and oily fish; and control of the intake of foods containing saturated and trans fatty acids.

In March 2018, Diabetes UK published an updated *Evidence-based nutrition guidelines for the prevention and management of diabetes*[2]. The key recommendations are to:

- Prioritise sustained weight loss of at least 5% in overweight people by reducing calorie (energy) intake and increasing energy expenditure.
- Aim for a Mediterranean-style diet or equivalent healthy eating pattern:
  - Decrease salt intake (<6 g/day).
  - Eat two portions of oily fish each week.
  - Eat more wholegrains, fruit and vegetables, fish, nuts and legumes (pulses).
  - Eat less red and processed meat, refined carbohydrates and sugar-sweetened beverages.
  - Replace saturated fats (SFAs) with unsaturated fats, and limit intakes of trans fatty acids (TFAs).
  - Limit alcohol intake to <14 units/week.
- Offer individualised education to support people to identify and quantify their dietary carbohydrate intake, encourage low glycaemic index (GI) foods and consider reducing the total amount of carbohydrates.
- Aim for at least 150 minutes/week of moderate to vigorous physical activity, over at least 3 days.

What proportion of macronutrients is ideal for people with type 2 diabetes?

The ideal proportion of macronutrients to recommend for optimal glycaemic control for type 2 diabetes is not clear, but total energy intake, weight loss and overall diet quality are significant considerations[2].

Reference intakes (RIs) are a means of communicating maximum recommended nutrient intake to the public. The values for the nutrients are all maximums, **not targets**. Type 2 diabetes is a condition in which there is an inability to metabolise carbohydrates effectively, so there are likely to be benefits in reducing total carbohydrate intake below the level shown in the table below.

Energy or nutrient	Reference intake
Total fat	70 g
Sugars	90 g
Saturates	20 g
Salt	6 g
Protein	50 g
Energy	8400kJ / 2000kcal
Carbohydrates	260 g

What is a carbohydrate?

Carbohydrates exist in a number of forms:

Starch

- Starchy foods include bread, pasta, potatoes, cereals, rice and couscous.

Sugars

- *Natural sugars* are found in whole fruits (fructose), milk and milk products (lactose).
- *Free sugars* are added to sweets, chocolate, sugary beverages and desserts, but also occur naturally in fruit juices, fruit concentrates, syrups and honey.

Fibre

- Fibre is indigestible. There are two main types:
  - *Insoluble fibre* is found in wholemeal bread, brown rice and wholegrain cereals. It is beneficial for digestive health.
  - *Soluble fibre* occurs in fruit and vegetables, pulses, oats and barley. It may help to reduce cholesterol levels and slows the digestion of carbohydrates and the absorption of glucose.

What happens to carbohydrates?

Digestible carbohydrates are broken down into glucose and absorbed into the bloodstream. Insulin enables glucose to move into cells throughout the body to provide energy to fuel all functions. Unused glucose can be converted to glycogen and stored (mostly in the liver and muscles).

However, if more glucose is consumed than is utilised and stored in this way, the excess is converted to fat for long-term storage of energy. Fat accumulates in the liver causing insulin resistance and reducing insulin's suppression of hepatic glucose output. Blood glucose levels rise, stimulating basal insulin secretion (and promoting further fat storage) until a point is reached where the pancreas is unable to secrete sufficient insulin and type 2 diabetes develops[3].

References

[1]NICE (2015) *Type 2 diabetes in adults: management* (NG28). NICE, London. Available at: https://www.nice.org.uk/guidance/ng28

[2]Diabetes UK (2018) *Evidence-based nutrition guidelines for the prevention and management of diabetes.* DUK, London. Available at: https://bit.ly/2xR60mp

[3]Taylor R (2013) Reversing the twin cycles of Type 2 diabetes. *Diabet Med* **30**: 267–75

[4]Institute of Medicine of the National Academies (2005) *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids.* National Academies, Washington, DC, USA: p. 275

[5]Feinman RD et al (2015) Dietary carbohydrate restriction as the first approach in diabetes management: critical review and evidence base. *Nutrition* **31**: 1–13

How much carbohydrate is needed in the diet?

"The lower limit of dietary carbohydrate compatible with life apparently is zero…"[4]

A misconception is that the brain and central nervous system require at least 130 g of carbohydrate per day to function effectively. The brain does prefer glucose from the diet as the primary source of energy but, where dietary carbohydrate intake is sufficiently restricted, glucose can be derived from the breakdown of glycogen as well as by synthesis from amino acids (protein) and glycerol (fat).

There is no robust evidence to recommend an ideal amount of carbohydrate for a person with diabetes.

The amount of carbohydrate a person needs to eat will vary between individuals and will be influenced by several factors, including activity levels.

Diabetes UK suggests that it may help to:

- Estimate the amounts of carbohydrate you are eating.
- Reduce the amounts of carbohydrate you eat.
- Choose healthier sources.
- Spread your intake through the day.[2]

What constitutes a little and a lot?

Table 1 (below) illustrates a consensus definition of different levels of dietary carbohydrate[5].

	Carbohydrate (g/day)	Carbohydrate (% of energy)*
Very low carbohydrate	20–50	6–10
Low carbohydrate	<130	<26
Moderate carbohydrate	130–225	26–45
High carbohydrate	>225	>45

*Based on a 2000-kcal diet.

Not all carbohydrates have the same effect

Carbohydrate sources are digested and absorbed at different rates. The glycaemic index (GI) indicates how quickly certain foods raise blood glucose levels compared to glucose, which has a value of 100.

- Sweet, sugary foods have a higher GI than starchy foods and individuals with diabetes may opt for lower GI foods.
- However, large portions of starchy carbohydrates (which may have a low GI) can also lead to a significant rise in blood glucose. Glycaemic load (GL) takes account of this (by measuring the carbohydrate content in grammes multiplied by the GI and divided by 100).

For example, one tablespoon of honey has a high GI of 87 but a GL of only 3, whereas a cup of dried apricots has a low GI of 23 but a high GL of 23.

GI and GL values are commonly interpreted as follows:

Table 2.

Glycaemic index (GI)	Glycaemic load (GL)
Low: <55	Low: <10
Medium: 56–69	Medium: 11–19
High: >70	High: >20

The World Health Organization (WHO) strongly recommends **reducing intake of free sugars to <10% of total calorie intake** (about 12 teaspoons/day). The traffic light system on food and drinks labels can help consumers to identify the sugar content.

DRINKS	LOW per 100 mL	MEDIUM per 100 mL	HIGH per 100 mL
Sugars	<2.5 g	2.5–11.25 g	11.25 g

FOOD	LOW per 100 g Less than...	MEDIUM per 100 g	HIGH per 100 g More than...	HIGH per Portion More than...
Sugars	5 g	5 g–22.5 g	22.5 g	27 g

Figure 1. Traffic-light labelling system for drink (above) and food (below).

Top tips for discussing carbohydrates with patients

Explain

- ❑ What a carbohydrate is (give food examples) and that carbohydrates are broken down into glucose (the body's fuel).
- ❑ That excessive consumption of carbohydrate will result in excess glucose being converted to fat and stored (especially around the waist, and in the liver and pancreas). This will eventually impair the body's ability to regulate blood glucose levels.
- ❑ There is a causal link between excessive weight gain and type 2 diabetes. Achieving a 10–15-kg weight loss over 2–3 months, and maintaining that loss, can result in remission. Refer to local pathways for support.

Describe

- ❑ The different types of carbohydrate and the impact they have on blood glucose levels.
- ❑ What is a little and what is a lot of carbohydrate (see ***Table 1*** above).
- ❑ Why all carbohydrates are NOT equal and that some have greater impact than others (whole versus refined [processed] carbohydrates).

See ***Table 2*** and ***Figure 1***, and refer to NICE-endorsed infographics (see **Useful resources** inset below).

Encourage individuals to

- ❑ Look at food labels (including the traffic light system [use ***Figure 1*** to assist interpretation], and refer to the RI table [overleaf]) and use resources, such as *Carbs & Cals*, to calculate total carbohydrate intake. (In the author's experience, this far exceeds the RI and reducing it can have a significant impact on both weight and glycaemic control).
- ❑ Consider the total number of calories consumed, try to reduce portion sizes, opt for "real foods" (rather than highly refined, processed foods) and resist the temptation to keep eating little and often (this tends to result in excessive calorie intake).

Useful resources

Carbs & Cals: www.carbsandcals.com

NICE-endorsed infographics explaining how carbohydrates in foods may affect blood glucose: www.phcuk.org/nice