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# Food-based dietary guidelines for the patient with diabetes

***Over the past decade, more and more evidence has accumulated to indicate that rigid, prohibitive 'diabetic diets' are not the answer.***

Type 2 (non-insulin-dependent) diabetes currently affects 1.5 million South Africans (5 - 10% of the adult population).[1] Worldwide the prevalence of diabetes is predicted to double from 110 million during the 1990s to 221 million by 2010.[2]

## DIETARY MANAGEMENT

Simply stated, there is no such thing as a 'diabetic diet'. However, dietary management is an integral part of the management of diabetes and has a vital role in helping people with diabetes to achieve and maintain optimal glycaemic control, the benefits of which have been demonstrated in several large-scale studies.[3-5]

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The aims of dietary management are complementary to those of medical treatment for diabetes, namely:[6,7]

- maintaining blood glucose levels within/as close to the normal range as is safely possible in order to reduce or prevent the risk of diabetic complications, together with optimal nutrition, activity and appropriate medication
- minimising the risk of hypoglycaemia for those taking insulin or oral hypoglycaemic agents
- adjusting energy intake to achieve reasonable weight, normal growth and development
- achieving blood pressure and lipid levels that reduce the risk for micro- and macrovascular disease or complications
- reducing the risk of long-term complications (obesity, dyslipidaemia, cardiovascular disease, hypertension and nephropathy)
- maintaining quality of life
- addressing individual nutritional needs, taking into consideration personal, ethnic and cultural preferences and lifestyle while respecting the individual's wishes and willingness to change.

## NUTRITIONAL RECOMMENDATIONS

In the pre-insulin era (before 1921), diabetics were placed on near-starvation diets, with a maximum allowance of 10 g carbohydrate per day and minimum intakes of protein and fat, to prevent the accumulation of excess blood glucose. Since then, nutritional recommendations have evolved dramatically (Table I), with calories from fat decreasing from 70% to a moderate 30%, and calories from carbohydrate increasing from 20% to 60%.[7]

Following the discovery of insulin in 1921, total energy intake was substantially increased. However, carbohydrate intake was still allowed only to the extent of preventing ketosis, and sugar was an item to

*Table I.* **Historical perspective of nutritional recommendations for diabetes mellitus[7]**

| Year | Distribution of calories: % carbohydrates | % protein | % fat |
|---|---|---|---|
| Before 1921 | | Starvation diets | |
| 1921 | 20 | 10 | 70 |
| 1950 | 40 | 20 | 40 |
| 1971 | 45 | 20 | 35 |
| 1986 | Up to 60 | 12 - 20 | < 30 |
| 1994 | * | 10 - 20 | * † |

*Based on nutritional assessment and treatment goals outlined by the dietitian/physician.
†Less than 10% of calories from saturated fats.

be avoided. It was only by the mid-1960s that the emphasis on carbohydrate restriction began to fall (with a maximum intake of 150 g carbohydrate permitted daily), and it became obvious that the recommended diet was too high in fat. This was the beginning of the high-carbohydrate, high-fibre, low-fat 'diabetic diet' of the 1970s and 1980s, where a system of carbohydrate equivalents (exchanges) was used to match carbohydrate consumption and the medication regimen.[8]

Since the 1990s the concept of a 'diabetic diet' has slowly been replaced with that of a meal plan compiled according to a dietary prescription based on individual nutrition assessment and treatment goals and outcomes. This requires an ongoing, integrated, comprehensive, multiclinician approach.[7]

Many countries have published nutritional recommendations for diabetes, which are used to compile individualised dietary prescriptions. Recent emphasis on evidence-based practice has resulted in the reassessment of previous proposals and many countries are currently revising their nutritional recommendations for diabetes. These recommendations reflect a general consensus between countries about suitable nutritional recommendations for people with diabetes, most of which are similar to those for the promotion of good health in the general population (Table II).

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## MAIN DIETARY PRINCIPLES

While it is recognised that a registered dietitian is a pivotal team member in integrating nutrition therapy into diabetes management and education, all team members must be knowledgeable about the latest evidence-based principles and recommendations for diabetes nutrition. The following summary highlights the key nutritional recommendations (based on expert consensus and supportive evidence from multiple, well-conducted studies) for the management of diabetes, a detailed review of which is available in the literature.[9,10]

### Carbohydrate

- Carbohydrate and mono-unsaturated fat together should provide 60 - 70% of energy intake. However, the individual's metabolic profile and need for weight loss should be considered when determining the monounsaturated fat content of the diet.
- Foods containing carbohydrate from whole-grains, fruits, vegetables and low-fat milk are important components and should be included in a healthy diet.
- The total amount of carbohydrate in meals and snacks is more important than the source or type.
- Because sucrose does not increase glycaemia to a greater extent than isocaloric amounts of starch, sucrose and sucrose-containing foods do not need to be restricted by people with diabetes. However, sucrose and sucrose-containing food should be substituted for other carbohydrate sources or, if added, be covered with insulin or other glucose-lowering medication.

***Because sucrose does not increase glycaemia to a greater extent than isocaloric amounts of starch, sucrose and sucrose-containing foods do not need to be restricted by people with diabetes.***

*Table II.* **Comparison of nutritional recommendations for diabetes mellitus: RSA,[26] USA[7] and UK[27]**

| Advice | RSA | USA | UK |
|---|---|---|---|
| Energy | Achieve and maintain a reasonable weight | Maintain or attain reasonable weight | Aim for BMI 19 - 25 kg/m$^2$ |
| Protein | 10 - 20% TE, from a variety of foods (0.8 g/kg/day if any nephropathy present) | 15 - 20% TE, from a variety of foods (0.8 g/kg/day if any nephropathy present) | 10 - 20% TE (0.7 - 9 g/kg/day if any nephropathy present) |
| Total fat | < 30% TE (adults)/ < 40% TE (children) | < 30% TE (older than 2 years) | < 30% TE |
| Saturated fat | < 10% TE | < 10% TE | < 10% TE |
| Cholesterol | | < 300 mg/day | |
| Carbohydrate | 50 - 65% TE, from a variety of foods | 60 - 70% (together with monounsaturated fat) | 50 - 60% TE, especially those rich in soluble fibre or with a low GI |
| Sucrose | Limited amounts, as part of a balanced diet | To be substituted for other carbohydrate sources | < 10% TE; must not replace foods rich in fibre |
| Fibre | 3 g/1 000 kJ, from a variety of foods | 20 - 35 g/day, from a variety of foods | Emphasis on sources of soluble fibre |
| Sodium | | < 2 400 mg/day | |
| Alcohol | 10% TE, ingested with a meal (unless contraindicated, e.g. pregnancy) | 1 - 2 alcoholic beverages/ day (abstain during pregnancy or other medical complications) | 1 - 2 alcoholic beverages/day ingested with carbohydrate-rich foods |
| Vitamin and mineral supplementation | Advised for 'at risk' groups | Not needed with adequate diet intake | Not needed with adequate diet intake |
| Non-nutritive sweeteners | Limited amounts allowed, but more research needed to determine long-term effects | Approved by FDA: saccharin, aspartame, acesulfame K, sucralose | Saccharin, cyclamate aspartame, alitame, sucralose |
| 'Diabetic' products | Not essential and to be used with discretion | | Not essential |
| Exercise | Regular; monitor blood glucose levels before, during and after | An increase in physical activity is recommended | Physical activity may be needed to achieve acceptable BMI |
| Meals | Minimum 3/day; must correlate with peak action of medication | Eat at consistent times synchronised with medication | |

TE = total energy; BMI = body mass index; GI = glycaemic index; FDA = Food and Drug Administration.

- Non-nutritive sweeteners are safe when consumed within acceptable daily intake (ADI) levels as established by the Food and Drug Administration (FDA).

### Protein

- There is no evidence to suggest that usual protein intake (15 - 20% of total daily energy) should be modified if renal function is normal.
- The long-term effects of diets high in protein and low in carbohydrates are unknown. Although such diets may produce short-term weight loss and improved glycaemia, it has not been established that weight loss is maintained in the long term. The long-term effect of such diets on low-density lipoprotein (LDL) cholesterol is also a concern.

### Dietary fats

- In total, < 10% of energy intake should be derived from saturated fats. Some individuals (i.e. those with LDL cholesterol of 100 mg/dl) may benefit from lowering saturated fat intake to < 7% of energy intake.
- Dietary cholesterol intake should be < 300 mg/day. Some individuals (i.e. those with LDL cholesterol of 100 mg/dl) may benefit from lowering dietary cholesterol to < 200 mg/day.

### Micronutrients

There is no clear evidence of benefit from vitamin or mineral supplementation in people with diabetes

without underlying deficiencies. Exceptions include folate for prevention of birth defects and calcium for prevention of bone disease.

### Alcohol

- People with diabetes who choose to drink alcohol, should limit daily intake to one drink for adult women and two drinks for adult men. One drink is defined as 360 ml beer, 150 ml wine or 45 ml distilled spirits.
- Alcohol should be consumed with food to reduce the risk of hypoglycaemia.

### Energy balance and obesity

- Reduced energy intake and modest weight loss improve insulin resistance and glycaemia in the short term.
- Structured programmes emphasising lifestyle changes including education, reduced fat (< 30% of daily energy) and energy intake, regular physical activity, and regular participant contact, can produce long-term weight loss in the order of 5 - 7% of starting weight.
- Exercise and behaviour modification are most useful as adjuncts to other weight-loss strategies. Exercise is helpful in maintenance of weight loss.
- Standard weight reduction diets, when used alone, are unlikely to produce long-term weight loss. Structured, intensive lifestyle programmes are necessary.

### Children and adolescents

- Nutrient requirements for children and adolescents with type 1 or type 2 diabetes appear to be similar to those for non-diabetic children and adolescents of the same age.
- Individualised food/meal plans and intensive insulin regimens can provide flexibility for children and adolescents with diabetes to accommodate irregular meal times and schedules, varying appetites, and varying activity levels.

### Pregnancy and lactation

- Nutrition requirements during pregnancy and lactation are similar for women with and without diabetes.
- Medical nutrition therapy for gestational diabetes focuses on food choices for appropriate weight gain, normoglycaemia, and absence of ketones.
- For some women with gestational diabetes, modest energy and carbohydrate restriction may be appropriate.

### Older adults

- Energy requirements for older adults are lower than for younger adults.
- Physical activity should be encouraged.
- In the elderly, undernutrition is more likely than overnutrition, and therefore caution should be exercised when prescribing weight-loss diets.

### Hypertension

- In both normotensive and hypertensive individuals, a reduction in sodium levels lowers blood pressure. A modest amount of weight loss also affects blood pressure beneficially.
- The goal should be to reduce sodium intake to 2 400 mg/day or sodium chloride to 6 000 mg/day.

### Dyslipidaemia

Energy derived from saturated fat can be reduced if weight loss is desirable, or replaced with either carbohydrates or monounsaturated fats if weight loss is not a goal.

## DIETARY ADVICE

The challenge for practitioners is to provide dietary advice that is received enthusiastically by the individual. This requires motivation and skills to tailor advice to the individual. In practice there is evidence that many people diagnosed with diabetes receive dietary advice from the primary health care team and in particular from practice and district nurses. Nurses, dietitians, doctors and other health care professionals are therefore all involved in the dissemination of dietary advice to people with diabetes, and it is vital that everyone provides consistent advice.[11]

An individualised approach, discussed with a registered dietitian, should be used with each meal plan based on

- a nutrition assessment to determine what the person is able and willing to do
- individual treatment goals which can extend not only to blood glucose levels but also to weight control and blood lipid levels
- ongoing monitoring to check whether the meal plan should be modified.

## FOOD-BASED DIETARY GUIDELINES FOR PEOPLE WITH DIABETES MELLITUS

Food-based dietary guidelines are qualitative or descriptive statements that provide dietary guidance in terms of *foods*, rather than numerical quantities of nutrients. They reflect the most current scientific understanding of nutrition's role in health, and present this information as simple, practical (action-orientated) advice for choosing optimal eating habits. Such dietary guidelines are intended to help the general public in assessing their total diet, for example, 'Eat fats sparingly' as opposed to the nutrient goal of '30% energy from fat'.

For good health, everyone should use the South African Food-Based Dietary Guidelines which were officially adopted by the National Department of Health on 4 May 2003. These are especially important for people at risk of obesity, type 2 diabetes, high blood cholesterol and high blood pressure.[12]

Throughout the process of developing the South African Food-Based Dietary Guidelines as core nutrition messages for the promotion of health to South Africans, the intention was also to adapt them for people with special dietary needs, such as infants, young children, the elderly, pregnant and lactating women, and those with chronic diseases of lifestyle and HIV/AIDS. The rationale is that, within a household, nutrition messages are more consistent and easier to implement. The South African Food-Based Dietary Guidelines can and should be adapted to suit the needs of the person with diabetes, as illustrated below.[3,13,14]

### Enjoy a variety of foods

No single food or meal can provide the body with all the nutrients it needs. Nutritionally speaking, there are no bad or junk foods. However, unhealthy eating habits, like skipping meals, can lead to an unhealthy eating pattern.[15]

The eating plan for people with diabetes is a healthy way of eating that the whole family can enjoy. The energy and carbohydrate distribution must be taken into account when determining meal size and meal distribution for the day. Because meal distribution/times of intakes must relate to the duration of action of medication, food distribution will vary with the different treatment regimens. However, whatever the treatment regimen, the person should consume a minimum of 3 meals a day.[13]

***Carbohydrate and monounsaturated fat together should provide 60 - 70% of energy intake.***

### Make starchy foods the basis of most meals

Starchy foods are a rich source of carbohydrates, which supply the body with energy. They are also low in fats, depending on how they are prepared and what is added to them when they are eaten. Minimally processed and fortified starchy foods are also a good source of fibre, vitamins and minerals.[16]

A person with diabetes needs to be aware that starchy foods affect blood glucose levels. Consequently, these foods should have a low glycaemic index and/or be rich in fibre, such as unrefined maize meal, oats, high-fibre breakfast cereals, whole-wheat bread, brown rice and whole-wheat pasta. It is also important for people with diabetes to eat equal amounts of starchy foods at breakfast, lunch and supper, rather than having large amounts in one meal.[13,17]

### Use food and drinks containing sugar sparingly

Sucrose (sugar) can be included in small amounts as part of a balanced diet for people with well-controlled diabetes. Sugar can cause blood glucose levels to rise fairly quickly; therefore sweetened foods should be eaten only in small amounts. Sweetened foods should be high in fibre, e.g. bran muffins, and eaten as part of a meal, e.g. a small piece of plain cake after a meal rather than as a snack between meals.[3,13]

Products labelled 'diabetic', 'no sugar added' and 'low sugar' are not essential. Many of these products have a high fat and energy content, and should be used with discretion. The use of nutritive sweeteners such as fructose or sugar alcohols (sorbitol, mannitol, xylitol) must be accounted for in the meal plan as they have the potential to affect blood glucose levels. While the energy contribution of non-nutritive sweeteners (aspartame, acesulfame-K, cyclamates, sucralose) is negligible, there are contraindications, including renal impairment and phenylketonuria. Non-nutritive sweeteners and products containing these should be used in moderation.[3,13]

### Use fat and salt sparingly

Foods like margarine, butter, oil, salad dressings, mayonnaise, meat pies, doughnuts and fried chips supply the body with fats. Apart from providing energy, fats also contribute vitamins and essential fatty acids to the diet. Fats should therefore not be completely excluded from the diet, but too much fat can result in weight gain, making diabetes more difficult to control, as well as increasing the risk of heart disease. Fats and high-fat foods should be eaten in small amounts or substituted with

low-fat counterparts. Food should be steamed, baked, made into casseroles or grilled ('braai') instead of fried.[13,18]

A high intake of salt (sodium) has been linked with high blood pressure and increased risk of heart disease and stroke. To use less salt and keep food tasting good, people should be encouraged to use herbs, curry powder, chilli, ginger, garlic, onions, green peppers and tomatoes for flavour. Some foods are also rich in salt, such as biltong, bacon, snoek, pickled fish, salted nuts, salted popcorn and chips. These can still be part of a healthy diet if they are eaten in small amounts and not too often. Everyone should be advised to read food labels, especially when buying processed foods (such as soya mince and soup), and to choose those foods containing less than 5 g fat per serving and less than 600 mg sodium per serving.[19]

### Eat plenty of vegetables and fruit every day

Vegetables and fruit are the best suppliers of antioxidants (beta-carotene, vitamin C and selenium) and fibre. All types of vegetables and fruit can be eaten as part of a healthy eating plan (preferably with the peel on, and raw or lightly cooked). The motto is to 'strive for five', i.e. 3 vegetable portions and 2 pieces of fruit a day.[20]

Fresh fruit is preferable to dried fruit, and may be eaten as part of main meals and/or snacks. Dried fruit portions should be kept small as they are concentrated, e.g. 2 peach halves are equivalent to 1 fresh peach. Dried fruit should preferably form part of a high-fibre meal. As a general rule, fruit juices should be used with caution as they are very concentrated sources of carbohydrate and may cause a rapid rise in blood glucose levels. They must be diluted appropriately and accounted for in terms of carbohydrate and energy distribution.[3,13]

### Eat beans, peas, lentils and soya regularly

These foods are particularly good choices for people at risk of or with diabetes. They have a low glycaemic index that helps to keep blood glucose levels stable and to regulate appetite. These foods should be eaten at least once a week, either in the form of substitution (to replace meat dishes) or supplementation (to enhance the protein quality of a meal). They are especially useful for adding fibre to the diet and are a low-cost source of cholesterol-free dietary protein.[21]

### Chicken, fish, milk, meat or eggs may be eaten daily

These foods are rich in protein, calcium (dairy products), iron (meat products and eggs) and vitamin $B_{12}$, but can also be high in fat and cholesterol. Good choices include lean meat cuts, skinless chicken, fresh or tinned fish, eggs, and low-fat dairy products (milk, maas, yoghurt, cheese).[22]

### Drink lots of clean, safe water

People should aim to drink at least 6 - 8 cups of water a day. This intake should be increased during times of excessive water loss, such as diarrhoea, vomiting, haemorrhaging, or states of profuse perspiration (exercise, high external temperatures, illness). Some vegetables and fruits have a high water content, and soups, stews and casseroles will also contribute towards water intake. Drinks sweetened with non-nutritive sweeteners should be used in moderation.[23]

### If you drink alcohol, do so sensibly

Research has shown that the beneficial effects of alcohol are limited to an intake of no more than 1 - 2 standard alcoholic beverages a day. For people with diabetes, alcohol should be consumed in moderation (i.e. a maximum of 1 - 2 standard alcoholic beverages a day) and with a meal (to prevent hypoglycaemia). Individuals should also aim for at least 2 alcohol-free days per week.[24]

### Be active

Regular physical activity helps to promote a healthy lifestyle, increases bone strength and improves muscle strength and flexibility. It can be walking briskly, playing outdoors with the children, doing household chores, attending fitness classes, running, cycling, etc. People should aim to do some physical activity every day, working

**People with diabetes can check their daily compliance with the Food-Based Dietary Guidelines by asking the following questions:**

- Am I eating at least 3 equal-sized meals every day?
- Does the main part of every meal contain a starchy (carbohydrate-rich) food, such as unrefined maize meal, wholewheat bread, sweet potatoes, brown rice, samp, pasta?
- Am I eating some vegetables and fruit during every meal?
- Am I eating small amounts of protein-rich foods (beans, lentils, split peas, chicken, fish, meat, milk, cheese or eggs) during some meals?
- Am I adding as little fat as possible to foods when preparing, cooking and eating them?
- Am I choosing low-fat snack foods, such as low-fat fruit yoghurt, fresh fruit, popcorn?
- Am I eating foods rich in fibre, such as beans, lentils, wholewheat bread and raw fruit with the peel on?
- Am I drinking clean water every day?

up to one 30 - 45-minute session or three short 10-minute sessions over the course of the day.[25]

Being active is strongly recommended for people at risk of or with diabetes as it helps to normalise blood glucose levels as well as blood cholesterol and blood pressure levels. People with diabetes should not exercise alone. They should also monitor their blood glucose levels before, during and after exercise. In general, moderate exercise for < 30 minutes rarely requires any additional carbohydrate or insulin adjustment. However, 1 hour of increased exercise generally requires an additional serving of starchy food or fruit before exercise, while more strenuous exercise may require double this amount. A small snack (preferably low fat, low glycaemic index) may be needed if blood glucose is < 4.4 mmol/l.[13]

References available on request.

## FURTHER READING

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## IN A NUTSHELL

There is no such thing as a 'diabetic diet'. People with diabetes need a low-fat, moderate-carbohydrate, high-fibre eating plan – one that can be followed by the entire family.

The carbohydrate in the diet of a person with diabetes should come from a variety of foods, e.g. whole-wheat cereals, fruits, vegetables, low-fat dairy products and legumes.

The glycaemic index should be used in conjunction with general guidelines for healthy eating, i.e. moderate-carbohydrate, low-fat intake from a variety of foods.

Using a food-based approach that presents dietary guidelines to people with diabetes as simple, practical, action-orientated advice will aid compliance.

Dietary advice given to people with diabetes needs to be consistent. The responsibility of providing training of other health care professionals should rest with the registered dietitian to meet the need for consistency and high-quality dietary care.

A registered dietitian is trained to plan appropriate eating plans for people with diabetes. People diagnosed with diabetes should therefore be referred to a registered dietitian for individual counselling.

## SINGLE SUTURE

### Casinos and defibrillators

Rapid defibrillation by targeted but non-traditional responders is probably good value for money compared with standard emergency medical services. The data came from US casinos, which were encouraged to place sufficient defibrillators on the scene to ensure that no more than 3 minutes elapsed from the time of collapse. Investigators used Monte Carlo simulation and sensitivity analyses assessed the robustness of results – appropriate considering the setting! The authors say that the incidence of arrest should be considered when choosing locations for public access defibrillators.

(Nichol G, *et al. Circulation* 2003; **108:** 697-703.)